

SusTech 2014

Invited Speakers Program

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GOLD PATRON PRESENTATION

Title: “Sustainability Certification”

Speaker: Mark Rossolo, UL Environment



Abstract:

Governments and other institutions around the world have adopted green purchasing as a way to reduce the human health, environmental and social impacts of routine purchasing decisions. Purchasers around the globe have also modeled remarkably similar approaches to integrate these considerations into standardized purchasing practices. This presentations highlights the importance of product development to meet sustainability criteria for government and other purchasing policies, the standards and tools that support and help to communicate that a product has met these criteria, and ways that this may be considered in the research and design process for electronics manufacturers.

Speaker Bio:

Mark Rossolo is the global director of public affairs for UL Environment (ULE), a business unit of Underwriters Laboratories. Mark leads ULE’s strategic outreach and advocacy efforts, representing ULE worldwide and campaigning on behalf of the organization to drive public awareness about sustainability and green product issues. Additionally, Mark is a sought after resource on green building and sustainable procurement and has given speeches and training sessions all over world on indoor air quality, green purchasing and sustainability in general.



Mark also directs ULE’s engagement in key standards development processes globally and has an in-depth knowledge of all major green building codes and standards, including: LEED, BREEAM (UK), IgCC, ASHRAE 189.1 & 90.1, Green Globes, DGNB (Germany) and Three Star (China). Mark is a board member for the Sustainable Purchasing Leadership Council, serves on the Corporate Advisory Board for the World Green Building Council, is on the Advisory Board for the Healthy Facilities Institute and recently concluded a 2-year term on the Board of Directors for the Interior Design Collaborative-OR.

Mark has a long and varied background in the sustainability, green building and public policy realms. Previously Mark worked for the Green Building Initiative where he helped develop the first green building rating system in the U.S. to be certified as an official American national standard by the American National Standards Institute.

Mark’s professional background also includes running a non-profit dedicated to increasing green building practices, serving in a staff role for the Oregon State Legislature, running state political campaigns and doing public relations for a mid-size private appliances retailer in Oregon.

ALTERNATE ENERGY INVITED SPEAKERS

RFID Energy Harvesting: Extending Battery Life From Eighteen Hours to Thirty Days	Will Lumpkins (O & S Services, USA)
The Mechanism of Stress Corrosion Cracking in Sensitized Austenitic Stainless Steels in Nuclear Power Reactor Heat Transport Circuits	Digby Macdonald (University of California at Berkeley, USA); Jiangbo Shi (Tianjin University, USA)
Marine Tidal Energy: a Case Study in Legislative Challenges and Environmental Impacts	Sarah Marten (Macquarie University, Australia); Philip Hall (The University of Western Australia, USA)
Grid Integration Costs of Fluctuating Renewable Energy Sources	Jonas Mueller (ETH Zürich, Germany); Marcus Hildmann (ETH Zurich, Switzerland); Andreas Ulbig (ETH Zürich, Germany); Göran Andersson (ETH Zürich, Switzerland)
Evaluation of Production Cost Savings From Consolidation of Balancing Authorities in the U.S. Western Interconnection Under High Wind and Solar Penetration	Tony Nguyen (Pacific Northwest National Laboratory, USA); Nader Samaan (Pacific Northwest National Laboratory, USA); Chunlian Jin (ERCOT, USA)
Modular and Dispatchable Battery Energy storage System Field Demonstration and Use cases	John Steigers (Energy Northwest, USA)

Title: "RFID Energy Harvesting: Extending Battery Life From Eighteen Hours to Thirty Days"

Speaker: Will Lumpkins, O & S Services

Abstract:

The current battery technology has not changed greatly in over fifty years, the advent of wireless power and RFID energy harvesting is now upon us. Wireless power is achieved by directing (through Induction) a field of a single radio frequency like 2.5Ghz towards a device with an antenna cut for that frequency. Similar to the Powermat systems being deployed in major U.S. cities by Starbucks. RFID energy harvesting works in a similar fashion but instead of a single directed or inducted field of RF energy, multiple frequencies can be used in a wide field that can range from several centimeters to multiple meters of distance, and in the case of VHF/UHF frequencies up to many miles (Kilometers). This talk will cover our current situation in RFID Energy Harvesting as well an overview of the upcoming technologies that will be available in the next five to ten years as well as the varied applications that will enable sustainable technologies to turn into the next multibillion dollar marketplace. I will also cover IEEE 1874 the standard for XML standardization of repair manuals as it relates to energy harvesting and the repairing energy harvesting devices.

Speaker Bio:

William Lumpkins, Senior Member of IEEE is the CTO of O & S Services (www.ons-services.com) an Engineering Services company specializing in Consumer Product development with bringing ideas in the U.S. to fruition and bridging the manufacturing process into the Far East. William also works for Wi2Wi Inc (www.wi2wi.com) as their lead technical consultant helping integrate Wi-Fi, GPS, and Blue Tooth into multiple projects for various customers. He served in the United States Navy from 1987 ~ 1996. During his active duty and while serving aboard the USS Carl Vinson, William actively studied

Electrical Engineering/Computer Science and received his BS from New York University, Albany, 1996. While in a master's program at University of Maryland, Far East Division, Japan; William taught classes for University of Maryland & Central Texas College from 1993~1998 at night and on the weekends. William has had the honor of being a Past President of the IEEE Consumer Electronics Society.

Title: "The Mechanism of Stress Corrosion Cracking in Sensitized Austenitic Stainless Steels in Nuclear Power Reactor Heat Transport Circuits"

Speaker: Digby Macdonald, University of California at Berkeley, USA

Abstract:

Various forms of corrosion (the interaction of an alloy with its environment resulting in the degradation of properties) are responsible for 80% of the unscheduled outages of nuclear power plants (NPPs) world-wide. Of the various forms of corrosion, stress corrosion cracking (SCC), particularly in thermally-sensitized austenitic stainless steels, is a major contributor to economic loss in both Boiling Water Reactors (BWRs) and Pressurized Water Reactors (PWRs). The problem could be significantly alleviated if a model was available that could accurately predict crack growth rate (CGR), so that repairs might be affected during scheduled outages (e.g., for refueling), thereby avoiding costly, unscheduled outages, the cost of which is not built into the price of the product (electrical energy).

Over the past three decades, one of the current authors (DDM) has developed the deterministic Coupled Environment Fracture Model (CEFM) that provides accurate prediction of CGR in BWR primary coolant environments (water at 288oC) and this model has been used to model the accumulation of SCC damage in 14 operating BWRs world-wide. The CEFM is "deterministic", because the output (predicted CGR) is constrained by the relevant natural laws (conservation laws of mass and charge and Faraday's law of mass-charge equivalency) and hence is fundamentally different from the empirical models that are commonly used by nuclear engineers for this purpose.

In developing any model for predicting a dependent variable in a complex environment, in response to various independent variables that span a set of physico-chemical phenomena, it is important to establish that the model accurately captures the "character" of the phenomenon. Thus, in the case of SCC in thermally-sensitized austenitic stainless steels, it is known that the observed CGR is a function of temperature and of various mechanical (stress intensity factor), metallurgical (degree of sensitization and extent of cold work), and electrochemical [electrochemical corrosion potential (ECP), coolant conductivity, flow velocity, pH] factors, such that the "character" of the process is an appropriate mixture of these same factors.

In this paper, we describe an Artificial Neural Network (ANN) analysis of available CGR data in the literature to determine the contribution of each factor (temperature, stress intensity factor, KI, degree of sensitization, DoS, ECP, coolant conductivity, κ) to the magnitude of the dependent variable (CGR), as predicted by the ANN. It is shown that the contributions of the factors lie in the following order: ECP (43.6%) > T (17.8%) > κ (14%) > DoS (13.8%) > KI (10.8%), thereby establishing that SCC in thermally-sensitized austenitic stainless steels is primarily an electrochemical phenomenon, not a mechanical phenomenon, as is commonly postulated by the nuclear power

community. We show that the CEFM is in high fidelity with the ANN findings, thereby further confirming the correct physical basis of the model.

Speaker Bio:

Digby D. Macdonald is Professor in Residence, Departments of Materials Science and Engineering and Nuclear Engineering, at the University of California at Berkeley.

Born in Thames, New Zealand, December 7, 1943, Professor Macdonald gained his BSc and MSc degrees in Chemistry at the University of Auckland, New Zealand, and his Ph.D. degree in Chemistry from the University of Calgary in Canada.



For more details, see his keynote bio.

Title: “Marine Tidal Energy: a Case Study in Legislative Challenges and Environmental Impacts”

Speaker: Philip Hall, The University of Western Australia

Abstract:

With the international pressure mounting on first world and developing countries to respond to climate change by targeted reductions in carbon emissions and their overall carbon footprint, increasing focus is being placed on the exploration of new and renewable energy sources using innovative and emerging technologies, such as marine tidal turbines. In pursuing new energy sources, governments must put in place a clear and consistent national energy strategy that addresses the use of renewable energy sources as well as the environmentally sustainable use of traditional energy sources. The national energy strategy must also place a strong emphasis on energy conservation as well as emphasize integrated solutions, solutions that make use of the best available technologies and can be readily tailored to local requirements. Such solutions evolve as technologies change, and provide a wide range of choices to meet varying social, economic and environmental conditions. As these solutions evolve, so must the legislative framework evolve to ensure these solutions are developed and operated not only for the social and economic benefits they offer, but also to cater for their potential environmental impacts. Marine tidal turbines harvest energy by the rising and falling of the sea and the tidal stream across turbine rotors which generate electricity to the grid. The United Kingdom is a world leader in development and application of this technology. This paper examines the key areas in developing Marine Tidal Energy (MTE) as a source of renewable energy; the level of maturity in legislation, development of technology and the potential environmental impacts to marine life.

Speaker Bio:

Philip Hall provides strategic business and project management consulting services internationally to major companies, organisations and government agencies. He is also an international adviser on practical strategies for emergency management and climate change adaptation, consulting to the Australian government and several agencies within the United Nations.



He recently co-chaired a high-level workshop sponsored by the Australian Government through the Australian Council of Learned Academies (ACOLA) to consider the role of new technologies in Securing Australia's Future, and participated in the 2nd World Emerging Industries Summit (WEIS 2013) in Wuhan, China, as a guest of the Asia-Pacific CEO Association Worldwide (APCEO) and the Wuhan Municipal Government of China.

Philip is an Adjunct Professor in the School of Civil, Environmental and Mining Engineering at The University of Western Australia. He is a Fellow of both the Australian Institute of Management (FAIM) and Engineers Australia (FIEAust), a Senior Member of the Institute of Electrical & Electronic Engineers (SMIEEE), and a Member of both the International Water Association (MIWA) and International Association of Emergency Managers (MIAEM). In IEEE he is a Distinguished Lecturer in the Society of Social Implications of Technology (SSIT), current Chair of IEEE SSIT Australia, current Chair of the IEEE SSIT Chapters Committee and SSIT Chapters Coordinator. He is also the SSIT representative on IEEE-USA's Committee on Transportation and Aerospace Policy (CTAP), which advises policy guidance to the US Administration and Congress.

Title: “Grid Integration Costs of Fluctuating Renewable Energy Sources”

Speaker: Marcus Hildmann, ETH Zurich

Abstract:

The grid-integration of intermittent renewable energy sources (RES) production causes costs for grid operators due to inherent RES forecast uncertainty and the thereby resulting production schedule mismatches. These so-called profile service costs are marginal cost components and can be understood as an insurance fee against production schedule uncertainty that the system operator incurs due to the obligation to always provide sufficient control reserve capacity for power imbalance mitigation.

This paper studies the situation for the German power system and the existing German RES support schemes. The profile service costs incurred by German transmission system operators (TSOs) are quantified and means for cost reduction are discussed. In general, profile service costs are dependent on the RES prediction error and the workings of the power markets via which the error is balanced. It is shown how the prediction error can be reduced, for instance via optimization against power markets or active curtailment of RES generation.

Speaker Bio:

Marcus Hildmann received his Dipl. Ing and MSc. degrees from the Technical University of Darmstadt, Germany in 2007. In 2007 he joined swissQuant AG in Zurich, Switzerland, where he worked as a quant in structured product pricing and electricity risk. Since 2010 he is a researcher and doctoral student at ETH Zurich (Swiss Federal Institute of Technology), Switzerland. His research interests are in electricity pricing and risk estimation, parameter estimation, optimal control, machine learning and data mining, renewable energy integration and asset valuation.

**Title: “Evaluation of Production Cost Savings From Consolidation of Balancing Authorities in the U.S. Western Interconnection Under High Wind and Solar Penetration”**

Speaker: Tony Nguyen, Pacific Northwest National Laboratory

Abstract:

This paper introduces a comprehensive analysis to quantify the potential savings in production cost due to consolidation of 32 U.S. Western Interconnection Balancing Authorities (BAs). Three simulation scenarios are developed: the current structure of Western Electricity Coordinating Council (WECC) BAs, full copper-sheet consolidation, and full consolidation with transmission congestion considered. The study uses a WECC Transmission Expansion Planning Policy Committee model that was developed for the year 2020. The model assumes 8% wind and 3% solar energy penetration as percentage of total WECC demand in 2020. Sensitivity analyses are carried out to assess the impact of transmission hurdle rates between WECC BAs on potential benefits. The study shows that savings ranging from \$440 million (2.4% of total one-year production cost) to \$610 million (3.2%) per year in thermal unit production cost due to consolidation can be achieved. The copper-sheet consolidation scenario shows a further savings of \$240 million (1.4%) per year.

Speaker Bio:

Tony B. Nguyen received the B.S., M.S. and Ph.D. degrees in electrical engineering from the University of Illinois at Urbana-Champaign in 1998, 1999 and 2002 respectively. He is currently a Research Scientist at Pacific Northwest National Laboratory in Richland, WA. His research interests are in Power System Dynamics and Stability, Power Systems Operation and Control, Dynamic Security Assessment, Distributed Generation, Renewable Energy, System Modeling and Simulation. He is a member of IEEE.



Title: "Modular and Dispatchable Battery Energy storage System Field Demonstration and Use Cases"

Speaker: John Steigers, Energy Northwest

Abstract:

Reporting to-date progress and results of a collaborative partnership between an energy storage system (ESS) developer and manufacturer, northwest public power, and a national energy laboratory undertaking field deployment and assessment of a portable self-contained battery-based ESS in multiple potential deployment environments. Utilizing a single 120 kilowatt and 500 kilowatt-hour capacity ESS by Powin Energy, the project's Phase I had the ESS at Bonneville Power Administration's medium voltage test facility for comprehensive characterization and performance testing; Phase II at Energy Northwest's 96MW Nine Canyon Wind Generation facility for transmission grid scale and intermittent generation resource integration application "use cases"; Phase III, currently wrapping up, focuses on utility scale use cases in the electric distribution system of City of Richland, Washington; and Phase IV will address "behind-the-meter" use cases at a larger institutional load having on-site solar generation, Pacific Northwest National Laboratories.

*Joint project with Pacific Northwest National Laboratories (PNNL), and Bonneville Power Administration (BPA).

Speaker Bio:

John Steigers has a BSEE (Honors) University of Idaho.

John joined Energy Northwest's generation project development team in 2009, focusing on identifying opportunities for and pursuing generation resources using solar, wind, biomass, and other non-conventional energy sources. Most recently, John has managed Energy Northwest's participation with multiple partners in battery-based energy storage testing and field deployment projects and spearheading a team of regional utilities' successful offering of demand response resources to Bonneville Power Administration.

After serving 6 years in the US Navy submarine service, John spent 14 years with Avista Utilities as substation and generation design engineer, senior internal auditor, and thermal generation (coal, natural gas, fuel oil, and biomass) asset management, operations, and fuel supply. John also served 8 years as vice president and project manager for a Denver-based environmental permitting and business development consulting firm; renewable energy programs manager for Alaska's state energy office; and as business development manager for a north Idaho engineering firm.

ENERGY EFFICIENCY INVITED SPEAKERS

Energy Efficiency Projects - A Case Study at Weber State University	Fred Chiou (Weber State University, USA)
Institutional Transformation for Energy Conservation/Sustainability	Jerry McNeish (Sandia National Labs, USA)

Title: "Energy Efficiency Projects - A Case Study at Weber State University"

Speaker: Fred Chiou, Weber State University

Abstract:

Weber State University has been doing many energy efficiency projects in the past years. The achievement is remarkable. The case study conducted a survey on the projects that Weber State has done or in progress and showed the impacts on the campus. The study shows that \$3.8 million has been invested in 59 energy efficiency projects. Ten more energy efficiency programs are still in progress. The energy efficiency projects include Dee Event Center LED lightings, Natural gas fueling station, Lighting upgrade project, Davis campus solar array, Shepherd Union solar array and Swenson solar water heating. A pilot project of solar charge station for charging electric bikes is in progress. The goal of this project is to promote the energy saving and sustainability on Weber State campus. It also provides the opportunity for research and education through student's senior projects. By designing and implementing the projects, students will learn the theory of solar PV systems with the hands-on experience.

Weber State has reduced its electrical consumption by 30 percent during the past five years. The university has reduced electricity use by 10.8 million kilowatt hours, resulting in \$540,000 in savings annually. Weber State University is awarded 2014 Wattsmart Business Partner of the Year for its commitment to energy efficiency by local utility company Rocky Mountain Power.

Speaker Bio:

Fred Chiou is Assistant Professor in the Electronics Engineering Technology program in the College of Applied Science and Technology at Weber State University. He teaches Digital Systems, Embedded Controllers, Real-Time Embedded Controllers, System Design and Integration, Circuit Analysis, Troubleshooting, Renewable Energy and Senior Project I & II.

Prior to Weber State he was an Adjunct Professor in the Electrical Engineering Department at Southern Polytechnic State University.

He is a member of ASEE, IEEE and the American Solar Energy Association. He has a Ph.D. and MSEE in Electrical Engineering from Georgia Institute of Technology, and BS in Electronic Engineering from Taiwan University of Science & Technology.

Title: “Institutional Transformation for Energy Conservation/Sustainability”

Speaker: Jerry McNeish, Sandia National Labs

Abstract:

Reducing the energy consumption of large institutions with dozens to hundreds of existing buildings while maintaining and improving existing infrastructure is a critical economic and environmental challenge. SNL’s Institutional Transformation (IX) work integrates facilities and infrastructure sustainability technology capabilities and collaborative decision support modeling approaches to help facilities managers at Sandia National Laboratories (SNL) simulate different future energy reduction strategies and meet long term energy conservation goals.

The modeling platform integrates 114 individual eQUEST (<http://doe2.com/equest/>) building models from SNL’s New Mexico and California campuses within a Visual Basic for Applications (VBA) wrapper. The 114 buildings include all buildings at SNL greater than 10,000 sq. ft., and represent greater than 90% of the energy consumption at SNL. The IX model allows users to simulate the application of different combinations of energy conservation measures (ECMs) to different buildings over different time frames. The model is useful for evaluating tradeoffs associated with competing strategies and making them clear to decision makers and other stakeholders. As an example, a solar module built in Powersim Studio allows planners to evaluate the potential photovoltaic (PV) energy generation potential for flat plate PV, concentrating solar PV, and concentration solar thermal technologies at multiple sites across SNL’s New Mexico campus.

Development of the modeling framework was a unique collaborative effort among planners and engineers in SNL’s facilities division, scientists and computer modelers in SNL’s research and development division, and engineers from Arizona State University and Bridgers and Paxton Consulting Engineers, Inc., in Albuquerque, NM. With some modification and with new building models the IX model can be applied to institutions all over the world.

Speaker Bio:

Currently a technical manager at Sandia National Laboratories in California, Jerry McNeish’s interests are in technical analysis and management for modeling and simulation of energy, cyber, and environmental complex systems. He has a special interest in resilience and sustainability of such systems. Mr. McNeish’s professional experience includes complex systems analysis, modeling and simulation, renewable energy feasibility assessment, environmental consulting, risk assessment/ management, and cost risk assessment. He has experience conducting and managing analyses for industrial, state, U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and international clients. Other stops along the way have provided experience with virtual organizations across multiple sites/states, software verification and validation, uncertainty analysis, human health and cost risk assessments of active and abandoned facilities, groundwater modeling, and aquifer testing and analysis and field sampling. International consulting experience in Switzerland (2 years) dealing with radioactive waste disposal issues. He is a co-developer of Sandia’s Sustainability Innovation Foundry which supports a linkage between facilities and R&D toward improved energy utilization.



SMART GRID INVITED SPEAKERS

Edison was Right! By the Numbers, DC Microgrids for Sustainable Buildings Sooner	Guy ALee (EMerge Alliance, USA)
The Role of Flexible Load in Achieving Sustainability	Conrad Eustis (Portland General Electric, USA)
Advances in Power Grid Research in the Pacific Northwest	Emilie Hogan (Pacific Northwest National Laboratory, USA)
Charging Into a Greener Future with Smart Grid	Rhonda Walton (EVO2GO, USA)
Demonstration of Energy Storage Applications at the Salem Smart Power Center	Kevin Whitener (Portland General Electric, USA)
Smart Grid in the Northwest	Bryce Yonker (Smart Grid Oregon, USA)

Title: “Edison was Right! By the Numbers, DC Microgrids for Sustainable Buildings Sooner”

Speaker: Guy ALee, EMerge Alliance

Abstract:

As the imperative to move to sustainable technology moves inexorably forward, our continued reliance on alternating current for power distribution and end-point use is becoming, literally, unsustainable. 80% of all new products use power semiconductors, thus the entire load base is becoming inherently dc. The needless conversions back and forth between ac and dc (and the additional cooling load it creates) calls into question the continued use of ac and begs for dc, especially as microgrids in a distributed-everything world. As 3,300 Volt rated semiconductors hit the market we have the technology to do more efficient conversion and distribution using dc microgrids from LV to MV to HV. In a sometimes serious, sometimes irreverent take on dc microgrids this presentation asserts that “Edison was right!” and looks at dc microgrids for a more sustainable world and accelerating zero net energy buildings, by the “numbers”.

Speaker Bio:

Guy ALee is a Server / Data Center Energy Researcher and a Direct-Current Evangelist because dc is a matter of when not if. He is a computer industry veteran with over 30 years of experience in computer architecture, hardware, software, energy and the Internet of Things (his current assignment). As a Research Scientist in Intel Labs, Intel’s research arm, he has helped deliver breakthrough technologies that bring the benefits of the ongoing digital revolution to everyone. He worked in the Energy & Sustainability Research Lab which envisioned the smart-grid with energy-smart homes and offices and neighborhoods as the next big inflection point since PCs, cell phones and the Internet. He created Cabezon Peak Technology to use Data Centers as a subsecond-responsive megawatt load in demand-response. For the last several years he has been working on 380Vdc in the Data Center and was Intel’s representative to the worldwide EMerge Alliance. He is currently Chair of the EMerge Alliance’s Campus/Building Direct-Current Microgrid Technical Specification Committee where 380Vdc is expected to expand its use beyond data centers into all commercial buildings. He holds a BSEE and MSECE from Portland State University and is currently working on a PhD there.

Title: “The Role of Flexible Load in Achieving Sustainability”

Speaker: Conrad Eustis, Portland General Electric

Abstract:

For the first 125 years of the electric system, engineers designed load devices based on the assumption that the grid was a 24x7, all you can eat buffet. But as we start to add wind and solar resources at scale, the value of these resources is limited under the way loads operate today. So to create value we either need to store and shape renewable energy or we need loads to follow renewables if possible. The presentation will cover leading efforts to accomplish both.

Speaker Bio:

Conrad Eustis is Director Retail Technology Strategy for Portland General Electric Company. Conrad has 38 years of experience in the energy industry including 5 years working on nuclear submarines and 28 years at Portland General Electric. In the past twenty-one years Conrad has had major roles implementing more than twenty new technology platforms to enable both utility and customer benefits in the smart grid areas of metering, demand response, and integration of renewable generation. His roles in these projects are broad including engineering design, information technology requirements, economic evaluation, business case creation, and contracting. In 2009, '10 and '11 he supported Portland State University's course: *Designing Smart Grid for Sustainable Communities* as an Adjunct Professor. In 2010 he testified on smart grid standards to the U.S. House Subcommittee on Technology and Innovation. He has technical degrees from Carnegie-Mellon and Brown Universities.

Title: “Advances in Power Grid Research in the Pacific Northwest”

Speaker: Emilie Hogan, Pacific Northwest National Laboratory

Abstract:

In this talk I will describe three major efforts at Pacific Northwest National Laboratory to study and improve the current power grid, as well as research on mathematical techniques inspired by power grid needs. First, the Pacific Northwest Smart Grid Demonstration Project, headed by Battelle, aims to implement new smart grid technologies and business models in order to test them on a regional scale. Next, the Future Power Grid Initiative (FPGI) at PNNL is an internally-funded endeavor which addresses three pressing areas of research for an evolving power grid: data networking and management; modeling, simulation, and analysis; visualization and decision support. Finally, I will discuss the DoE-funded Center for Multifaceted Mathematics for Complex Energy Systems (M2ACS). In this center, managed by Argonne National Laboratory, we are developing new mathematical techniques that have applications for complex systems including the power grid. I will briefly describe these capabilities.

Speaker Bio:

Dr. Emilie Hogan is a Computational Mathematics Scientist in the Computational Mathematics group at PNNL. She graduated from Rutgers University in May 2011 with a doctorate in Mathematics. Her PhD research was in creating an algorithm to prove global asymptotic stability of rational difference equations. Her current research is in applications of discrete mathematics to cybersecurity, power

grid, knowledge systems, and computational chemistry. In all of these research areas she is applying order theory and graph theory, to solve various real world problems.

Title: “Charging Into a Greener Future with Smart Grid”

Speaker: Rhonda Walton, Evo2Go

Abstract:

The concept of EVO2GO was conceived in March of 2000. We’ve designed our own micro grid kiosk that will support Smart Grids today. Arguably, we feel it is the Swiss Army Knife of Smart Grid.

Speaker Bio:

Rhonda Walton is President and CEO of Evo2Go, which she founded in 2009. Previously Rhonda had held multiple positions in marketing and advertising and has 35 years of experience. She has held many senior positions in Univision and AT&T Advertising Solutions where she specialized in television commercials and Hispanic advertising. She had been active in promoting green energy and environment consciousness and was former board member and chair of events for Oregon Electric Vehicle Association (OEVA). She is presently a member of OEVA, Citizens Utility Board (CUB). She is a proud sponsor of events like OEVA Electric Vehicle Celebration Day and appears in Who’s Who in America 2011 – 2012. Her field of interests include Electric Vehicles(EV), Electric Charging Stations(EVSE), EVSE testing, EV Critical Mile, PayPointSystems (for EV charging), Smart Grid, Solar, Wind and Hydro. She brings about a wind of new concepts in promoting clean technology.

Title: “Demonstration of Energy Storage Applications at the Salem Smart Power Center”

Speaker: Kevin Whitener, Portland General Electric

Speaker Bio:

Kevin Whitener is a smart grid project manager for Portland General Electric. He is a licensed electrical engineer and holds a master’s degree in business administration. In addition to designing smart grid solutions to address system reliability improvement, he also explores and implements smart grid technologies to increase integration of renewable energy onto the grid.

Title: “Smart Grid in the Northwest”

Speaker: Bryce Yonker, Smart Grid Oregon

Abstract:

For years the Pacific Northwest has been a model for comprehensive energy planning and effective energy conservation and clean energy resource development. In addition, the NW is filled with early adopters of energy-related products such as electric vehicles and home energy management systems and it's a birthplace of green buildings.

The new trade organization Smart Grid Northwest intends to take the region's advances and assets to the next level of effectiveness by weaving them all together with a smarter energy system.

Significant progress is already unfolding:

- BPA and regional partners are nearing completion of a \$180 million dollar smart grid demonstration project proving out various transactive energy models, installing various advanced solutions like dispatchable assets such as battery storage
- PGE and Idaho power have deployed smart meters across their service territories and a number of other utilities are planning AMI projects in the next few years
- A number of energy storage projects are online and being actively planned
- Avista and other regional utilities are investing in grid innovation through demonstration and R&D programs that hold commercial promise
- Many demand response solutions are coming online via commercial and rural programs
- Pacific Northwest National labs are testing various smart grid applications and solutions
- Key industry firms from Itron, Alstom, and Ecova to Building Energy, McKinstry, and Serveron are selling solutions to clients around the globe

This session will discuss the smart grid activities in the NW and the plans for Smart Grid Northwest with its mission to promote, grow and enable the smart grid industry and infrastructure in the Pacific Northwest.

It will also review the reasons that a smart grid is so critical for the region including:

- Creating jobs
- Integrating new energy resources
- Optimizing clean and distributed energy sources
- Empowering consumers
- Ensuring energy affordability
- Establishing a more resilient, reliable, and sustainable energy system

Speaker Bio:

Bryce Yonker is the Director of Business Development at Clean Edge, a leading clean-tech research and advisory firm. In heading up the business development, sales, and marketing efforts, Bryce is often the first line of contact between Clean Edge and its customers. Bryce also helps the firm's clients apply insights and understand opportunities, having delivered a number of educational sessions on datasets and market activity. He is also a leader for strategic projects that Clean Edge conducts in collaboration with partners including efforts on the utility of the future and other clean-tech industry thought-leadership. Bryce is a Founder and the Acting Executive Director of nonprofit Smart Grid Northwest (which is currently expanding from Smart Grid Oregon). In this role he is heading up the efforts to broaden the organization's membership base and develop regional initiatives to foster the progress of smart grid industry and infrastructure in the Pacific Northwest. Bryce holds his B.S. in Business Administration and Marketing from Pepperdine University and an MBA from IE in Madrid, Spain.

SOCIETAL IMPLICATIONS / QUALITY OF LIFE INVITED SPEAKERS

Integrated Technology Solutions for Agricultural Irrigation	Dan Berne (Next Chapter Marketing, USA)
Will New York City Ever Be Safe From Future Flooding?	Malcolm Bowman (Stony Brook University, USA)
Residential Energy Independence: Moving Beyond Net-zero	Karen Faerber-Hall (Project One Earth, Inc, USA); Philip Hall (The University of Western Australia, USA)
Educating Sustainability Engineers - Redesigning Curricula	Roger Hadgraft (CQ University, Australia)
Recent Advancements and Opportunities in Humanitarian Technologies	T.L.Prasanna Venkatesan (Expert in Humanitarian Technologies, USA)
Renewable Energy for International Development	Slobodan Petrovic (Oregon Institute of Technology, USA); John Grieser (Elemental Energy, USA); Hope Corsair (Oregon Institute of Technology, USA)
DIY Repair: How a Global Movement of Tinkerers, Hackers, and Self-Taught Engineers is Building a Repairable Electronics Industry	Kyle Wiens (IFIXIT.COM, USA)

Title: “Integrated Technology Solutions for Agricultural Irrigation”

Speaker: Dan Berne, Next Chapter Marketing

Abstract:

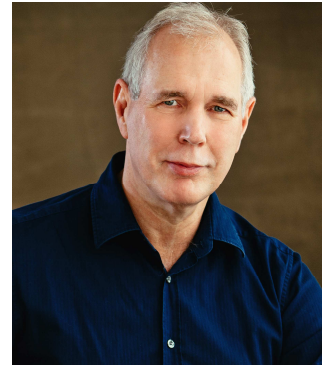
During the past two and a half years, the Northwest Energy Efficiency Alliance (NEEA) has developed and managed an Agricultural Irrigation Initiative. The goal is to accelerate the market’s adoption of smart, integrated irrigation technology solutions that will increase energy efficiency in irrigation management.

Technology has provided many tools to help growers irrigate their land more efficiently. However, these tools rarely work together well, and; growers using them must invest extra effort to bring the information together. Improving interoperability among these tools will reduce users’ effort, increase adoption, and lead to greater water use efficiency through improved accuracy and precision of irrigation management.

Over the past eighteen months, a group of companies has been collaborating to develop data standards to enable interoperability of environmental sensors, soil mapping, advanced pump controls, variable rate irrigation, and software applications. These industry-wide data schemas and formats will enable the exchange, and use by irrigation management systems, of data currently stored in a variety of proprietary formats. This work is currently taking place in the context of AgGateway’s Water Management Group and PAIL project, with sponsor funding by the NEEA. Dan will present the results of the work to date, including key accomplishments, and technical, social and market challenges.

Speaker Bio:

Dan Berne is a highly regarded professional business growth strategist with over 25 years' experience. In his consulting practice, Dan has worked with the Northwest Energy Efficiency Alliance (NEEA) during the past two years to help them craft an Agriculture Irrigation Energy Efficiency strategy. He has led the effort with NEEA and the AgGateway Consortium to develop industry-wide data standards for agricultural data transfer. He is also working with NEEA and northwest utilities to craft a market strategy for its Strategic Energy Management initiative. Dan is an affiliate of the Chasm Institute, a certified practitioner of Innovation Games, and a certified coach of Six Disciplines Strategic Planning and Execution.

**Title: "Will New York City Ever Be Safe From Future Flooding?"**

Speaker: Malcolm Bowman, Stony Brook University

Abstract:

Superstorm Sandy inflicted a huge amount of damage and destruction to coastal New Jersey, Metropolitan New York and the south coast of Long Island. Conflicting statements by former Mayor Michael Bloomberg and New York State Governor Andrew Cuomo made shortly after the storm with their views about what to do to better protect the region from future catastrophes have contributed to confusion, doubt, inaction, financial hardship and ruin for many thousands of residents living near the coast.

Meanwhile well-publicized competitions for intelligent redesign have led to futuristic, imaginative proposals, some of which would be quite ineffectual in stopping another major storm surge such as Sandy. A philosophical chasm exists between the so-called "green" and the "grey" factions.

Environmental and engineering groups talk past each other, rather than to each other. On the left, the environmental community is invoking "soft solutions" of reseeded long extinct oyster beds to absorb storm surges, placing huge mats of floating seaweed attached to the shoreline of Manhattan to dampen down the storm tide and rebuilding exotic offshore sand dunes, to replenish and protect the exposed ocean beaches. On the right, civil engineers are warning that many of these proposed solutions just will not stop the fury of an extreme storm surge, and giant European-style storm surge barriers are the only permanent solution for a sustainable future, keeping the city dry.

These various points of view are complicated by the uncertain predictions of climate change, rate of rise in sea levels, expected increasing intensity of storms and continuing unwise development of the coastline in exposed areas. So the situation boils down to "resilience" versus "protection". Does the region have to settle for an inevitable future of occasional flooding, but with local strengthening of facilities and infrastructure designed to rebound quickly, or is a regional solution of storm surge barriers to protect not only New York City, but also heavily-industrialized northern New Jersey, the better approach? What does the future hold, given political uncertainties, fiscal restraints and lack of commitment to a sustainable future?

This presentation discusses these various points of views and the emerging science of storm surge dynamics. The Stony Brook Storm Surge Research Group develops modern ocean/ atmospheric modeling systems to hind-cast storm surges based on the characteristics of historical storms (rather than synthetic storms) to better estimate realistic predictions of future storm surges and flooding scenarios for Metropolitan New York and New Jersey in an era of climate change and rising sea levels.

Speaker Bio:

Malcolm J. Bowman is an observational physical oceanographer and a registered professional engineer with more than 40 years of experience in coastal marine science, ocean and water quality modeling, storm surge science and the interactions of the physical environment with marine ecosystems.

Dr. Bowman holds B.Sc., and M.Sc. degrees in Physics and mathematics from the University of Auckland, New Zealand, and a PhD degree in Engineering Physics from the University of Saskatchewan, Canada.



Malcolm Bowman is Distinguished Service Professor of Physical Oceanography at the State University of New York at Stony Brook. He is a marine physicist and coastal engineer and has published over 80 contributions in the fields of oceanography, ocean modeling, storm surge science and policy studies related to climate change. He also has published numerous papers on solid state physics and biomedical engineering. He is the Leader of the Stony Brook Storm Surge Research Group. His current research is devoted to the study of storm surge science and the characteristics and dynamical properties of extreme weather events such as hurricanes and winter nor'easters and the waves, surges and flooding such storms produce especially over the northeastern seaboard. He serves on the New York Panel on Climate Change. His most recent book is "Modeling Gulf of Mexico Circulation and Oil Dispersal: with reference to the Deepwater Horizon oil spill" (with D. Dietrich, K. Korotenko and M.H. E. Bowman. In press, Scrivener Publishing).

Title: "Residential Energy Independence: Moving Beyond Net-zero"

Speaker: Karen Faerber-Hall, Project One Earth, Inc.

Abstract:

Significant advances have been made in developing and employing technologies and techniques to improve the energy efficiency of residential buildings in First World countries. The correct application of these technologies and techniques, in conjunction with adherence to sound energy conservation practices in the home environment, has been shown to achieve a considerable and sustainable reduction in the energy footprint (and therefore carbon footprint) of the typical household for a modest financial investment.

In many cases, homes have been able to become "net zero" or "near net-zero" in their annual energy consumption. While this achievement is the aspirational goal of most environmental conservation groups and environmentally conscious home owners, we need to now ask ourselves "Why stop at net-zero? What if our homes could generate enough electricity to meet all of our own energy demands - all the time - and thus be "energy independent"?

This paper proposes that achieving "Residential Energy Independence" should now be our aspirational goal; not only for the acknowledged benefits it offers to society and the environment, but - if vigorously pursued - it also offers our best chance to permanently change our complacent attitude to domestic energy supply and demand. This paper argues that moving beyond net-zero to sustainable energy independence is not only possible for the typical residential household, but is achievable through the appropriate integration of existing technologies and the diligent application of proven energy reduction measures in the home.

Speaker Bio:

Karen Faerber-Hall is a founding Member of the Board of Directors of Project One Earth Inc., a newly founded non-profit organisation in the United States that is dedicated to promoting the development of innovative environmental science and technology solutions and facilitating their transition into mainstream practical applications.

She works internationally as a strategic business and project management consultant providing support to a diverse range of clients in challenging business and complex technological environments. A qualified ENERGY STAR Rater (RESNET) and certified Level I Thermographer specialising in weatherisation, she has also consulted to several US companies on the technology and policy issues of energy efficiency in the residential and commercial built environment.

She holds a Bachelor of Arts from the University of Missouri, a Master of Arts from Eastern Michigan University, and a Senior Executive Masters of Business Administration from The University of Melbourne Business School (Australia).

Title: "Educating Sustainability Engineers - Redesigning Curricula"

Speaker: Roger Hadgraft, CQ University, Australia

Abstract:

There is a pressing need to graduate new kinds of engineers. These engineers must be competent across four domains – the traditional technical domain of engineering as well as the economic, the environmental and the social/political.

So, you might say, what's changed? Engineers have been dealing with the technical and the economic for the last 5,000 years. However, it wasn't until the 70s and 80s that the environmental domain became an issue. We solved that problem by educating 'environmental engineers', so most branches of engineering simply pretended that it wasn't their problem. In the 21st century, the social dimension is transforming engineering. Will we create 'social engineers' or will we wait for other professions to define the problem for us so that we can bring our technical skills to bear? Will engineering move beyond the technical and economic?

For example, water shortages in cities were once solved by building new dams. In the 70s and 80s, economists challenged this method by asking 'can we reduce usage by pricing the resource more realistically?', that is, by reducing demand. Recognising that half of urban water usage is in the garden (in Australia), people have been encouraged to plant native gardens that use less water (better suited to the local climate). In this century, we have also reduced water usage by educating

people to use less. So, solutions are available in all four technical domains: the technical, the economic, the environmental and the social. Engineers need to be skilled in all these areas.

However, when we look at modern engineering curricula, we find them dominated by learning technical skills from 'fundamentals'. Many hours are spent learning to solve mechanics problems from first principles when sophisticated software already exists to do this. We believe that this is essential to understanding. However, the research in concept tests and concept inventories shows that passing our exams does not lead to fundamental understanding. We need to do this differently. There are many more fundamentals that must now be learned, which includes economics, environmental science and social sciences. How will we manage this?

We need different kinds of curricula that allow students to integrate their understanding across the four domains. Teaching these skills in isolation leads to isolated thinking. We already have quite a lot of experience in introducing students to complex problem solving in first year through the Engineers Without Borders Challenge in Australia, and now in New Zealand and the United Kingdom. However, years 2 and 3 are often given over to technical matters and many, perhaps most, students complete final year also entirely focussed on technical skills. This does not graduate engineers ready for work in the 21st century.

Curricula need to combine the complexity of practice with the fundamentals of the supporting sciences in every year and every semester. This engages students through experiential learning where they see the role of theory in helping them act as better problem solvers. These complex problems will naturally include the four domains discussed above – not necessarily every problem but at least half of them. Students need to learn that engineering is about dealing with complexity and much of the complexity emerges from the social domain. We have already brought much of the technical complexity under our control through software.

Inevitably, students will increasingly use online tutorial systems to learn the fundamentals. These systems will be licensed by universities in the same way that we already license engineering software. Learning at university will be transformed from drafty lecture halls to engineering workshops using sophisticated modelling tools to build prototype solutions to real problems. Students will be actively engaged with communities, interacting with real stakeholders. Anyone who has seen the work of a Formula SAE team knows what this looks like. Given autonomy and a clear sense of purpose they proceed to master both the problem and their disciplinary knowledge. These are the engineers we need for the future.

Speaker Bio:

Professor Roger Hadgraft, FIEAust, is Deputy Dean, Learning and Teaching in the School of Engineering and Technology, Central Queensland University in Melbourne. He is a Fellow of Engineers Australia, and in his previous appointment was Innovation Professor in Engineering Education at RMIT University where he established the Bachelor of Sustainable Systems Engineering degree course. Prior appointments include 5 years as Director, Engineering Learning Unit at the University of Melbourne; 5 years as Director for Teaching & Learning in Civil, Environmental and Chemical Engineering at RMIT University; and 16 years as a Senior Lecturer in Civil Engineering at Monash University.



Title: “Recent Advancements and Opportunities in Humanitarian Technologies”

Speaker: T.L.Prasanna Venkatesan, expert in Humanitarian Technologies

Abstract:

Sustainability thoughts and ideas need to be integrated in our education system early in the learning cycle. Several reports have pointed out how engineers lack a sense of notion about social issues and ecological factors. Sustainability as a direction should be natural to any problem solving approach and our education and academic system have a big role to infuse such thoughts in the coming generations. This session will aim to pose questions on the above lines and inspire healthy discussion. Further the speaker will throw light on some of the leading IEEE Initiatives that attempts to solve the aforementioned problem.

Speaker Bio:



Prasanna Venkatesan is the co-founder of Hubvents where he leads the company’s efforts to power data driven solution to the events Industry. He previously worked with IBM Research where he conducted research on Enterprise People Connections, an effort sponsored by the IBM CIO’s office. He has been volunteering with IEEE on a number of roles. Most recently he is the Chair of IEEE Educational Activities Board (EAB), Section Education Outreach Committee and a voting member of the EAB. He also serves as a member of the SIGHT Steering Committee and multiple other committees of the IEEE.

Title: “Renewable Energy for International Development“

Speaker: Slobodan Petrovic, Oregon Institute of Technology

Abstract:

For the past four years, Oregon Tech, in collaboration with a non-profit organization, Solar Hope organized trips to Africa where students participated in a study-abroad program that included installations of solar photovoltaic systems for schools and hospitals in rural areas; and impacted an estimated 20,000 people. The photovoltaic systems provide electricity for lights, water purification, and hospital needs; and give people of Africa hope that renewable energy can improve their lives.

The unique blend of humanitarian work, with the educational component, also resulted in numerous student-led projects and development of products for developing countries such as low cost solar module assembly, water purification, micro-solar devices, 3rd generation of solar cells, solar thermal refrigeration, remote sensing for renewable energy systems, and others.

These products designed for low cost and durability can be used in other developing countries to improve quality of life, prevent illnesses and tragedies due to burning of fossil fuels indoors. These advances critically improve system availability and reliability, and change the typical outcome of donated PV systems in Africa that deteriorate very quickly as a result of substandard modules and components, amateurish system installation, and poor or no maintenance.

During their trips, the Oregon Tech students also conduct studies on the impact of technology on people and their environment; and examine a complex system in which nature, technology, and humanity all influence, and are influenced by, each other. The impact of renewable energy on economic development and present state of solar energy in Africa is examined as well.

Speaker Bio:



Dr. Slobodan Petrovic is a Professor of Electrical and Renewable Energy Engineering at Oregon Institute of Technology. Dr. Petrovic has over 30 years of experience in various areas of science and technology and has published, presented and patented over 80 works in these fields. His current interest is in nanotechnology materials for energy storage devices, MEMS fuel cells, dye-sensitized solar cells, investigation of carrier lifetime in solar cells, portable fuel cells, battery charging techniques, hydrogen production and storage, silicon-based anodes for Li Ion batteries, Li air cells, water purification methods, remote sensing for smart grid, and low-cost technology for developing countries.

Prior to his academic career, Dr. Petrovic was a Vice President of Engineering for a stationary power fuel cell company, a Director of Systems Integration for a portable fuel cell company, and a Member of the Technical Staff for Motorola, Inc. He received his B.Sc. from the University of Belgrade in his native Serbia and his Ph.D. from the Technical University of Dresden in Germany.

Dr. Petrovic is also Founder and President of a non-profit organization, Solar Hope, dedicated to helping developing countries through use of renewable energy.

Title: “DIY Repair: How a Global Movement of Tinkerers, Hackers, and Self-Taught Engineers is Building a Repairable Electronics Industry”

Speaker: Kyle Wiens, IFIXIT.COM

Abstract:

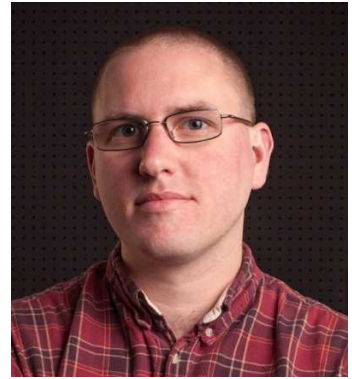
What if everyone had free access to a repair manual for everything they owned? How much longer would our things last? I started iFixit with the goal of providing people the knowledge and encouragement they need to make their things work as long as possible. Making repair accessible to everyone is the best shot we've got at reducing e-waste and starting to make our high-tech lives sustainable. We can't keep throwing away cell phones every 18 months! We need to get every last bit of functionality from the things we own before we safely recycle them.

Speaker Bio:

Kyle Wiens is a senior member of IEEE and the co-founder and CEO of iFixit, an online repair community internationally renowned for their open source repair manuals and product teardowns. Launched out of his Cal Poly college dorm room, iFixit has now empowered millions of people to repair their broken stuff. In 2012, he started Dozuki, a software company that helps manufacturers

publish manuals. Kyle has testified on electronic exports in front of the International Trade Commission and is actively involved in developing global environmental standards.

Kyle regularly speaks on design for repair, technical writing, service documentation, and the environmental impact of electronics. His writing has appeared in The Atlantic, Harvard Business Review, Wired, and the Wall Street Journal.



SUSTAINABLE ELECTRONICS INVITED SPEAKERS

Life Cycle Assessment of Electronics	Otto Andersen (Vestlandsforskning, Norway)
Valuing Natural Capital: How to Enhance Business Value in the Technology Sector	Annabelle Bennett (Trucost PLC, USA)
Safe Advanced Mobile Power Initiative	Thomas Coughlin (Coughlin Associates, USA)
Research to Innovation for Sustainable Electronics	Douglas A. Keszler (Oregon State University, USA)
Environmental Markets Enhance Business Value	Wayne Rifer (Green Electronics Council)

Title: “Life Cycle Assessment of Electronics”

Speaker: Otto Andersen, Vestlandsforskning, Norway

Abstract:

Life Cycle Assessment (LCA) is a methodology for assessing the environmental aspects and potential impacts throughout a product’s life cycle from raw materials and energy extraction, components manufacture, assembly, distribution and sale, use and final end-of-life treatment such as disposal, recycling and energy recovery (i.e. cradle-to-grave).

The environmental and resource impacts include climate change, stratospheric ozone depletion, toxicological stress on human health and ecosystems, the depletion of resources, water use and many others.

This paper presents and discusses cases where LCA is used for assessing the environmental impact of electronics products and processes. Included are consumer electronic products, interconnect technology in electronics micro-integration, electric vehicles and photo-voltaic (PV) solar cells.

Speaker Bio:

Otto Andersen has an unusually broad scientific background covering a wide spectra of science disciplines. He has applied both natural science and social science methods to address societal problems. Originally trained as a biochemist with practical application of analytical biological separation in combination with immunological methods at the Norwegian National Institute of Public Health and University of Minnesota, Dr. Andersen has obtained an understanding for cross-disciplinary problem-based science. The pharmaceutical R&D experience at 3M Company, as well as the regulatory and quality assurance work at Dyno Particles AS, gave him through insight into the importance of addressing environmental challenges for industrial companies.



The research at Vestlandsforskning (Western Norway Research Institute) has spanned 19 years of work with energy problematics, with special focus on the environmental impacts. The doctoral work on the relation between transport and industrial ecology provided new insight into the environmental aspects of mobile energy, including renewable options.

Recently, he is also engaged in stationary renewable energy production, including photovoltaic solar energy technologies, and the impact assessment of their manufacturing.

Title: “Valuing Natural Capital: How to Enhance Business Value in the Technology Sector”

Speaker: Annabelle Bennett, Trucost PLC

Abstract:

Learn about how tech companies are measuring and managing the true cost of natural resources - their natural capital - in order to make better business decisions and promote value. See how this can inform supply chain management/sourcing decisions, engage the CFO & have your solution stand out from the crowd.

Speaker Bio:

Annabelle Bennett joined Trucost in 2006, originally based in the London office, she joined the North American team last year and is now based out of New York.

She works with companies to help them understand their natural capital dependency to enable them to manage risk from volatile commodity prices and increasing environmental costs; and ultimately build more sustainable brands.



Title: “Safe Advanced Mobile Power Initiative”

Speaker: Thomas Coughlin, Coughlin Associates

Abstract:

The IEEE Consumer Electronics Society Future Directions Committee has launched an effort with other IEEE societies to create an initiative for Safe Advanced Mobile Power. This talk will discuss the initiative and how it can lead to more sustainable power sources and mobile consumer electronic products while meeting important requirements for safety, sustainability, manufacturability and cost. The objective of this initiative is to promote the development of a technology to supply energy needs for a weeks worth of "normal" mobile device use without recharging from a fixed power source with . The allowable energy sources include advanced batteries, energy harvesting, power generation and mobile wireless power sources. Less frequent charging of mobile devices could extend battery life and reduce the impact of these devices on the grid (depending upon the technology used) while extending the useful lifetime of these products. Longer running mobile power sources will also have significant advantages for emerging markets where power may be infrequent as well as power mobile device users who are often on the go.

Speaker Bio:

Tom Coughlin, President, Coughlin Associates is a widely respected storage analyst and consultant. He has over 30 years in the data storage industry with multiple engineering and management positions at companies such as Ampex, Polaroid, Seagate, Maxtor, Micropolis, Syquest, and 3M.

Tom has over 60 publications and six patents to his credit. Tom is also the author of *Digital Storage in Consumer Electronics: The Essential Guide*, which was published by Newnes Press in March 2008. Coughlin Associates provides market and technology analysis (including reports on several digital storage technologies and applications and a newsletter) as well as Data Storage Technical Consulting services.

Tom is active with IDEMA, the IEEE Magnetics Society, IEEE CE Society, and other professional organizations. Tom was Chairman of the 2007 Santa Clara Valley IEEE Section and currently chair of the IEEE Region 6 Central Area. He was former Chairman of the Santa Clara Valley IEEE Consumer Electronics Society and the Magnetics Society. In addition to the IEEE and IDEMA, Tom is a member of SMPTE, ACM, APS, AVS and AAAS.

Tom is the founder and organizer of the Annual Storage Visions Conference, a partner to the annual Consumer Electronics Show as well as the Creative Storage Conference that was recently held during the 2008 NAB. Tom is also an organizer for the Flash Memory Summit and the Data Protection Summit. He is also a Leader in the Gerson Lehrman Group Councils of Advisors. For more information go to www.tomcoughlin.com.

Tom has a PhD in Electrical Engineering from Shinshu University in Nagano, Japan and a MSEE and a Bachelor in Physics from the University of Minnesota in Minneapolis.

Title: “Research to Innovation for Sustainable Electronics”

Speaker: Douglas A. Keszler, Oregon State University

Abstract :

Imagine a world with ten or more networked devices for every person on the planet. As we approach this level of connection, 200,000 people are being born every day. Only 2% of them will be born in developed countries. In this contribution, I will present recent research findings that are contributing to enhancing atom efficiency and minimizing process steps in the fabrication of next-generation, high-performance electronic and energy devices. The paths to innovation and commercialization will also be considered.

Speaker Bio:

Douglas Keszler is the Director of the Center for Sustainable Materials Chemistry, an NSF Phase-II Center for Chemical Innovation. He is also Associate Dean of Research in the College of Science at Oregon State University and the Chief Science Officer for Inpria Corp. Keszler’s research is focused on chemical approaches to optimizing materials performance. With colleagues at OSU, he contributed to the development of the first transparent oxide thin-film transistors and co-authored *Transparent Electronics*. More recently, he has invented new solar absorbers and aqueous-based approaches for directly patterning inorganic materials via EUV and electron-beam nanolithography. He received his PhD from Northwestern University.



Title: “Environmental Markets Enhance Business Value”

Speaker: Wayne Rifer, Green Electronics Council Director of Research

Abstract:

Environmental Markets Enhance Business Value
Environmental Standards Define Market Preferences by Institutional Purchasers.

EPEAT has established environmental product performance as a market value for the major ICT and CE manufacturers. The EPEAT standards and the Registry of conforming products provide the needed tools – a measure of performance and a means to demonstrate achievement – for industry to gain business value by investing in good for society.

The presentation will:

- Describe the role of standards in environmental purchasing
- Describe EPEAT and its impact on environmental purchasing worldwide
- Provide a case study of the growth of recycled plastics in electronics

A particular focus will be how EPEAT standards measure superior environmental performance, the role of LCA in those standards, and how the EPEAT Registry creates market incentives to achieve that performance. The substantial growth of the use of PCR plastics in electronics is a testament to the market success of environmental standards.

Speaker Bio:



Back in 2003 Mr. Rifer managed a multi-stakeholder process to find solutions to the environmental and recycling challenges of high technology products. As an outcome, he was a stakeholder in the negotiation for a national electronics recycling system, NEPSI. When it became clear that a national program was infeasible, he worked with Representative Jackie Dingfelder to develop the Oregon e-waste recycling bill.

In 2005 he founded EPEAT (the Electronics Product Environmental Assessment Tool – www.epeat.net), which is a procurement tool for environmentally preferable electronics and has worked with that program since.

Mr. Rifer is a member of the Board for the National Center for Electronics Recycling (NCER). He teaches masters-level classes in product design and stewardship at the Portland State University Business School.

TRANSPORTATION ELECTRIFICATION INVITED SPEAKERS

B-Line, Sustainable Urban Delivery	Franklin Jones (Owner/CEO B-Line, USA)
Electric Vehicles as Grid Resources in ISO-NE and Vermont	Stephanie Morse (Vermont Energy Investment Corporation, USA); Karen Glitman (Vermont Energy Investment Corporation, USA)
IEEE Transportation Electrification Initiative	Lee Stogner (Chair, IEEE Transportation Electrification Initiative; Vincula Group, USA)
Applications and Advanced Controls for Heavy Duty Hybrids	Jennifer Vining (Daimler, USA)
HEV/BEV Noise, Vibration, Harshness Issues Caused by Electric Machine Drive Components and Mitigation Using Advanced Electric Machine Design and Motor Control Algorithms	Julia Zhang (Oregon State University, USA)
Last Mile Asset Monitoring	Zdenek Zumr (Portland State University, USA)

Title: “B-Line, Sustainable Urban Delivery”

Speaker: Franklin Jones, Owner/CEO B-Line

Abstract:

B-line is an innovative Portland company that is sustainably solving the last-mile delivery problem. They use human-powered trikes with electric assist to deliver goods to more than 200 destinations for 40 companies like Office Depot, OMSI and Dave’s Killer Bread. Their freight trikes can transport up to 600 pounds of payload and feature an electric assist system by EcoSpeed. B-line has generated national buzz and has been covered by New York Times and Time magazine. Come hear from Franklin Jones, the co-founder and CEO about what it takes to start and run a ground-breaking business. We will also hear from the B-line head mechanic on the challenges of moving a 600 lb payload up a hill with two legs and a 1 hp motor.

Speaker Bio:

The seeds for B-line were planted into Franklin’s life long before he knew it. Who knows where it all really began, perhaps somewhere in that lofty call to serve the Common Good instilled upon all Bowdoin College grads. A formal genealogy of B-Line began with Franklin’s first “real” job out of school as a bicycle and pedestrian planner in Bend, OR for David Evans and Associates. The concept silently percolated over a thirteen-month, 10K bicycle trip from Japan to Ireland and then had some time to rest as Franklin entered a rewarding career in education as a sixth grade teacher in the SF Bay Area. In 2008, his entrepreneurial and adventurous spirit took over and Franklin departed sunny San Francisco for the greener pastures of Portland, OR. Never short on ideas to enhance the community around him, Franklin combined his interest in seeing how business can be a catalyst for social and environmental change with his love of cycling and founded B-Line. Franklin loves how when the right tool for the job is used, the right team steps up, and a day-to-day commitment towards a sustainable future is embedded in the culture of a



company all stakeholders benefit—everybody wins. You can catch him on the trikes working to enhance the fabric of our cities one pedal stroke at a time.

Title: “Electric Vehicles as Grid Resources in ISO-NE and Vermont”

Speaker: Karen Glitman, Vermont Energy Investment Corporation

Abstract:

A shift from fossil fuels to the electric grid as the primary supplier of energy for transportation will pose new challenges for utility providers with regards to peak power management but also new opportunities that, if properly managed, could result in net benefits to the grid. To explore various ways in which EVs can serve as resources to the electric grid, integration will be approached in an incremental manner, with opportunities presenting the fewest barriers explored first. Technological and regulatory requirements necessary for services and benefits to be realized will be presented along with potential values where possible. Final recommendations attempt to identify the questions that need to be addressed, who must be involved, and steps necessary to move towards a system in which EVs add significant value to Vermont's electric grid.

Speaker Bio:



Karen Glitman is the Director of Transportation Efficiency at the Vermont Energy Investment Corporation (VEIC). Ms. Glitman has more than 18 years' experience in transportation research and administration. Her work focuses on blending transportation and energy efficiency data, systems, and programs. She is a former Director of Policy and Planning for the Vermont Agency of Transportation, and Deputy Secretary and Acting Secretary of Transportation. Her deep understanding of transportation policies, programs, systems, and operations has been informed by her years at the Vermont Agency of Transportation and the UVM Transportation Research Center. Her knowledge and understanding of alternative fuels and vehicle technologies drove VEIC's leadership in coordinating the State of Vermont's Drive Electric Vermont initiative, which includes the active engagement of Vermont's Agency of Transportation, Agency of Natural Resources, and the Department of Public Service. Her research and project management have also helped inform the transportation energy use profile for Vermont's Comprehensive Energy Plan. She has many publications, including the annual *Vermont Transportation Energy Report* (2008-2011); several analyses of rural transportation financing, and its role in economic development; and a Review of Utility Integrated Resource Plans and Electric Vehicle Load Forecasting.

Title: “IEEE Transportation Electrification Initiative”

Speaker: Lee Stogner, Chair, IEEE Transportation Electrification Initiative; Vincula Group

Abstract:

Lee Stogner will speak on the IEEE Transportation Electrification Initiative, TEI. This Initiative is one of four major IEEE efforts that will provide growth opportunities for the IEEE and its members. This Initiative is a venue for discussion, debate and information sharing on the latest Transportation Electrification developments among a vast international community of IEEE members and non

members. IEEE TEI is home to innovators, inventors, and engineering in the emerging field of Transportation Electrification.

The Initiative's scope includes, Advanced Charging, Battery Technologies, Drive Trains, Electric Vehicle Advancements, Development of relations with Industry Leaders, Plug In Electric Vehicles and the Smart Grid and Telematics. Products / Services of the Initiative include, conferences, publications, standards, education workshops and more. Our goal is to drive the transformation for clean, efficient, connected and safe vehicles. More information on the Initiative can be found at, <http://electricvehicle.ieee.org>.

Speaker Bio:

Lee Stogner is the President of the Vincula Group, a consultancy business in energy management, transportation solutions, systems integration and project management. Lee has over 30 years of design, consulting, project management and business development experience across a range of industries. Lee has driven growth at companies that include Digital Equipment, Fluor Corporation and Rockwell International. Customers around the world have benefited from Lee's expertise and leadership.



Throughout his working career, Lee has been active in both local and international professional activities. Lee is the Chair of the Carolinas' Engineering Cluster and a past Director of the IEEE Board of Directors. Today, Lee is active in promoting the development of advanced transportation through his participation in the IEEE Smart Grid Initiative, the IEEE Energy Policy Committee, the IEEE Internet of Things Initiative and as Chair of the IEEE Transportation Electrification Initiative.

Title: “Applications and Advanced Controls for Heavy Duty Hybrids “

Speaker: Dr. Jennifer Vining, Daimler

Abstract:

How often do you stop to ask yourself how complicated the control system is in your car? Or even yet take a serious look at the engineering behind these commonplace wonders? Probably not too often. This is a question that engineers at Daimler ponder every day. The technology behind today's transportation options increases in complexity every year. This talk will cover these topics with a focus on the advanced controls and hybrid-enabled high voltage systems for the Dept. of Energy SuperTruck program at Daimler as well as high voltage design for manufacturability.

Speaker Bio:

Dr. Jennifer Vining received her B.S. degree in Electrical Engineering from the University of Texas - Austin in 2004 and both M.S. and Ph.D. degrees in Electrical Engineering, minoring in Mechanical Engineering from the University of Wisconsin – Madison in 2007 and 2011 respectively. While in Austin, Jennifer worked for IBM (2003-2004) and the Applied Research Laboratories: UT Austin (2004-2005) prior to attending UW-Madison for graduate school. Upon finishing her Masters, she worked in Warwick, UK at Ocean Power Technologies. Her work in the UK and various other marine renewables consulting positions served to complement her research in the area of modeling and



design of electric drives and controls for marine renewables, leading to her Ph.D. dissertation “A Doubly-Fed Linear Generation for Ocean Wave Energy Conversion”. Dr. Vining now works on hybrid powertrain development at Daimler within the Dept. of Energy SuperTruck program.

Title: “HEV/BEV Noise, Vibration, Harshness Issues Caused by Electric Machine Drive Components and Mitigation Using Advanced Electric Machine Design and Motor Control Algorithms”

Speaker: Julia Zhang, Assistant Professor, School of Electrical Engineering and Computer Science, Oregon State University

Abstract:

Interior permanent magnet (IPM) synchronous machines are widely used for passenger-size hybrid electric vehicles and battery electric vehicles traction. The IPM machines are typically driven by high power DC to AC power electronic converters that operate in the switching mode. The switching frequency varies from around 1 kHz to a few kHz. This talk discusses the vehicle noise, vibration and harshness (NVH) issues caused by the traction motors and the power converters. For example, the torque ripples of the traction motors can create vibration that excites the vehicle driveline resonance. The high frequency switching of the power electronic devices can generate unpleasant acoustic noise for the driver and passengers. Advanced electric machine design and motor control algorithms will be introduced to mitigate those NVH issues.

Speaker Bio:

Dr. Julia Zhang received her Ph.D. degree in Electrical Engineering from The Ohio State University 2010. From 2010 to 2012, Dr. Zhang was a control engineer at Ford Motor Company, leading design and development of electric machine drive and power electronics control strategies and specifications for Ford’s 2013 hybrid electric vehicle products including Fusion Hybrid, Fusion Plug-in Hybrid, C-Max Hybrid and C-Max Plug-in Hybrid.

Dr. Zhang joined Oregon State University as an assistant professor in the fall of 2012. Her research interests include the design of high power density, high torque density AC electric machines for vehicle systems, robotic systems and renewable energy generation systems, modeling and control of AC electric machine drive systems, system noise, vibration and harness issues caused by electric machine drive components interaction and mitigation methods applying novel machine design and control strategies, and circuit, cooling and packaging design of various types of power converters for vehicle systems, robotic systems and renewable energy conversion systems. Dr. Zhang's research is currently funded by Ford Motor Company and the Office of Naval Research.



Title: “Last Mile Asset Monitoring”

Speaker: Zdenek Zumr (Portland State University, USA)

Abstract:

Installation and utilization of residential distribution transformers has not changed substantially over a long period of time. Utilities typically size their transformers based on a formula that takes into account broadly what types and how many dwellings will be connected. Most new residential dwellings feature 200 Amp service per household with an anticipated energy demand of under 20,000 kWh per year. Average electrical energy consumption varies from state to state but averages to 11,280 kWh per year. Energy demand is expected to fall into a typical residential load curve that shows increased demand early in the morning, then decreasing during the day and another peak early to late evening. Distribution transformers are sized at the limit of the combined evening peak with the assumption that the transformer has enough thermal mass to absorb short overloads that may occur when concurrent loading situations among multiple dwellings arise. The assumption that concurrent loading is of short duration and the transformer can cool off during the night time has been validated over the years and has become standard practice. This has worked well when dwelling loads follow an averaging scheme and low level of coincidence. With the arrival of electric vehicles (EVs) this assumption has to be reevaluated. The acquisition of an electric vehicle in a household can drive up energy demand by over 4000 kWh per year. Potentially problematic is the increased capacity of battery packs and the resulting proliferation of Level 2 chargers. The additional load of a single Level 2 charger concurring with the combined evening peak load will push even conservatively sized distribution transformers over their nameplate rating for a substantial amount of time. Additionally, unlike common household appliances of similar power requirements such as ovens or water heaters, a Level 2 battery charger will run at peak power consumption for several hours, and the current drawn by the EVs has very high levels of harmonic distortion. The excessive loading and harmonic profile can potentially result in damaging heat build-up resulting in asset degradation. In this thesis I present a device and method that monitors pole mounted distribution transformers for overheating, collect and wirelessly upload data and initiate commands to chargers to change output levels from Level 2 to Level 1 or shut down EV charging altogether until the transformer returns into safe operational range.

Speaker Bio:



Zdenek Zumr earned a BSME from Portland State University and recently an M.S. in Electrical Engineering. Zdenek is the full time staff engineer in the SWEETLab at Portland State. Zdenek was born in the Czech republic and raised in Switzerland where he acquired professional FEAM certification in electronics. He worked as a contract technician and project manager on international projects for Swiss companies in Europe, South America and the Middle East. During a ten year sabbatical from technology he earned a Masters Degree in Traditional Chinese Medicine, practiced and taught Chinese Medicine and published an instructional workbook for students.