SusTech 2013

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KEYNOTES

Thursday, August 1 – Luncheon Keynote

Systems Thinking for Sustainability
Thomas P Seager, PhD, Arizona State University

Abstract:

Sustainability is now recognized as a pluralistic concept with different meanings to different people. This presentation maps out multiple understandings of sustainability, from longevity, to reliability, to resilience, to renewal and introduces the evolution of scientific thinking as it relates to sustainability. An inventory of contrasting ethical views is introduced that reveals the value laden choices that are inherent in sustainability, but not always explicitly stated. Lastly, the presentation explains three different systems approaches to sustainability, including logical problem-solving (optimization), systems thinking, lateral thinking, and *big bang* thinking, and discusses examples.

Speaker:

Thomas P Seager is an Associate Professor of Sustainable Engineering and founding Director of the Sustainable Energy and Environmental Decisions Sciences (SEEDS) studio at Arizona State University. He is President of the Sustainability Conoscente Network and chairs the annual International Symposium on Sustainable Systems and Technologies (ISSST), which will be held in Oakland CA 18-21 May, 2014. Dr. Seager's research explores the systemic environmental consequences of alternative energy systems. He teaches courses in ethics, engineering business practices, and systems.

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Friday, August 2 – Luncheon Keynote

"21st Century Engineering"
Gordon W. Day, IEEE 2012 President

Speaker:

In 2012 Gordon Day served as the 50th President of the IEEE. He spent most of his career in research and management at the National Institute of Standards and Technology, where he founded and led the NIST Optoelectronics Division. His personal research ranged from fundamental optical measurements to the development of standards for optical fiber and new concepts in instrumentation. More recently, he has served as science adviser to Sen. Jay Rockefeller and Director of Government Relations for the Optoelectronics Industry Development Association. He has been a Professor Adjoint at the University of Colorado, a Professor Adjunct at the Colorado School of Mines, a Visiting Fellow at the University of Southampton (UK), and a Visiting Scholar at the University of Sydney (Australia), and has served on many industry, government, and academic advisory groups. He is a past President of the IEEE Photonics Society and of IEEE-USA, and is a Fellow of IEEE, AAAS, the Optical Society of America, the Institute of Physics (UK), and the Institute of Engineering and Technology (UK). He received B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Illinois.

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ALTERNATIVE ENERGY INVITED SPEAKERS

"Overview of SCE Solar Programs"	Rudy L. Perez, P.E, Southern California Edison
"Meeting the Technical Challenges of Integrating Wind Power Plants with the Grid"	Chris Walford, P.E, Puget Sound Energy
"Energy harvesting technologies for structural health monitoring application"	Changki Mo, Washington State University, Tri-Cites
"The role of the fuel cell system in sustainable power generation"	Quentin Ming, InnovaTek
"Modeling and simulation of the microalgae derived hydrogen process in compact photobioreactors"	Jose Vargas, Federal University of Paraná, Curitiba, Brazil
"Oregon State University's Small Modular Nuclear Reactor Experimental Program"	Brian G. Woods, Oregon State University
SPECIAL PRESENTATION: OCEAN WAVE ENERGY "Advancing Ocean Wave Energy through Research, Development and Testing Including Research on Materials and Technologies for Bio-Fouling Resistant Surfaces"	Annette von Jouanne, Alex Yokochi, Oregon State University, Northwest National Marine Renewable Energy Center (NNMREC)

Title: "Overview of SCE Solar Programs"

Speaker: Rudy L. Perez, P.E, Southern California Edison

Abstract:
Southern California Edison (SCE) is the largest supplier of renewable generation in the US and has vast experience with Photovoltaic and Concentrated (thermal) solar. This talk will give an overview of SCE's solar experience and focus in on the Solar Rooftop Program. SCE's 25O MW Solar Rooftop Program (SPVP) is designed to install 1 to 10 MW roof and ground mounted PV projects at an average cost of under $3.50/watt. The cost savings are achieved via a variety of means, including (a) volume procurement pricing (b) Standardization of optimal engineering practices (c) interconnection directly onto distribution circuits (d) Balance of System component reduction and innovation (e) Data Monitoring Aggregation plus other means. This paper will review SCE's lessons learned and provide the solar industry with recommendations for going forward in the most cost effective manner. In depth analysis o f grid interconnection issues, data communication and other technical issues will be presented.

Speaker Bio:
Rudy Perez is the Program Manager for Southern California Edison's Solar Photovoltaic Program (SPVP), the 125 MW rooftop solar initiative. The program has built out 91 MWs of solar projects on large commercial warehouse rooftops in 1 to 1 MW sites. Previously, he held the position of Distributed Generation Development Manager for Southern California Edison responsible for the integration of various smaller generation technologies onto the grid. Prior, he has held a variety of engineering and management roles throughout the company. With over 30 years of electric utility experience, his duties have included managing a gas fired conventional power plant, Renewable and Cogeneration Facilities compliance manager and transmission interconnection contracts manager. He has also been heavily involved in implementing innovative power generation efficiency and reliability improvement projects.

Mr. Perez holds BS in Chemical Engineering from the University of Notre Dame an MBA from California State University Long Beach and a as well as holding a Professional Mechanical Engineer's License

Title: "Meeting the Technical Challenges of Integrating Wind Power Plants with the Grid"

Speaker: Chris Walford, P.E, Puget Sound Energy

Abstract:
Puget Sound Energy owns and operates 772 MW of wind power at three facilities in Washington State. These wind power plants were installed over the past seven years, and in that time the requirements for grid connection have become increasingly stringent. Wind turbine technology has evolved in response to these requirements, so that our most recent plant is more sophisticated than our earlier installations, with power control and communications capabilities that weren't available seven years ago. This presentation will discuss the technical challenges of grid interconnection for wind power plants, and will present examples of how PSE has used the available technology to address those challenges.

Speaker Bio:
Chris Walford is a Consulting Engineer for Wind Facilities and supervisor in the generation engineering group at Puget Sound Energy. His primary responsibilities are to provide engineering support for PSE's wind power plants, from layout of the project through procurement of the equipment and operation and maintenance of the completed facility. He has 28 years of experience with design and operation of power transmission equipment, including tunnel boring machines, industrial process equipment and wind turbines. He is a registered professional engineer and is a graduate of the University of Washington.

Title: "Energy harvesting technologies for structural health monitoring application"

Speaker: Changki Mo, Washington State University Tri-Cites

Abstract:
This paper reviews energy harvesting technologies for structural health monitoring application. Structural health monitoring (SHM) is the damage detecting process in machinery, and aerospace and civil structures. There is a great deal of interest across a broad section of industries in obtaining technology that can be used to monitor the health of machinery and structures. In particular, the need for autonomous monitoring of structures has been ever-increasing in recent years. Autonomous SHM system typically includes embedded sensors, data acquisition, wireless communication, and energy harvesting system as depicted in the schematic of a SHM system(Clark et al., 2007). Among all those components, this paper focuses on the energy harvesting technologies. Since low-power sensors and wireless communications are used in most of recent SHM systems, a number of researchers have recently investigated techniques to extract energy for such stand-alone, self-powered systems from the local environment. Ambient energy sources could be vibration, thermal gradient, sun, wind, pressure, etc. If the structure has a rich enough loading, then it may be possible to extract the needed power directly from the structure itself. Harvesting energy using piezoelectric materials by converting applied stress to electricity is most common. In a structural health monitoring application, the piezoelectric material would be stressed due to vibrations or direct loading in a structure. Other methods to harvest

energy such as electromagnetic, magnetostrictive, or thermoelectric generator is also reviewed. Lastly, energy harvester with frequency tuning capability is demonstrated.

Speaker Bio:
Dr. Changki Mo is Assistant Professor in the School of Mechanical and Materials Engineering at Washington State University Tri-Cities. He received his Ph.D. degree in Mechanical Engineering from the University of Oklahoma in 1996. Before joining WSU, Dr. Mo was Visiting Professor in the Department of Mechanical Engineering and Materials Science at the University of Pittsburgh, Pittsburgh, PA and Associate Professor in Automotive Engineering Department at Kyungpook National University (Sangju campus), South Korea.

His research interest includes vehicular and structural vibration control, energy harvesting: self-powered medical implants and self-powered structural health monitoring, micro actuators and sensors, adaptive structure technology, and smart structures for sustainable buildings. Much of his current research focuses on morphing systems using shape memory polymer and piezoelectric systems for actuators, resonators, sensors, or energy sources. He has published about 50 peer reviewed journal and conference articles and one book chapter.

Title: "The role of the fuel cell system in sustainable power generation"

Speaker: Quentin Ming (speaker) and Patricia Irving, InnovaTek

Abstract:
As we continue to consume more energy to meet the economic development and the growth of our society, environmental and sustainability are becoming ever increasing concerns. Many environmental problems (e.g. pollution, acid rain, eco system deterioration, global climate change) caused or associated with the production, transformation, and consumption of energy. Fuel cell technologies are clean and efficient, and use hydrogen for power production. If renewable hydrogen is used the fuel cell technologies are truly sustainable. It meets three simple criterion of sustainability: "lasts a long time, does no harm, and leaves no change".

Fuel cell system has been successfully used, even though limitedly, in the applications ranging from small portable battery charger to megawatt distributed power station. In this presentation we will first introduce various fuel cell technologies and hydrogen production methods, and then we will examine a case study based upon the research and development work done at InnovaTek to discuss how the fuel cell approaches to sustainable power production through its improved efficiency, renewable sources of hydrogen, and combined heat and power operation.

Speaker Bio:
Dr. Ming is the director of sustainable energy division of InnovaTek Inc (Richland, WA). The primary business of InnovaTek is to develop fuel processor and to integrate the fuel processor with fuel cell systems for power generation for the applications ranging from stationary combined power and heat, auxiliary power units for transportation, and portable battery charger. His role at InnovaTek is to provide overall technical supervision, and system level design, catalyst development, and customer support. He has been with InnovaTek since 2000. Dr. Ming graduated from the Department of Chemical Engineering at the University of Houston in 1999.

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Title: "Modeling and simulation of the microalgae derived hydrogen process in compact photobioreactors"

Speaker: Jose Vargas, Federal University of Paraná, Curitiba, Brazil

Abstract:
A general transient mathematical model for managing microalgae derived hydrogen production, with temperature dependence of the cultivation medium is developed. The tool allows for the determination of the resulting whole system temperature, relative humidity, and mass fractions distribution. For that, the simplified physical model combines principles of classical thermodynamics, mass, species and heat transfer, resulting in a system of differential equations which are discretized in space using a three-dimensional cell-centered finite volume scheme. A Michaelis-Menten type expression is proposed for modeling the rate of H2 production with dependence on O2 inhibition. Tridimensional simulations are performed in order to determine the temperature and mass fractions distributions inside a compact photobioreactor (PBR), under different operating conditions. A relatively coarse mesh was used (6048 volume elements) to obtain converged results for a large compact PBR computational domain (5m x 2m x 8m). The largest computational time required for obtaining results was 560 s, i.e., less than 10 min. The numerical results for microalgal growth are validated by direct comparison to experimental measurements. Hydrogen production simulations are conducted to demonstrate PBR intermittent operation (aerobic and anaerobic stages) feasibility and adequate species evolution trends in an indirect biophotolysis approach. Therefore, after experimental validation for a particular H2 production system, it is reasonable to state that the model could be used as an efficient tool for PBR systems thermal design, control and optimization for maximum H2 production.

Speaker Bio:
José V. C. Vargas is an Associate Professor at the Department of Mechanical Engineering at Federal University of Paraná, Curitiba, Brazil, and a Visiting Professor at the Department of Mechanical Engineering and the Center for Advanced Power Systems at Florida State University. His research interests include Biofuels, Alternative Energy, Constructal Theory, and Modeling, Simulation and Optimization of Complex Integrated Systems.

Title: "Oregon State University's Small Modular Nuclear Reactor Experimental Program"

Speaker: Brian G. Woods, Oregon State University

Abstract:
Currently there are 102 nuclear power reactors operating in the United States providing approximately 19% (2012) of the United States' electricity generation. All of these plants are of the "Generation-II" Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) designs, which were originally conceived in the 1960's and 1970's. Since that time the United States has gained thousands of plant-years in operational experience, which has led to the advent of several type of advanced reactor designs. Of increasing interest are the small modular reactor design types. The International Atomic Energy Agency has defined a small modular reactor as any nuclear reactor with an electrical output less than 300MW(e). These types of small modular reactors may prove to be attractive to nations with smaller electric grids and locations with smaller energy needs.

Oregon State University (OSU) has been conducting research into several types of these small modular reactors. The first involves a small light water reactor design called the Multi-application Small Light Water Reactor (MASLWR). As currently conceived, the MASLWR design is a modular pressurized light water reactor relying on natural circulation during both steady-state and transient operation. The prototypical MASLWR is a small size type reactor with a net output per module of 35 MW(e). Its small size allows for the MASLWR to be both road and rail transportable. It is envisioned that the MASLWR module would be factory fabricated, transported to its site and connected to an installed steam turbine system. The power output of a MASLWR "plant" is expandable as each module is added. The MASLWR is suited for electricity generation as well as the production of process steam for industrial processes such as desalinization, heating and other non-electric applications. Due to their relatively small size, portability and modularity, the MASLWR design is well suited to help fill the potential need for grid appropriate reactor designs for smaller electricity grids as may be found in developing or remote regions. OSU's MASLWR Test Facility is an integral test facility, which is scaled to model the steady-state and transient operation of the prototypical MASLWR. It is scaled at 1:3 length scale, 1:254 volume scale and 1:1 time scale. It is designed for full pressure (11.4 MPa) and full temperature (590 K) prototype operation and is constructed of all stainless steel components.

The second type of small reactor being investigated at Oregon State University is the Very High Temperature Reactor (VHTR). The VHTR uses helium as its coolant, which allows for outlet temperatures in the 900˚C range. This high outlet temperature makes this design attractive for industrial applications as well as electricity generation. In order to get such an advanced reactor licensed in the US, applicable analysis tools must be developed and validated. A correctly scaled integral facility modeling the VHTR that can be used to examine the thermal hydraulic system behavior of the design basis and beyond design basis transients would be of significant value in this effort. The experimental results obtained could be used to validate analytical tools and methods being proposed for use with the VHTR. To that end an experimental facility has been constructed at Oregon State, the High Temperature Test Facility (HTTF). The HTTF is a 1/4 height model of the High Temperature Gas Reactor. The HTTF pressure vessel is constructed from stainless steel (SS304) which is ASME rated for operation up to 9.65 bar at 550˚C. The vessel has a diameter of approximately 163.8 cm outside diameter and a height of 6.1 m. The vessel utilizes a 2:1 elliptical upper head and a flat lower head. Both heads utilize an inner ceramic liner. The lower head provides for instrument taps and penetration of the electric heater rods. The core internals are supported by ceramic tubes that rest on the ceramic inner liner and wrap around the heater rods.

Speaker Bio:

Dr. Brian Woods is an Associate Professor in the Department of Nuclear Engineering and Radiation Health Physics at Oregon State University. He holds a B.S. in Mechanical Engineering (1988) from the University of Virginia, an M.S. in Nuclear Engineering (1999) from the University of Maryland, and a Ph.D. in Nuclear Engineering (2001) from the University of Maryland. His areas of interest include experimental and computational fluid dynamics, nuclear reactor thermal-hydraulics, and reactor safety.

Dr. Woods has worked at the U.S. Department of Energy as an engineer within the Office of Environmental Restoration as well as serving for four years in the U.S. Navy as a diver. Prior to coming to Oregon State he worked as a Nuclear Safety Analyst at Dominion Energy's Innsbrook Technical Center outside of Richmond, Virginia. Dr. Woods has been at Oregon State University since 2003 teaching undergraduate and graduate courses on nuclear technology. He has been actively involved in thermal-hydraulic and reactor safety research projects sponsored by the NRC, DOE and IAEA. Dr. Woods was the Chair of the American Nuclear Society Thermal Hydraulics Division from 2011 through 2012.

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SPECIAL PRESENTATION: OCEAN WAVE ENERGY

Title: "Advancing Ocean Wave Energy through Research, Development and Testing, Including Research on Materials and Technologies for Bio-Fouling Resistant Surfaces"

Speakers: Annette von Jouanne, Ph.D., P.E. and Alexandre (Alex) Yokochi, Ph.D., Oregon State University, Northwest National Marine Renewable Energy Center (NNMREC)

Abstract:
An extremely abundant and promising source of energy exists in the world's oceans. Ocean energy exists in the forms of wave, tidal, marine currents, thermal (temperature gradient) and salinity. Among these forms, significant opportunities and benefits have been identified in the area of ocean wave energy extraction, i.e., harnessing the motion of the ocean waves, and converting that motion into electrical energy. Ocean wave power offers several attractive qualities including high power density, low variability and excellent forecastability. This presentation discusses the opportunities for ocean wave power to become a new, reliable and clean source of renewable energy and provides a summary of the wave energy research and developments at Oregon State University (OSU). Also presented will be the activities of the Northwest National Marine Renewable Energy Center (NNMREC), a Department of Energy sponsored partnership between OSU and the University of Washington (UW). NNMREC performs fundamental technological, social, and environmental research, in addition to providing unique testing facilities including a wave energy test bed, 2D and 3D wave tanks, and an Ocean Sentinel mobile ocean test berth instrumentation buoy to facilitate ocean testing. This presentation will include the ongoing research and testing with the Ocean Sentinel instrumentation buoy, including the current 2013 deployment, along with the testing of materials and technologies for bio-fouling resistant surfaces.

Speaker Bios:

Annette von Jouanne, Ph.D., P.E., IEEE Fellow, has been a professor in the School of Electrical Engineering and Computer Science at Oregon State University since 1995. She received her Ph.D. degree in Electrical Engineering from Texas A&M University where she also worked with Toshiba International Industrial Division. Professor von Jouanne specializes in Energy Systems, including power electronics and power systems. With a passion for renewables, she initiated the Wave Energy program at OSU in 1998, developing it into a National multidisciplinary program, where she continues to be in leadership along with several excellent colleagues. She is also Co-Directing the Wallace Energy Systems & Renewables Facility (WESRF), the highest power university-based Energy Systems Lab in the nation. Dr. von Jouanne has received national recognition for her research and teaching, and she is a Registered Professional Engineer as well as a National Academy of Engineering "Celebrated Woman Engineer."

Prof. Alexandre (Alex) Yokochi is an Associate Professor of Chemical Engineering and the Director of the *innovative* Reaction Engineering for Materials and Sustainability laboratory (iREMS lab) in the School of Chemical, Biological and Environmental Engineering at Oregon State University. He received a B.S. ('89) and M.S. ('92) from Southern Illinois University at Carbondale and the Ph.D. ('97) from Texas A&M University. His research and teaching interests focus on the process and reaction

engineering of novel processes as applied to sustainability related issues such as renewable energy production. Dr. Yokochi's work includes the development of advanced electrochemical approaches to energy conversion and storage, water treatment, and creation of novel materials with advanced properties through the development of nanocomposites. His work is supported by various state and federal agencies including the Bonneville Power Administration (BPA), Oregon BEST, ONAMI, the USDOE and the NSF including a CAREER award, as well as industrial partners.

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ENERGY EFFICIENCY INVITED SPEAKERS

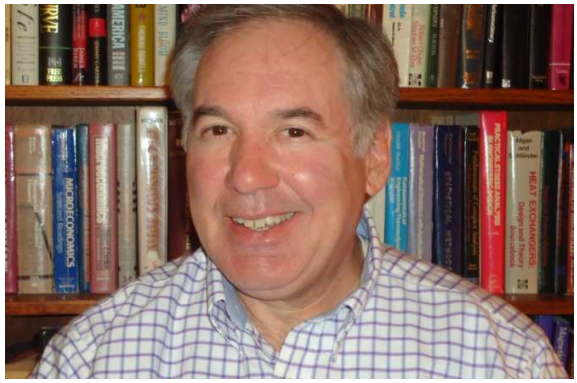
“Progress in Technology for Energy Efficiency”	Dan N. Donahoe, Ph.D., P.E. , 1000 kilometers
“Green Data Center Technologies Case Study: Using as Little as Possible, as Efficiently as Possible”	Steve Knipple, EasyStreet Online Services, Inc.
"The Changing Utility Business Model & Challenge For Energy Efficiency"	Mike Weedall, Senior Advisor, E-Source

Title: “Progress in Technology for Energy Efficiency”

Speaker: Dan N. Donahoe, Ph.D., P.E. , 1000 kilometers®

Abstract:
The so-called "Arab Oil Embargo" in 1973 initiated focused national efforts to improve energy efficiency, a modification from the previous focus on providing energy safely. The Department of Energy was formed in 1977 with a cabinet level director called the Secretary of Energy Secretary. These efforts have reduced the annual growth of electric power demand from 10% per year to less than 1% per year. Electric power production consumes 40% of all primary power (petroleum, coal, natural gas, nuclear and renewables). This presentation will review the two constituent parts of this effort to contain electrical energy demand: energy efficiency programs, new more efficient technologies and technology frontiers.

Speaker Bio:



Dan Donahoe’s career began with senior project and master’s degree topics related to energy conservation which included running the early building modeling programs NBSLD and BLAST. Dan’s first professional task at Lockheed was HVAC for space. Over time, Dan focused on the growing electronics industry. Dan worked for Lockheed, Motorola, Ford Aerospace, Teledyne, Compaq Computer, Iomega and Exponent Failure Analysis Associates. He has served as an Associate Editor for the IEEE Transactions since 1998; as 2007–2008 chair of the IEEE (CPMT/SCV) Santa Clara Valley Chapter (aka Silicon Valley) and on the Board of Governors for IEEE CPMT Society. The CPMT/SCV chapter was granted the international 2008 CPMT Chapter of the Year Award. Dan was the ASME nominee for 2013 Utah Engineer of the Year. Dan has a number of publications and granted patents. He holds a PhD from the University of Maryland at College Park, MBA from Santa Clara University, BS and MS from the University of Illinois at Champaign-Urbana. He is a registered professional engineer (PE) in Arizona, California and Utah and is a certified reliability engineer (CRE).

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Title: "Green Data Center Technologies Case Study: Using as Little as Possible, as Efficiently as Possible"

Speaker: Steve Knipple, EasyStreet Online Services, Inc.

Abstract:
First conceived in 2007 when a group of engineers and energy-efficiency consultants gathered in Beaverton for an intensive design charrette, EasyStreet's ultra-efficient Data Center 2 (DC2) has now been in operation for well over two years. EasyStreet's CTO and VP of Engineering and Operations, Steve Knipple, will detail the technologies employed in DC2 and how well they have performed against expectations. Technologies covered include:

- An innovative Indirect Evaporative Cooling (IEC) system, which uses outside water-cooled air rather than traditional, refrigerant-based direct expansion (DX) cooling. (DX cooling kicks in only as a back-up when required.
- A hot air containment system achieved via passive chimney equipment cabinets that are part of the cooling system. These cabinets gather hot exhaust air and route it to the roof for processing by the cooling units.
- Extensive 25,000-gallon rainwater capture and filtering system designed to use supplemental city water only when necessary.
- More efficient and reliable VYCON flywheel-based UPSs that do not require the continuous recharging of conventional batteries and are considered seven times more reliable than battery-powered systems.

DC2 was the first data center to quality for funding through the Oregon Department of Energy's Small Scale Energy Loan Program (SELP).

Speaker Bio:

Steve Knipple is Vice President of Engineering and Operations for EasyStreet Online Services, Inc. Steve has 15 years' experience in IT enterprise strategy, architecture, management and operations. He is a specialist in Corporate IT transformational programs of local, national and international scale. He has developed Disaster Recovery concepts for global, regional and local data centers inclusive internal and external collocation facilities.

Before joining EasyStreet in 2010, Steve was Senior Manager of Global IT Architecture, Deployment and Operations at Munich-based Wacker Chemical Corporation. While there, Steve led the company-wide IT infrastructure standardization and consolidation including the global deployment of virtualized hosting services as well as improving the firm's Disaster Recovery and Business Continuity capabilities.

At EasyStreet, Steve is focused on meeting business requirements in terms of functionality, performance and availability while encouraging an innovative and enjoyable workplace.

Steve holds an M.S. in Applied Information Management from the University of Oregon where his thesis work focused on leveraging existing and future IT investments to realize maximum value. He earned undergraduate degree in Mechanical Engineering at the University of Wisconsin-Madison.

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Title: "The Changing Utility Business Model & Challenge For Energy Efficiency"

Speaker: Mike Weedall, Senior Advisor, E-Source

Abstract:
Utilities face a number of emerging drivers that will bring change to the traditional manner in which revenues are grown. That is, with flat or declining retail sales due to a slow economy, effective energy efficiency, integration of renewables, and increased penetration of distributed generation, utilities will no longer be able to count on growing revenues through sales to end-users. A variety of studies are underway to determine how best to deal with these challenges and ensure energy efficiency remains viable and a priority. This session will discuss the status of activities looking at these developments and how energy efficiency can continue to be grown.

Speaker Bio:
Mike Weedall is Senior Advisor working with E-Source providing support in a variety of demand-side initiatives and forums. Mike has been a speaker at a variety of conferences. He is a member of the Electricity Oversight Committee, reporting to U.S. Department of Energy Secretary.

Previously, Mike was Vice-President, Energy Efficiency at Bonneville Power Administration (BPA), Manager, Energy Services for Sacramento Municipal Utility District, Director, Energy Management Services at Green Mountain Power Corporation, Principal and Founder of Pacific Energy Associates, and Program Manager, Conservation Finance for BPA. He started his career at the U.S. Department of Energy.

Mike has an M.P.A., Public Administration from the University of Arizona, Tucson and a B.A., Liberal Arts from Northeastern University, Boston.

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ELECTRONIC MATERIALS INVITED SPEAKERS

"Aluminum: A Sustainable Substrate Alternative to FR4 in PCB Assemblies"	Joseph Fjelstad
"Optimization of Material Resource Conservation in Electronics Through Design of Products and EoL Systems"	Wayne Rifer, EPEAT
"Green Design: Field lessons in repairable consumer electronics engineering"	Kyle Wiens, iFixit
"iNEMI Environmental Thrust; History, Challenges, & Opportunities"	Bill Bader, CEO iNEMI
DIAMOND Patron Presentation: "Transparency in Electronics: Going Above and Beyond "	Mark Rossolo, UL Environment

Title: "Aluminum: A Sustainable Substrate Alternative to FR4 in PCB Assemblies"

Speaker: Joseph Fjelstad, Verdant Electronics

Abstract:
Aluminum is at once inexpensive (~ $0.98 per lb), abundant and environmentally benign. While it has been used as a metal core in PCBs for many years and has more recently found interest among LED assemblers as a heat spreading substrate for high wattage assemblies. The attractive thermal benefits come as at a cost, however when it comes to assembly. High thermal conductivity is a challenge to solder assembly. The risk of either thermal damage to substrate or components is compounded by the risk of forming cold or incomplete solder joints, especially in the new era of high temperature leadfree solders mandated by the EU's RoHS legislation. In this environment, a new approach to manufacturing electronics assemblies is presently in development. The process is one which falls under the broad umbrella and aegis of SAFE (solderless assembly for electronics). By reversing the manufacturing process and putting circuits on "component boards" rather than components on circuit boards, a host of benefits can be obtained including: lower cost, higher reliability and improved electrical, thermal and mechanical performance. This paper will described the process, providing examples of assemblies produced in the manner described and will as well review the many benefits the use of aluminum can offer.

Speaker Bio:
Joseph Fjelstad, a 40 year veteran of the electronics manufacturing industry is an internationally known serial entrepreneur, innovator, author and lecturer. He holds more than 170 US patents and is author of more than 350 articles, papers, and columns and several books including Chip Scale Packaging for Modern Electronics and Flexible Circuit Technology, 4th Edition

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Title: "Optimization of Material Resource Conservation in Electronics Through Design of Products and EoL Systems"

Speaker: Wayne Rifer, EPEAT, USA

Abstract:
The future of electronics is miniaturization. Products that provide greater functionality in smaller packages will enhance the lives of billions.

However, this evolution comes with a potential dark side. Whereas the chips that drive these products just 20 years ago were comprised of 11 materials, today they contain 60. Nearly the entire periodic table, harvested from around the planet, can be found in today's ever smaller computing product.

The intensity of extraction of nature's resources is matched by the depth of our ignorance regarding the stocks, flows and future needs for those resources. Challenges to the sustainability of material supply to high tech industry may arise from several fronts – an increasing scarcity of specific resources, the unacceptability of the environmental harm from obtaining those materials from a densely populated planet, and even geopolitical challenges or gamesmanship.
The one source that seems to present the least uncertainties is the products themselves. The collection, processing, and treatment of the products, and their transformation into materials for new products, offers an unrealized opportunity for many of the materials that may be critical.

But a substantial challenge is presented by the ultra miniaturization of these products. The very feature that makes them so desirable makes them increasingly more likely to be used once and discarded in ways that waste a substantial portion of the 60 or so materials they contain. And this is especially true for the most valuable materials – often those that occur in nature in low concentrations and entail the greatest environmental impact in their extraction.

To place a sharp point on this matter, the current suboptimal recycling systems, based either on whole product shredding in the developed world, or informal recycling in the developing world, typically recovers in the range of 25% of the precious metals contained in the product. And that is the direction that product ultra miniaturization is leading us for an increasing portion of the e-scrap stream. These are products that are practically discarded when the battery gives out, and from which it is economically infeasible to remove the circuit board for proper recycling, which could recover 90% or more of the precious metals.

This paper will examine the factors inherent in this potentially intractable conflict of business and environmental values. Moreover, it will identify the key to resolving this conflict – to building a sustainable electronics industry for a densely populated and prosperous planet. This key is found in product design for greater product reuse (getting longer service from the invested materials, energy and human ingenuity) and for optimal recycling (extending the use of materials into next-generation products), and a corresponding E0L system that takes advantage of these enhanced opportunities.

Several factors are major impediments; otherwise it would not be a challenge. The impediments, and opportunities, that this paper will examine – specifically as they relate to miniaturized computers in the form of tablets, slates, phones, cameras, etc. – include:

- Product design for end-of-life (EoL), or the lack thereof

  - Design for disassembly in order to repair, upgrade, refurbish and reuse
  - Design for high value material recovery
- The design of EoL systems – collection, processing and treatment – for optimal conservation and recovery of valuable resources
  - The minor role for reuse
  - Conflicted motivations of producer take-back schemes
  - Suboptimal treatment options
- The determination of critical resources – what really makes sense to conserve and recover?

Finally the paper will examine what some of the paths forward might be, including research, voluntary initiatives and standard setting.

Speaker Bio:

Mr. Rifer initiated and managed the development of EPEAT (Electronics Product Environmental Assessment Tool), which is a procurement tool for environmentally preferable electronics. In leading up to the establishment of EPEAT, he managed the Western Electronic Product Stewardship Initiative (WEPSI)—an EPA-funded multi-stakeholder process. WEPSI initiated EPEAT and was a predecessor to the negotiation to establish a national recycling system for electronics—the National Electronic Product Stewardship Initiative (NEPSI)—in which he participated as a stakeholder.

Mr. Rifer is currently the EPEAT Director of Standards and Thought Leadership Programs (see http://www.epeat.net). 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 in the Business School at Portland State University.

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Title: "Green Design: Field lessons in repairable consumer electronics engineering"

Speaker: Kyle Wiens, Daniel Wiens, iFixit

Abstract:
The embodied energy in electronics is significant, and a popular sustainability strategy is designing products for extended lifespans. Design for repair and disassembly are fast-growing fields of interest. What design characteristics make some devices harder to fix? Our society has a long-standing culture of repairing cars: there is a massive parts, documentation, and resale infrastructure built around using cars as long as possible. This is more challenging with electronics due to increases in complexity and model proliferation. What lessons can the electronics world learn from other fields?

iFixit's world-renowned teardown experts will show disassembly analysis and discuss the latest electronics, analyzing the tradeoffs and decisions made by product designers that help and hinder repairability. See what's inside everything from the MacBook Pro Retina, the amazing Parrot quadcopter to the latest Galaxy S4.

Speaker Bios:

Kyle Wiens is 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 is revolutionizing online technical documentation for manufacturers. 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 disassembly, technical writing, service documentation, and the environmental impact of electronics. He writes for The Atlantic, Harvard Business Review, Wired, and TreeHugger.

Daniel Wiens is director of iFixit.org, the advocacy wing of iFixit. iFixit is an online repair community internationally renowned for open source repair manuals and product tear downs. The organization has empowered millions of people to repair their broken stuff. Daniel has an extensive background in humanitarian design and is the founder of Journeyman International, a non-profit organization that designs and constructs buildings around the world. He has designed orphanages, medical clinics and schools in Ghana, Cameroon, Zambia, Ethopia, Ethiopia, Haiti, Mexico, and Belize.

The design strategies required for facility longevity in the developing world parallel the design strategies required for electronic gadgets used in the world's most remote places. Daniel is currently spearheading a campaign to improve clean water access by deploying repair manuals for hand water pumps throughout Africa. He regularly speaks on the humanitarian benefits of sustainable design and the environmental impact of electronics.

SusTech 2013

Title: "iNEMI Environmental Thrust; History, Challenges, & Opportunities"

Speaker: Bill Bader, CEO of iNEMI

Abstract:
iNEMI (International Electronics Manufacturing Initiative) consortium has been creating and exploiting technology roadmaps for the electronics industry for 20 years. It has become recognized as an important tool for defining the "state of the art" in the electronics industry. Additionally, INEMI puts significant focus on identifying key gaps and challenges in emerging and disruptive technologies. From this gap analysis and workshops in areas of focus we define and organize collaborative iNEMI R&D projects. Specific examples will be reviewed that demonstrate how roadmap findings are used to develop industry led programs to close identified technology gaps.

One key area of focus for iNEMI for the past 12 years has been driving improvements in materials and products that leads to progress in sustainability. This presentation provides a brief history of iNEMI environmental improvements that have been driven to realization in the past, and a holistic assessment of the roadmap challenges and gaps in electronics sustainability looking to the future. The material will then provide a deeper dive into a set of per competitive collaboration opportunities in the areas of materials, eco- design and sustainability, and recycling and reuse. The presentation will also include a preview of the key findings of the 2013 roadmap including some of the electronics industry paradigm shifts and the key technology developments.

Speaker Bio:
Bill Bader is the CEO of the International Electronics Manufacturing Initiative, iNEMI. Bill took this role in August of 2009 and he has been driving excellent growth in the iNEMI membership and in the quantity and quality of collaborative R&D projects that are executed by the iNEMI membership. INEMI has seen a growth in membership of 75% overall during that time period and has grown the number or Research institute or University members by 160% during Bill's Leadership with an increased focus on collaborative research.

He came to iNEMI after a 26 year career at Intel Corporation. Bill retired from Intel in 2005.

At Intel Bill served as the General Manager (GM) of Intel's Systems Manufacturing and Technology Development group (SMTD) that provided design, and manufacturing services for new board and system products for all the business units within Intel, and was accountable for Technology Development and Path Finding in support of board and system manufacturing. Bill managed up to 1100 employees at multiple sites in the US, Malaysia, and China. His group developed key assembly and test technologies in support of CPU and Chipset launches and enabled high volume launch in multiple outsourced factories in SE Asia. Bill's organization(s) also won two Intel Quality Awards under his leadership for excellence in support of Intel's values.

Bill has a BS in Electrical Engineering from the Rochester Institute of Technology.

SusTech 2013

DIAMOND Patron Presentation

Title: "Transparency in Electronics: Going Above and Beyond "

Speaker: Mark Rossolo, UL Environment

Abstract:
Now, more than ever before, buyers, specifiers, and consumers are demanding to know the full extent of a product's environmental and health impacts. From raw material extraction, production, and packaging to distribution, end-use, and disposal, transparency into the impacts of a product at each stage of its lifecycle has become a critical driver of purchases and specifications.

Electronics manufacturers that voluntarily disclose all of their products' cradle-to-grave impacts are seen as trailblazers in the sustainability marketplace. They demonstrate a commitment to sustainability and willingness to go above and beyond—all in the name of transparency and clarity.

Tools like Environmental Product Declarations (EPDs) enable manufacturers to make those disclosures in a credible, streamlined, and universally understood manner. Pursuit of EPDs can happen alongside other certification or testing initiatives---like RoHS, REACH, ECOLOGO Certification, to name a few---and those achievements can become a part of the product's transparency story, told through the EPD.

Join UL Environment for a discussion of transparency trends in the industry. Take part in the growing conversation about sustainability in electronics, and learn more about how to lead those initiatives for your product.

Speaker Bio:
Mark Rossolo is the director of public affairs for UL Environment (ULE). Mark leads ULE's strategic outreach and advocacy efforts, representing ULE on the national, state, and local levels 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, energy efficiency 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, ASHREA 189.1 & 90.1, Green Globes, DGNB (Germany) and Three Star (China). Mark currently serves on the Corporate Advisory Board for the World Green Building Council, Advisory Board for the Healthy Facilities Institute, Steering Committee for the Sustainable Purchasing Council 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.

SusTech 2013

ELECTRIC VEHICLES INVITED SPEAKERS

"Electric Transportation: Trends and Opportunities"	Jeff Allen, Drive Oregon
"CONFESSIONS OF AN E.V. ADVOCATE: Thinking back on the past 5 years; Mind surfing ahead on the next 5 years"	George Beard, Portland State University
"IEEE's Transportation Electrification Initiative"	Lee Stogner
"Driving to Net Zero with full performance"	Bob Simpson, EVDrive
"Lithium-ion battery pack research and development at Brammo Inc."	Roger Gerson,Brammo Inc. Andishe Moshirvaziri, University of Toronto
"Batteries: The Search for a Perfect Chemistry"	Slobodan Petrovic, OIT

Title: "Electric Transportation: Trends and Opportunities"

Speaker: Jeff Allen, Executive Director, Drive Oregon

Abstract:
This presentation is about electric transportation industry innovations and trends. The transportation industry is changing at a record pace, and Oregon is leading the way, with more charging stations per capita than anywhere in the US and dozens of companies in the industry. In fact, a recent study estimated that the electric vehicle industry is already worth $266.56 million per year in Oregon. This emerging industry is creating opportunities for a wide range of businesses and technologies, from companies producing complete vehicles to software, embedded systems, cables and wiring, energy storage and recovery, and more.

Speaker Bio:

Jeff Allen is the Executive Director of Drive Oregon, a state-supported initiative to catalyze the growth of Oregon's electric vehicle industry. Jeff currently serves on the board of directors for Sustainable Northwest, and has previously served on many other boards and committees, including Governor Kulongoski's Advisory Group on Global Warming.

Jeff's previous environmental policy work includes projects in Europe, at the state level, and with national non-profit environmental groups. He holds a Master's degree in public policy from the Goldman School of Public Policy at the University of California, Berkeley and graduated Phi Beta Kappa from the University of Michigan.

SusTech 2013

Title: "CONFESSIONS OF AN E.V. ADVOCATE: Thinking back on the past 5 years; Mind surfing ahead on the next 5 years"

Speaker: George Beard, Portland State University

Abstract:
It can be argued that the Initiation Stage of the newest wave of electric vehicle deployments is drawing to a close. In the past several years the world has seen a growing number of battery electric, hybrid, and plug-in hybrid vehicles come to market. It has also been witness to a large number of EV charging companies, infrastructure projects, and business models. During the same period we have suffered the anxiety of skyrocketing gas prices (2008) and short term relief hydraulic fracking. What we haven't seen is much widespread excitement from the marketplace (unless you are a Tesla S owner!)

In this session, George Beard provides an unvarnished personal view of how his city and state have fared in achieving their EV aspirations during this period. He will also argue that the coming years will bring about increased electrification of vehicles even though plug-in vehicles will likely remain a minor footnote in the American fleet. Finally, he will lay out the urban trap that every place must pay attention to and attempt to avoid.

Speaker Bio:
George K. Beard is Alliance Manager in the Office of Research and Strategic Partnerships at Portland State University in Portland, Oregon USA.

Mr. Beard's primary professional interest centers on the interplay between technology, innovation, and leadership. He is currently closely involved with Oregon's unfolding electric vehicle initiative. He also manages PSU's newly formed strategic partnership with Portland General Electric along with several other alliances, including ones with Toyota Motor Sales USA, General Motors, and Clemson University's International Center for Automotive Research (ICAR).

During his 30-year career, George has split his time between the public and private sectors, much of it involving the deployment of technology and pursuit of innovation. Mr. Beard's federal, state, and local government experience includes stints with the U.S. Department of Justice, Bonneville Power Administration, State of Oregon, Multnomah County, and Santa Barbara County.

For most of the past 10 years, George has worked for several technology and software firms. His most recent work was managing Retek's global alliance with IBM, and as director of corporate communications for the firm's retail.com e-commerce business. He was employed earlier by Oracle Corporation as manager of its Performance Consulting practice in the Pacific Northwest, and as Global Account Manager to Nike. Before Oracle, George worked for four years with the Unisys Corporation's Information Services Group as Business Development Manager for Washington and Oregon.

Mr. Beard serves as a Senior Fellow at the Center for Digital Government and as a founding board member of SmartGrid Oregon. He is an occasional contributor to Public CIO and Digital Communities Magazines.

George holds degrees from Michigan State University, the State University of New York at Albany, and Portland State University.

SusTech 2013

Title: IEEE Transportation Electrification Initiative

Speaker: Lee Stogner, 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

I also invite you to participate in our ongoing discussions by joining the IEEE Clean Transportation Group at http://www.linkedin.com/groups?home=&gid=3049403&trk=anet_ug_hm

With your participation, we can develop the clean, efficient, connected and safe transportation solutions of the future.

Speaker Bio:

Lee Stogner is the Managing Principal 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 IEEE 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 electric vehicles through his participation in the IEEE Smart Grid Initiative, the IEEE Energy Policy Committee and as Chair of the IEEE Transportation Electrification Initiative. More information on the Initiative can be found at http://electricvehicle.ieee.org

SusTech 2013

Title: "Driving to Net Zero with full performance"

Speaker: Bob Simpson, CTO of EVDrive Inc

Abstract:
The new Electric Vehicle: In the last decade, battery chemistry has vastly improved to the point that automotive applications are not only possible and viable, but capable of very high levels of performance, to the delight of the driving enthusiast. With a source of energy that is capable of delivering enormous instantaneous power, the development focus then shifted to improving the power/weight ratio of the traction motor and it's drive controller to take advantage of this for mobile and power sports applications. The shift from fossil fuel to stored electrons for motive power has also enabled an improvement in the control of torque that is delivered to/from the wheels gaining even more function/performance/safety improvement over fuel burning vehicles.

Worried about a range limitation with an electric vehicle? A true series hybrid is most efficient - Just add a REX that delivers the *average* power only, with instantaneous drive power always coming from/to the battery pack. When the battery pack is sized properly, the fuel powered Range Extender will rarely be needed. This is a short term necessity along the path to greater energy dense battery cells.

<u>This presentation will highlight the following:</u>

- High power density drive system components installed in a BMW325i
- Power consumption profile for electric BMW 325i
- Regenerative braking significance
- Range EXtender tech – a glimpse of the solution to Range Anxiety
- Impact on home monthly power bill when used daily
- Power source - Grid tied solar array on home's roof
- EV's Impact to the grid

Speaker Bio:

Bob Simpson was born and raised in Albany Oregon, and graduated from West Albany High School in 1975. He received an AS Electrical degree, from Linn Benton Community College in 1977, and his BSEE from Oregon State University 1990 with focus on Hardware design. He was employed at Tektronix from June 1977 to June 2011. He co-founded EVDrive in January 2011, and is currently CTO of EVDrive Inc.

SusTech 2013

Title: "Lithium-ion battery pack research and development at Brammo Inc."

Speakers: Roger Gerson, Brammo, Inc. and Andishe Moshirvaziri, University of Toronto

Abstract:
Brammo began development of proprietary lithium-ion batteries in 2009 in preparation for competing in the very first internationally sanctioned electric motorcycle race at the Isle of Mann, UK. Since that time, Brammo has been working on both experimental and production lithium-ion battery packs designed for use in rugged environments. At this time Brammo has two serial production Li-NCM battery packs, and numerous successful Li-ion experimental packs that have mostly been used in our motorcycle racing program. In 2012 Brammo entered into a collaborative research program with Dr. Olivier Trescases and The University of Toronto, to study the sensitivity of different types of drive cycles on the cycle-life performance of Li-ion battery packs. This presentation provides a brief historical overview of the past 4 years of effort, including a preview of the implications of the current research project at The University of Toronto.

Speaker Bios:

Roger Gerson is Sr. Manager, Electrical/SW Engineering, Brammo, Inc. Roger joined Brammo in 2009 after helping launch serial production of the Vectrix VX1 BEV-maxi-scooter. Prior to serving as the EE manager @ Vectrix, Roger worked in the robotics/autonomous vehicle industry. He contributed to the iRobot Packbot, and earlier provided engineering leadership to the aerial rail-guided autonomous vehicles produced by PRI Automation; AeroTrak, and AeroLoader. Roger's passion is marrying innovation with robust design and high reliability. Roger holds a BSE from Northwestern University, and an MSE from Boston University.

Andishe Moshirvaziri is a Graduate Student in the Department of Electrical and Computer Engineering, at the University of Toronto.

SusTech 2013

Title: "Batteries: the search for a perfect chemistry"

Speaker: Slobodan Petrovic, Oregon Institute of Technology

Abstract:
An overview of the battery technology, from lead-acid and nickel-based batteries to Li ion systems will be presented. The historical perspective will be used to bring insights into the latest advances that offer promise of meeting the demands of the main application areas: transportation, stationary, and portable. Despite its long history, high manufacturing volumes, and ubiquitous nature batteries are not a mature technology. This is a result of changes in the materials in every generation and outdated manufacturing methods. The overview will compare different battery chemistries using performance characteristics such as safety, cycle life, specific energy, specific power, thermal management, and low-temperature operation. Based on this evaluation the attempt will be made to predict the winning chemistry that will break fundamental barriers critical for widespread use in electrical vehicles and other applications. Battery characterization techniques will be discussed as the critical tools in filling the fundamental gaps in knowledge and towards the systematic development. These techniques lead to understanding of the atomic and molecular level processes that control performance limitations and failure mechanisms.

Speaker Bio:
Dr. Slobodan Petrovic is an associate professor at the Oregon Tech (a.k.a. Oregon Institute of Technology) in Wilsonville, OR, where he teaches courses in Renewable Energy and Electrical Energy Engineering. His main research interests are in batteries, fuel cells, solar cells, MEMS, and electronic packaging. After obtaining his doctorate in Physical Chemistry for the work on oxygen cycle in sealed batteries, he held numerous positions in the energy field in Europe and North America. Prior to joining Oregon Tech, Dr. Petrovic was an associate professor at the Arizona State University, and he also held appointments at Clear Edge Power, Neah Power Systems, and Motorola, Inc.

SusTech 2013

QUALITY of LIFE INVITED SPEAKERS

"Wastewater – Sustainability Issues"	Jessie Israel, King County, Seattle
"Sustainability As A Key Component To Addressing The Sanitation Crisis In The Developing World"	Carl Hensman, The Bill & Melinda Gates Foundation
"Electromagnetic Green Spaces for Research and Recreation"	Rick Campbell, Portland State University
"Household Battery Re-use vs. Recycle Technologies, a Life Cycle Analysis Perspective"	Charlie Kawasaki, CEO of BETTERY
"Novel nanomaterials for water desalination technology"	David Cohen-Tanugi , MIT
"Education for Sustainability"	Tariq Durrani, Director UK National Commission for UNESCO, and Research Professor University of Strathclyde, Glasgow Scotland UK

Title: "Strategic Sustainability: Water | Waste | Energy"

Speaker: Jessie Israel, King County (Washington) Wastewater Treatment Division

Abstract:
King County WTD treats an average 175 million gallons of wastewater per day at three regional plants and two satellite plants. This puts King County's system in the top three percent of U.S. systems, ranked by the U.S. Environmental Protection Agency (EPA) according to volume of wastewater treated. Cleaning wastewater and stormwater is an energy intensive effort. It is estimated 3 - 4 percent of all annual national electricity consumption is due to the provision of drinking water and wastewater services - an equivalent to approximately 56 billion kilowatts (kW) or $4 billion. Urban resource recovery, renewable energy production and energy conservation is especially challenging in an era where an increase of energy use and cost often reflects efforts to further protect water or air quality. As a consequence, King County's sustainability strategies take a holistic approach and have evolved to better manage these challenges to retain sharp focus on energy use, innovation and our carbon impact - as we respond to our ratepayers' needs.

Speaker Bio:

Jessie Israel leads waste-to-resource initiatives for King County's wastewater treatment utility. As an urban utility dedicated to protecting public health and the environment, WTD leads the country on harvesting carbon, nutrients, methane, waste heat and non-potable water resources from what Jessie considers to be the "ultimate" renewable resource. Every day, Israel and her colleagues balance running an unfailingly reliable, safe and efficient business operation, with environmental envelope-pushing and innovative public service.

Prior to joining WTD, Jessie helped to reshape King County Parks into an entrepreneurial, performance-driven governmental organization. This transformation allows Parks to generate non-tax revenue and ensure green space remains open, even during tight fiscal times. As a public servant, consultant and

non-profit leader, Jessie has a fifteen year track record of bringing together groups to invest in community development, environmental and equity issues. She has trained around the world on public-private partnerships and building sustainable communities. In 2006, Jessie was honored to be named one of the Puget Sound Business Journal's 40 Under 40. Jessie spent more than two years as a volunteer with the United States Peace Corps in rural Guinea, West Africa and has a BA in Political Science from Seattle University.

Title: "Sustainability As A Key Component To Addressing The Sanitation Crisis In The Developing World"

Speaker: Carl Hensman, Bill & Melinda Gates Foundation

Abstract:
In the developed world we have the luxury of deciding to adopt sustainable systems. However, in developing countries the natural environment defines the need to address any sanitation approach in a sustainable manner. Consideration cannot just be given to eliminating fecal waste, but to achieve a truly sustainable approach in these sanitation environments, the beneficial value intrinsically contained within human fecal material and urine must be harnessed.

Speaker Bio:

Carl Hensman joined the Water, Sanitation and Hygiene team within the Global Development Program of the Bill & Melinda Gates Foundation in January 2012. Prior to joining the foundation, Carl was an Energy Program Manager for King County, WA (Seattle) focusing on resource recovery in the Wastewater Treatment Division. Additionally, he has served as the Chief Technology Officer for Asemblon, an energy storage development company. In that role Carl was responsible for the engineering and development of novel technologies from concept to commercial deployment, as well as partner relations for program execution. He has served as Chief Scientist/Engineer, Principal, and Director on the Board of Frontier Geosciences Inc., a consulting company focused on the energy industries. Carl has also been an employee of DowElanco, Exxon. and British Coal. In addition, he's been an Adjunct Faculty member at Clemson University, served on the National Coal Council, and the NCC Coal Policies Board. Carl has secured funding for multi-million dollar projects from private and government sources. Carl has been published in over a dozen peer-reviewed journals, has co-written one book and three book chapters, and served as a scientific advisor at the state and federal level. Carl received his doctorate from New Mexico State University in Applied Chemistry and spent two and a half years as a postdoctoral fellow at the Ohio State University.

Title: "Electromagnetic Green Spaces for Research and Recreation"

Speaker: Rick Campbell, Portland State University

Abstract:
A map of the Electromagnetic Spectrum appears as overcrowded as a major urban area, but closer

inspection reveals regions set aside for Amateur Radio, Radio Astronomy, and unspecified Government use. Armed with only a wideband antenna and spectrum analyzer, Microsoft Engineers and Cognitive Radio advocates repeatedly demonstrate that much of that spectrum is unused. Government agencies grown accustomed to battling red ink with billion dollar spectrum auctions eagerly prospect for the next slice of the golden pie. Twenty-something internet billionaires demand freedom for an electromagnetic spectrum constrained by the obsolete ideas of long-dead men.

Old ideas are not automatically obsolete. Those generous, forward-thinking old men also set aside the National Parks and the entire Oregon Coast. A treasured concept from the early 20th century is protecting undeveloped space: not for sale, closed to commercial use and open to the public. A wideband antenna connected to a Spectrum Analyzer may reveal Amateur Radio bands as apparently unoccupied as the North Face of Mount Rainier in mid-Winter, but amateur radio scientists routinely listen with receivers a thousand times more sensitive than a laboratory spectrum analyzer. Spin-off technology from those amateur experiments is today's wireless technology, just as specialized hardware developed by winter climbers on Mount Rainier has evolved into family camping gear.

This talk will showcase a few activities in empty spaces of the Electromagnetic spectrum that directly benefit society, and present a case for the continued protection of these Electromagnetic Green Spaces.

Speaker Bio:
Rick Campbell is an Associate Professor of Electrical and Computer Engineering at Portland State University, a sailor, a violinist, and an explorer of the natural world. He has climbed the major peaks of Washington State and listened to electromagnetic signals reflected off the moon. Rick has published a large portfolio of award-winning radio frequency and analog signal processing designs, and served as Technical Program Co-Chair for the 2013 International Microwave Symposium in Seattle.

Title: "Household Battery Re-use vs. Recycle Technologies, a Life Cycle Analysis Perspective"

Speaker: Charlie Kawasaki, CEO of BETTERY, Inc.

Abstract:
BETTERY has created a new technology and use model for household batteries that offers consumers the ability to re-use household batteries in a convenient model, offering an alternative to single-use alkaline batteries. Efforts are underway to develop environmentally net-positive recycling methodology for alkaline batteries, but recycling services are not widely deployed or used today. In this presentation, the author will present results of recent material life cycle analysis of alkaline batteries, focused on end-of-life management and compare findings with the benefits of the BETTERY technology-enabled re-use model. The presentation will also describe collaborative engineering projects with Portland State University's Electrical and Computer Engineering department, and present early findings of consumer acceptance for the new BETTERY use model.

SusTech 2013

Speaker Bio:
BETTERY is a conveniently located automated battery vending and recycling swap station that consumers use to buy and exchange drained rechargeable batteries for freshly recharged batteries. BETTERY offers the convenience of single-user batteries, with the cost savings of rechargeable batteries. Better than single-use battery disposal, and more environmentally friendly than recycling, BETTERY offers consumers a cost saving way to step up to reusable batteries.

Charlie has over 30 years of experience in the software and networking industries, primarily with venture-backed startup companies. He has extensive experience in technology and product development, product marketing, business development, partnership development, and M&A.

Previous roles included CTO of Pacific Star Communications maker of rugged, deployed network equipment, and CEO of RuleSpace, Inc. the company that created world-leading technology for Internet Parental Controls, used by companies such as AOL, Yahoo, and Microsoft. Prior to RuleSpace, he held various management roles at The Palace, Inc., Creative Multimedia Corp., Central Point Software, Inc., Asymetrix Corp., and Microrim, Inc.

Title: "Novel nanomaterials for water desalination technology"

Speaker: David Cohen-Tanugi, MIT

Abstract:
Water desalination has a central role to play in the global challenge for sustainable water supply in the 21st century. But while the membranes employed in reverse osmosis (RO) leave considerable room for technological improvement, several recent advances in materials suggest that new membranes with dramatically higher water permeability will become available in the future. After providing an overview of the importance of membranes for sustainable water desalination, I will describe some of the most exciting novel approaches for water desalination based on nanomaterials. In particular, graphene, a single-layer sheet of carbon with remarkable mechanical and electronic properties, can be patterned with nanometer-sized pores, to act as an ultra-thin filtration membrane. Drawing from our group's research at MIT, I will share some of our key findings about the potential impact of nanomaterials as membranes for water desalination in the 21st century.

Speaker Bio:
David Cohen-Tanugi is a Ph.D. candidate in materials science & engineering at MIT. His research focuses on clean water technology using computational modeling. He is especially interested in the design of next-generation Reverse Osmosis membranes for affordable and efficient water desalination. Prior to joining MIT, David worked on China-US climate and energy policy for NRDC, an environmental organization in Washington, DC. He holds a B.A., magna cum laude, in Physics from Princeton University and an M.A. in Materials Science & Engineering from MIT.

SusTech 2013

Title: "Education for Sustainability"

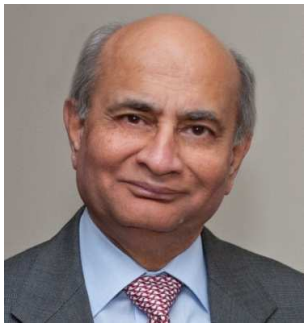
Speaker: Tariq S Durrani, Director UK National Commission for UNESCO, and Research Professor University of Strathclyde, Glasgow Scotland UK

Abstract:
Sustainability and Sustainable Development is now center stage in terms of technology innovation, policy development and indeed 'strategic imperatives'. The topic is high on the agenda of most nations and global organizations. The success of activity materially depends on the availability of talented and trained individuals, sensitive to the need for sustaining resources, maintaining and improving environmental quality, seeking solutions to reduce energy consumption and searching for alternative sources.

This presentation will trace the genesis of the work of United Nations and in particular of UNESCO, highlighting international achievements, and then focus on the requirements for engineering education that embrace sustainability as an integral element of educational philosophy. In this context the concept of 're-engineering engineering education' which is gaining much favour, will be discussed. Here the need to educate engineers to understand the effects of contemporary issues related to resource limitations, design complexity, environmental bounds, social concerns come to the fore.

Finally the presentation will address the current debate on ICT (Information and Communications Technologies) and sustainability; highlighting the threats and opportunities offered and the challenges for the future that need to be resolved.

Speaker Bio:



Tariq S Durrani is Research Professor at the University of Strathclyde. He joined Strathclyde as Lecturer (1976), Professor (1982), Department Head of one of the largest in UK (1990-1994), and Deputy Principal (2000-2006) with major responsibilities for large-scale strategic developments. His research interests cover Communications, Signal Processing, Technology Management. He has authored 350 publications; conducted collaborative research with industry, partnered in major European research programs; supervised 40 PhDs. He holds visiting appointments at Princeton, University of Southern California, Stirling (Scotland) and Chengdu (China).

Tariq has been 2010-2011 IEEE Director and Vice President for Educational Activities; 2006-2007 President IEEE Engineering Management Society; 1994-1995 President IEEE Signal Processing Society; 2003-2004 Vice Chair IEEE Region 8 Technical Activities, and many other senior IEEE appointments.

Tariq has held Directorships of eight organizations, public and private, national and multinational, such as UK National Commission for UNESCO. He has served as consultant advisor to the Governments of UK, Netherlands, Portugal, UAE, US, and European Union. Currently he is Vice President (International) Royal Society of Edinburgh (2012-2013).

He is Fellow: IEEE, UK Academy of Engineering, Royal Society of Edinburgh, and IET. In 2003 Queen Elizabeth II honored him with the title OBE (Officer of the Order of the British Empire) 'for services to electronics research and higher education'.

SusTech 2013

SMART GRID INVITED SPEAKERS

“Transactive Control in the Pacific Northwest Smart Grid Demonstration Project”	Ronald Melton, Pacific Northwest National Laboratory
“Insights gained on residential energy usage from the Pecan Street smart grid demonstration Project”	Scott Hinson, Lab Director, Pike Powers Laboratory and Center for Commercialization
“Smart Grid Research at the National Renewable Energy Laboratory”	Benjamin Kroposki, PhD, PE, Director of Energy Systems Integration, National Renewable Energy Laboratory
“Smart Grid…. A Team Sport”	Chuck Speicher, Managing Principal, Secure System Center Practice, McAfee
"Securing the Modern Grid: The Way Forward"	Patrick Miller, The Anfield Group
“Configurable PV solutions for high PV penetration”	Michael Mills-Price, PE, Advanced Energy Industries

Title: “Transactive Control in the Pacific Northwest Smart Grid Demonstration Project”

Speaker: Ronald Melton, Pacific Northwest National Laboratory

Abstract:
The Pacific Northwest Smart Grid Demonstration is one of 16 regional projects funded by the American Recovery and Reinvestment Act of 2009. The project is led by Battelle in Richland, WA, and includes participation by the Bonneville Power Administration, the University of Washington, 11 utilities across the five state region of Washington, Oregon, Idaho, Montana and Wyoming, and five technology providers including IBM T.J. Watson Research Center, IBM Netezza, Alstom Grid, 3TIER and QualityLogic. The five main objectives of the project are to invest in regional smart grid infrastructure, quantify costs and benefits of smart grid technology, develop a wide area communications and control infrastructure using incentive signals to engage responsive assets, protocol and incentive, contribute to smart grid standards and to facilitate the integration of wind and other renewable energy resources. A major element of the project is development and deployment a smart grid application called transactive control. This paper summarizes the overall efforts of the project, introduces the basic elements of the transactive control technique, and presents preliminary results.

Speaker Bio:
Dr. Ronald Melton is the director of the Battelle led Pacific Northwest Smart Grid Demonstration project, the administrator of the GridWise® Architecture Council, and Team Lead for Distribution Systems and Demand Response at the Pacific Northwest National Laboratory (PNNL). He has over 30 years of experience applying computer technology to a variety of engineering and scientific problems. In addition to smart grid related projects, recent experience includes research and engineering in cyber security for critical infrastructure protection and process control system security. Dr. Melton is a Senior Member of the Institute of Electrical and Electronics Engineers and a Senior Member of the Association for Computing Machinery.

SusTech 2013

Title: "Insights gained on residential energy usage from the Pecan Street smart grid demonstration Project"

Speaker: Scott Hinson, Lab Director, Pike Powers Laboratory and Center for Commercialization

Abstract:
With the deepest data on customer electric and gas use, and the highest residential concentration of electric vehicles in the United States, as well as the world's first independent research meter network, Pecan Street Research Institute and the Pike Powers Lab and Center for Commercialization have been able to arrive at valuable, data-driven insights from their research on customer energy use. This talk will focus on findings from their extensive residential energy use monitoring, including home appliances, electric vehicles and rooftop PV installations, as well as from neighborhood transformer monitoring.

Speaker Bio:
Scott leads the development of the Pike Powers Commercialization Lab. He worked at a thin film CIGS solar module manufacturer where he led module packaging, performance, certification and reliability efforts. Prior efforts include work in the military, medical, consumer and oil industries developing power supplies, precision measurement equipment and inductive heating technologies. Scott received his B.S.E.E. from The University of Texas at Austin with undergraduate specializations in both communications systems and power distribution.

Title: "Smart Grid Research at the National Renewable Energy Laboratory"

Speaker: Benjamin Kroposki, PhD, PE, Director of Energy Systems Integration, National Renewable Energy Laboratory

Abstract:
This paper gives a overview of Smart Grid research activities at the National Renewable Energy Laboratory (NREL) located in Golden, Colorado. These activities include: examining the impacts of high penetrations of renewables at both the transmission and distribution level, interoperability and interconnection standards, microgrids, and conformance testing and test procedure development. NREL's work on increasing the penetration of renewable and non-dispatchable resources has been instrumental in ever increasing amounts of renewable technologies being integrated into the electric power system. NREL has also recently opened its new Energy Systems Integration Facility (ESIF) that has been designed to help national laboratories, academia, and industry conduct state-of-the-art research on the development and deployment of advanced energy components and systems. ESIF will contain laboratories and equipment to help develop technologies and testing procedures to evaluate interoperability both at a deice level and system level. This paper will discuss ESIF as well as other energy system integration facilities at NREL.

Speaker Bio:
Dr. Kroposki is the Director of Energy Systems Integration at the National Renewable Energy Laboratory (NREL). At NREL he leads NREL's strategic research in the design and performance optimization of electrical, thermal, fuel, and data pathways for energy systems at all scales. He received his BS

and MS in Electrical Engineering from Virginia Tech and PhD from the Colorado School of Mines. His expertise is in the design and testing of renewable and distributed power systems and grid integration. He has more than 100 publications in these areas and is the editor for *IEEE Power & Energy Magazine* special issues on solar energy integration. Dr. Kroposki is also an Editor for both the *IEEE Transactions on Sustainable Energy* and *IEEE PV Journal*. Dr. Kroposki is a registered professional engineer in the state of Colorado.

Title: "Smart Grid…. A Team Sport"

Speaker: Chuck Speicher, Managing Principal, Secure System Center Practice, McAfee

Abstract:
Smart Grid means many things to many different people but common to nearly every element in the ecosystem is embedded intelligence and connectedness. These cyber physical assets are the next generation of connected intelligence needed to modernized the electric grid for the next 50 years. A new paradigm of security is upon us where designed-in security must be practiced while observing the next greater context in the design patterns to achieve end to end security and defense in depth in the electric grid.. The Security Fabric Alliance is an informal consortium dedicated to that mission with more than 50 companies contributing to the reference architecture. The Security Fabric reference architecture is based on the NIST IR 7628. It is intended to assist vendors, component suppliers, utilities and system integrators to build certifiable, interoperable, pluggable components on a common framework. A mass movement is needed within the entire ecosystem in order to produce a safe, reliable and resilient grid. I will provide an overview of the reference architecture and how it delivers the 7 tenets of the NIST IR 7628 in a control system environment.

Speaker Bio:
Chuck Speicher is the Founder of the Security Fabric Alliance and the Managing Principal of the Secure System Center at McAfee .A new business unit dedicated to the deployment of interoperable system solutions that practice designed-in security. He has been dedicated to solving the complex problem SMART GRID presents to the modernization of the electric grid since he join McAfee 3 and ½ years ago. Chuck has been a practicing entrepreneur his entire career. He has focused on solving industry wide problems that require practical knowledge of technology, process and people in order to deliver a whole market solution. He has achieved accolades from his peers as a finalist for the Ernst and Young Entrepreneur of the Year Award. One of his companies was #259 of Fastest Growing Privately held INC 500 Companies with more than 1200% sales growth over a 5 year period. He has introduced industry firsts to market in several categories in the wireless industry. The first wireless central station backup alarm system CelGuard..The first wireless billing system on a chip for wireless rentals, the first Wi-Fi hotspot in the hospitality space. The first federated portal for emergency notifications on college campuses linking personal wireless devices. He is the co-technical lead of the Security and Privacy Committee at Pecan Street a living laboratory for advance technologies in Austin TX. Finally A current work in progress … the first commercial deployment of end to end security in a synchrophasor network for demonstration within the ERCOT footprint.

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Title: "Securing the Modern Grid: The Way Forward"

Speaker: Patrick Miller, The Anfield Group

Abstract:
"What's really happening in the Smart Grid cybersecurity trenches? With all the hype around SmartGrid cybersecurity, it's hard to tell what's true and what isn't. Understanding the real threats, vulnerabilities and impacts to the modernization of our Critical Electric Infrastructure is a significant challenge. Discerning practical and cost-effective risk management strategies to mitigate the risks can be equally difficult. The uniqueness and similarities between Smart Grid Systems and traditional IT systems from technology, process and governance perspectives are not fully understood by many. In this session, you will learn successful approaches to navigate the difficult road ahead to achieve a secure Future Grid."

Speaker Bio:
Patrick Miller has dedicated his career to the protection and defense of critical infrastructures as a trusted independent advisor. He is a Partner and Managing Principal at The Anfield Group, as well as the founder, director and president emeritus of EnergySec, a 501(c)(3) nonprofit organization focusing on information sharing, situational awareness and security workforce development. Patrick's diverse background includes positions with regulatory agencies, private consulting firms and utility asset owners within the Energy, Telecommunications and Financial Services verticals.

Title: “Configurable PV solutions for high PV penetration”

Speaker: Michael Mills-Price, PE, Advanced Energy Industries

Abstract:
The primary focus of this presentation will be to inform the audience of the benefits of configurable voltage support functions and their application in today’s electrical distribution networks. With today’s electrical distribution system being a compilation of > 100 years of engineering accomplishments, and the diversity in control and operational schemes utility to utility, the need for user configurable, deterministic control functions to continue to support expanded PV penetrations is paramount. This presentation will cover multiple case studies ranging from large utility installations through to commercial rooftop applications whereby advanced inverter support functions were leveraged to solve a utility concern. The configurability of the resources will be highlighted with emphasis on practical use scenarios including directly controlled, scheduled, and stand-alone operation. The benefits resulting from a configurable platform approach on interconnection as well as future modifications to meet ever-changing load demand and utility operational needs will be discussed in detail. Details of how to leverage the configurable solar facility to meet system needs (whether wide area or local) will be covered to allow the audience to gain insights into inverter and system capabilities with an emphasis on practical implementation. Finally, a summary of next generation advancements in inverter control technology will be discussed to drive discussion and questions as well as to close the presentation.

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Speaker Bio:

Michael Mill-Price is SEGIS-AC program manager and technical lead for the Solar Energy business unit at Advanced Energy Industries. Michael has been designing inverter and inverter system technologies for the last decade as a lead researcher for AESE, with emphasis on technologies to lessen barriers to widespread PV adoption. He holds both a Master of Science (MSEE) and Bachelor of Science (BSEE) in electrical engineering from Oregon State University, and is a registered professional engineer (PE). Michael is active in the industry relevant standards writing committees including the IEEE 1547a and IEEE 1547.8. In his free time, Michael teaches senior level engineering courses for Oregon State University in energy storage and energy distribution systems.