2012

CONFERENCE ON ELECTRIC ROADS & VEHICLES

DRIVING IDEAS

ENERGIZING PARTNERSHIPS

CERV

FEBRUARY 16-17, 2012

NEWPARK RESORT & HOTEL

PARK CITY, UTAH, USA

SPONSORS

We gratefully acknowledge the following sponsors for their contributions to the inaugural Conference on Electric Roads & Vehicles. This program is possible due to the support and generosity of these organizations.

CONFERENCE

Energy Dynamics Laboratory
Utah State University Research Foundation

www.energydynamicslab.com

PLATINUM

Utah State University
COMMERCIAL ENTERPRISES

www.crd.usu.edu/htm/commercial-enterprises

GOLD

CONDUCTIX wampfler
DELACHAUX GROUP

www.conductix.com

USTAR
Turning innovation into industry.

www.innovationutah.com

SILVER

EDTA
Electric Drive Transportation Association

www.ElectricDrive.org

International IOR Rectifier

www.irf.com

Evatran
energy without limits

www.pluglesspower.com

BRONZE

ROCKY MOUNTAIN POWER
Let's turn the answers on.

www.rockymountainpower.net

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

www.nrel.gov

WELCOME

Welcome to the inaugural Conference on Electric Roads & Vehicles. We hope you find the discussions and presentations informative and interesting.
We encourage you to take advantage of this time to discuss ideas and challenges, make new contacts, and foster existing relationships. Thank you for joining us.

TABLE OF CONTENTS

CONFERENCE SCHEDULE AT A GLANCE*

The Pre-conference Tutorial and all conference sessions will be held in the Conference Center at the Newpark Resort & Hotel.

THURSDAY

7:30 AM - 5:00 PM	Registration
8:00 AM - NOON	**Pre-conference Tutorial:** *Recent Advances in Wireless Power Transfer for Transportation Applications*
1:15 PM	Conference Welcome & Introduction
1:45 PM - 3:15 PM	***Industry Executive Roundtable***
3:15 PM - 4:00 PM	Exhibit & Networking Break
4:00 PM - 5:30 PM	***R&D Laboratory Executive Roundtable***
5:30 PM	Conference Sessions End
6:30 PM - 8:30 PM	***Evening Social*** Swaner EcoCenter

FRIDAY

7:30 AM - 8:15 AM	Continental Breakfast
8:00 AM	Conference Announcements
8:05 AM - 10:10 AM	*Wireless Power Transfer & Vehicle Integration Session*
10:10 AM - 10:40 AM	Exhibit and Networking Break
10:40 AM- 11:30 AM	*Wireless Power Transfer & Vehicle Integration Session (cont.)*
11:30 AM - 12:15 PM	**U.S. Department of Energy Keynote Address:** David L. Anderson, Technology Development Manager in the Vehicle Technologies Program
12:15 PM - 1:15 PM	***Lunch Provided*** Swaner EcoCenter
1:20 PM - 2:05 PM	**U.S. Department of Transportation Keynote Address:** Kevin Womack, Associate Administrator, Office of Research, Development and Technology
2:05 PM - 2:25 PM	Refreshment Break
2:25 PM - 4:35 PM	*Broader Deployment Considerations Session*
4:35 PM - 5:25 PM	*Codes & Standards Spotlight Session*
5:30 PM	Conference Conclusion

*Conference Schedule is based on information available at the time of publication and is subject to change.

EXHIBIT INFORMATION

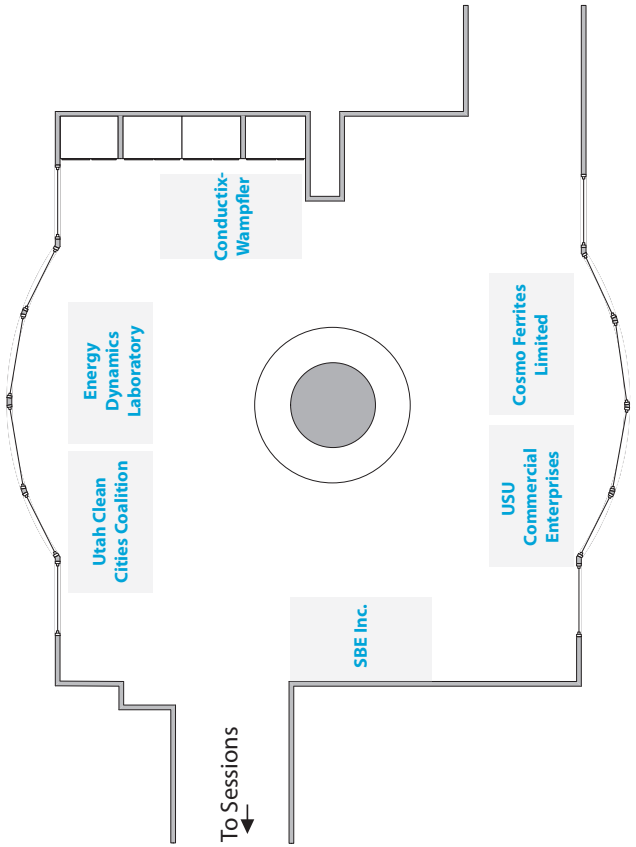
Exhibit Hours

THURSDAY ▪ FEBRUARY 16, 2012

8:00 AM - 1:00 PM	Check-in/Set-up
1:00 PM - 5:00 PM	Show Open

FRIDAY ▪ FEBRUARY 17, 2012

8:00 AM - 1:00 PM	Show Open
1:00 PM - 3:30 PM	Take Down



CONDUCTIX wampfler
DELACHAUX GROUP

Conductix-Wampfler AG
Delachaux Group
Rheinstrasse 27 + 33
79576 Weil am Rhein Germany
Register Court: Freiburg HRB 413485
Exhibit Manager: Gilles Hernandez
+49 1622-993-263
Email: gilles.hernandez@conductix.com
URL: http://www.conductix.com/

Conductix-Wampfler is proving the suitability of opportunity charging with wireless IPT®Charge solutions since a number of years in real installations being operated around the world. The most known ones are the operations in the Italian cities of Turin and Genoa. At Turin a fleet of 23 electric buses is operated with IPT®Charge.

Beside opportunity charging for electric buses, Conductix-Wampfler has been involved in inductive charging for electric cars. In a project supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Daimler and Conductix-Wampfler teamed up to test the technology in vehicles.

The knowledge of Conductix-Wampfler on inductive power transfer roots back to large experience in industrial application where the technology IPT®Rail is successfully applied since 1997 for conveyor systems and material handling applications.

Cosmo Ferrites Limited, India
Jabli, District - Solan
Himachal Pradesh, India 173209
Exhibit Manager: Sameer Yadav
+91-1792-277-231
Email: sameer@cosmoferrites.com
URL: http://www.cosmoferrites.com/

Cosmo Ferrites Ltd., one of the leading manufacturers and exporters of Mn-Zn Soft Ferrites from India, was established in 1986. Cosmo ranks #1 in India in terms of production capacity.

Currently our product portfolio has more than 500 different ferrite sizes. All basic materials comply with RoHS norms as per EU Standards. Epoxy coating material is UL94 V-0 approved. Our Research & Development Department is approved by the Government of India's DSIR.

Our product serves all major applications like Solar Inverters, Sensors, VLT Drives, Energy Metering, Lighting, SMPS, Battery Charger, and induction welding/heating applications.

We are also involved in Design, Development & Production of Ferrite Materials & Components, which are basic building blocks for Magnetics in the Electric Vehicle Chargers. Ferrite Components find application in the Power Supplies & PADS for Wireless EV Chargers. Our components have been tested complimentary for wireless charging of 5 kW.

EXHIBITOR DESCRIPTIONS

Energy Dynamics Laboratory
1695 N Research Park Way
North Logan, UT 84341, USA
Exhibit Manager: Jeff Muhs
435-713-3800
Email: jeff.muhs@usurf.usu.edu
URL: http://energydynamicslab.com/

The Energy Dynamics Laboratory (EDL)is a thriving research organization with state, national, and international collaborations. EDL is headquartered in North Logan, Utah.

At the heart of EDL are five teams working on transformative research and development aimed at ending, within a generation, America's over dependence on foreign oil, economy-damaging energy price spikes, and most air pollution in urban areas. In each case, EDL researchers are looking beyond incremental improvements to existing energy systems and working on entirely new approaches to solving energy challenges.

A major focus at EDL is developing technology that will wirelessly, safely, and automatically transfer electricity to cars, thereby reducing the amount of energy that vehicles need to carry. Commuters will not have to plug in, fuel up, or worry how far their vehicle's battery can take them.

SBE Inc.
81 Parker Road
Barre, VT 05641, USA
Exhibit Manager: Jim Crawley
802-661-3479
Email: JimC@sbelectronics.com
URL: www.sbelectronics.com

SBE Inc. is a leading developer and manufacturer of film capacitor solutions that provide a much higher degree of reliability, higher power density, and simpler cooling infrastructure in demanding applications, particularly for automotive/transportation, alternative energy, utilities, power supplies/laser and military/aerospace. SBE has significant expertise in high-performance hybrid film/foil capacitors which provide a unique combination of self-healing, heat transfer, and low-cost for resonant circuit applications including induction heating and wireless charging. Originally a Sprague Electric Plant, SBE has been manufacturing capacitors for over 50 years; producing over a billion capacitors, including the renowned Orange Drop®.

In 2009, SBE Inc. received a $9.1 Million grant by the Department of Energy to build a world-class facility for the manufacture of its DC Link Power Ring Film Capacitors™ used in drivetrain inverters for plug-ins and electric drive vehicles. The company's headquarters, engineering/product development groups and manufacturing plant are located in Barre, Vermont.

Utah Clean Cities Coalition
451 S State Street
Salt Lake City, UT 84111, USA
Exhibit Manager: Irene Rizza
801-535-7736
Email: irene.rizza@utahcleancities.org
URL: http://utahcleancities.org/

Utah Clean Cities, established in 1994, is a nationally recognized, local non-profit organization sponsored by the Department of Energy's Vehicle Technologies Program. It is one of almost 100 coalitions across the United States that works to advance the nation's energy, economic and environmental security by supporting local actions to reduce petroleum use in the transportation sector. Utah Clean Cities Coalition promotes the use of alternative fuels, alternative fuel vehicles and energy conservation strategies. We assist fleets and individuals throughout Utah who are interested in using fuels and vehicle technologies that are clean, domestic, efficient and cost effective. We also actively engage the public with various educational outreach campaigns.

Utah State University Commercial Enterprises
1780 N. Research Park Way, Suite 108
North Logan, UT 84341, USA
Exhibit Manager: Jacoba Mendelkow Poppleton
435-797-9608
Email: Jacoba.mendelkow@usu.edu
URL: http://crd.usu.edu

Commercial Enterprises works closely with academic and industry partners to develop new technologies by "spinning-in" business innovation opportunities. One such innovation has led to industry-sponsored research and $15M in future revenue. From severe weather sensors that fly in geosynchronous orbit to synthetically bio-manufactured products, our Commercial Enterprises team is working with our USTAR hires, our academic colleges, the Space Dynamics Laboratory and the Energy Dynamics Laboratory to develop new technologies for the market place—and we are asking the marketplace what it needs. It is our desire and our commitment to protect USU's intellectual property and to develop relevant, practical technologies with industry so that we can appropriately leverage the intellectual, financial and creative assets of Utah State University.

7:30 AM - 5:00 PM | Registration

8:00 AM - NOON

PRE-CONFERENCE TUTORIAL

Recent Advances in Wireless Power Transfer for Transportation Applications

Internal combustion engine (ICE) vehicles are disadvantageous to the worldwide environment and economy. For example, in the U.S., transportation accounts for one-third of carbon dioxide emissions. In the European Union, an average of 13.8 million barrels of oil is consumed per day.

One proposed alternative to ICE vehicles is the battery-powered electric vehicle (EV), which can be powered by an array of alternative energy sources. Unfortunately, current EV batteries take up to 15 hours to recharge and can only provide power for up to 100 miles (approximation). Wireless power transfer (WPT) could mitigate the limitations and problems mentioned above by delivering electric power to moving vehicles via time varying magnetic fields.

This four hour tutorial session will review recent developments in state-of-the-art roadway electrification technology. It will cover a broad range of topics on in-motion WPT system developments, including power converter topologies, magnetic coupler designs, controller designs, vehicle integration, and a system level cost benefit analysis. Recent prototypes and new technologies will be outlined by several experts in the field. In addition, the development path for a cost effective, highly efficient roadway electrification system will be outlined.

PRESENTER

John T. Boys
Professor
University of Auckland, Department of Electrical and Computer Engineering

John T. Boys received his ME degree from the University of Auckland, New Zealand in 1965. After completing his PhD he was with SPS technologies for five years before returning to academia as a lecturer at the University of Canterbury. He moved to Auckland in 1977 where he developed his work in Power Electronics. He is currently Professor of Electronics at the University of Auckland in the Department of Electrical and Computer Engineering and co-founder of HaloIPT. He has published more than 100 papers in international journals and is the holder of more than 20 US patents from which licenses in specialized application areas have been granted around the world. His specialist research areas are power electronics and inductive power transfer where he and Prof. G. A. Covic jointly head power electronics research. He is a Fellow of the Royal Society of New Zealand and a Distinguished Fellow of the Institution of Professional Engineers New Zealand.

PRESENTER

Grant A. Covic
Associate Professor
University of Auckland, Department of Electrical and Computer Engineering

Grant A. Covic (S'88-M'89-SM'04) received his BE (Hons), and PhD degrees in Electrical and Electronic Engineering from The University of Auckland (UoA), New Zealand in 1986 and 1993 respectively. He was appointed as a full time Lecturer in 1992, a Senior lecturer in 2000, and in 2007 as an Associate Professor in the Electrical and Computer Engineering Department at the UoA, New Zealand. In 2010 he co-founded (with Prof. John Boys) a new global start-up company "HaloIPT" focusing on electric vehicle charging infrastructure.

Today his research and consulting interests include power electronics, electric vehicle battery charging and inductive (contact-less) power transfer (IPT) from which he has published more than 100 refereed papers in international journals and conferences. He jointly heads power electronics research at the UoA and holds a number of US patents with many more pending, from which licenses in specialized application areas of IPT have been granted around the world.

PRESENTER

Chun-Taek Rim
Associate Professor
Korea Advanced Institute of Science and Technology (KAIST), Department of Nuclear and Quantum Engineering, Mobile Power Electronics Laboratory

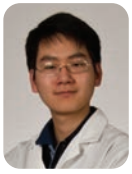
C. T. Rim was born in Korea in 1963. He received a B.S. degree in electrical engineering from Kumoh Institute of Technology, Gumi, Korea, in 1985, and M.S. and Ph.D. degrees in electrical engineering from KAIST (Korea Advanced Institute of Technology), Daejeon, Korea, in 1987 and 1990, respectively. Since 2007, he has been an Associate Professor of Nuclear and Quantum Engineering, and an adjunct to Aerospace Engineering in Power Electronics at KAIST. From 1990 to 1995, he was a Military Officer at the Ministry of National Defense in Korea. From 1995 to 2003, he was a Senior Researcher at the Agency for Defense Development, Daejeon, Korea and from 1997 to 1999 he was with Astrium in Portsmouth, U.K. From 2003 to 2007, he was a Senior Director at the Presidential Office, Seoul, Korea. He has cooperatively developed Korea's first airborne and spaceborne Synthetic Aperture Radars. He won 3 prizes from the Korean Government. He is currently developing Wireless Power Transfer Systems for On-Line Electrical Vehicles and leading the Mobile Power Electronics Lab, named Tesla Lab, at KAIST. His research area includes future green transportations such as electrified vehicles, ships, and airplanes and wireless power systems for robots, home appliances, and bio-medical applications. He has authored or coauthored 61 technical papers, written 3 books, and holds more than 40 patents (awarded and pending). Prof. Rim is a senior member of the IEEE and members of the Korean Institute of Power Electronics, the Korea Aerospace Engineering Society, and the Korean Political Science Association.

PRESENTER

Florian Risch
Research Assistant
The Institute for Manufacturing Automation and Production Systems (FAPS) of the Friedrich-Alexander University of Erlangen-Nuremberg

Florian Risch is a research assistant at the Institute for Manufacturing Automation and Production Systems (FAPS – Lehrstuhl für Fertigungsautomatisierung und Produktionssystematik) of the Friedrich-Alexander University of Erlangen-Nuremberg (Germany). He works in the research group of the Bavarian Technology Center for Electric Drives (E|Drive-Center) on the topic of stationary and in-motion inductive power transfer in electric vehicles by electrified roadways (E|ROAD) with a focus on planning and verifying different fields of application and the development of efficient production processes for contactless charging infrastructure, and the needed vehicle components.

SESSION CHAIR



Hunter Wu
Research Scientist
Utah State University Research Foundation/Energy Dynamics Laboratory

Hunter Wu graduated with a Ph.D. in Electrical and Electronic Engineering and Bioengineering (2010) and a B.E. in Electrical Engineering (2008) from the University of Auckland. He was awarded the Senior Scholar (equivalent to being ranked #1 in major) and the Top Achiever Doctoral Scholarship (equivalent to the Fulbright Scholarship), both in 2008. He now serves as the principal investigator and engineering scientist at EDL over the HCWPT project. He has over a dozen peer-reviewed, IEEE international journal and conference publications. Dr. Wu was granted one patent and has 6 patents pending. He also received a Best Paper Award at the 6th IEEE ICIEA 2011 Conference and serves as a technical journal reviewer for IEEE Transactions on Industrial Electronics, IEEE Transactions on Power Electronics, and Society of Automotive Engineers.

1:15 PM Conference Welcome
Samantha Mary Julian
Director of the Office of Energy Development, State of Utah

1:30 PM Conference Introduction & Overview
Jeff Muhs
Conference Chair

1:45 PM - 3:15 PM

ROUNDTABLE

Industry Executive Roundtable

PARTICIPANT

Eric Giler
Chief Executive Officer
WiTricity

Eric Giler is the Chief Executive Officer of WiTricity Corporation of Watertown, Massachusetts. WiTricity Corp. was founded in 2007 to commercialize an exciting new technology for wireless electricity invented two years earlier at the Massachusetts Institute of Technology (MIT).

Prior to WiTricity, he was the Chairman and Chief Executive Officer of Groove Mobile, the world's leading mobile music service from 2006 until its acquisition by LiveWire Mobile in early 2008. Mr. Giler was the founder and served as the Chief Executive Officer and President of Brooktrout Inc., a leading supplier of advanced hardware and software products for system vendors and service providers in the electronic messaging market, from 1984 until its acquisition by EAS Group, Inc. in 2005. Under his leadership, Brooktrout grew to over $150M in annual revenue, and had a successful IPO in 1992.

Mr. Giler serves on the boards of directors of Soundbite Communications in Bedford, Massachusetts and Muse Research in Menlo Park, California. In addition, he serves as a Trustee of the Massachusetts Technology Leadership Council, is on the President's Advisory Council for Berklee College of Music, and is a Corporation Member of Partners HealthCare. He is the author of eight patents and holds a BS from Carnegie-Mellon University and an MBA from the Harvard Business School.

PARTICIPANT

John Inglish

Chief Executive Officer

Utah Transit Authority

John Inglish has worked in the transportation industry for more than 35 years. With an engineering background, Mr. Inglish began his career in 1970 as a systems planning engineer for the Utah State Highway Department. In the early 70's he began working for the Wasatch Front Regional council on the early initiatives that formed today's UTA. In 1977 he became the director of Transit Development, later Director of Operations and then the Assistant General Manager for UTA. In August 1997, the Utah Transit Authority (UTA) Board of Trustees appointed John Inglish as the General Manager for the Authority and in May 2010, he was appointed Chief Executive Officer.

Under his leadership, UTA has garnered national and worldwide recognition for its transportation systems. Accomplishments during his tenure as UTA general manager include funding and construction of more than $4 billion in rail infrastructure and oversight of the negotiation for and purchase of the largest railroad corridor land acquisition by a transit agency in the United States.

Mr. Inglish sits on the Board of Governors for the Salt Lake Chamber of Commerce and has chaired many committees for the American Public Transportation Association, including a 3 year term on the Executive Board of Directors. He is a member of the board of directors of the University of Denver Intermobal Transportation Institute and the executive board of the Intelligent Transportation Society of America (ITSA).

PARTICIPANT

A. Richard Walje

President and Chief Executive Officer

Rocky Mountain Power

A. Richard Walje is president and chief executive officer of Rocky Mountain Power at PacifiCorp. He was appointed to this position in March 2006. Walje has executive management responsibility for the company's strategy, operations, community relations, regulatory affairs and customer service in Utah, Idaho and Wyoming.

Walje has worked in the electric utility industry since 1972, starting as a journeyman lineman. As an electrical engineer, he worked for General Electric's power engineering business and focused on high-voltage equipment applications. During that time he was a member of IEEE's Power Engineering Society. Walje joined Utah Power & Light in 1984 as a substation design and applications engineer.

With PacifiCorp, he has held senior management positions in transmission and distribution network operations, community relations, customer services and information technology. In 2000, Walje was named Scottish Power's chief information officer.

Walje currently serves on the Wyoming Business Council Board of Directors, the University of Utah's Business School National Advisory Committee, the University of Wyoming Art Museum Advisory Board, the Utah Sports Commission Board of Directors, and is Chairman of the Economic Development Corporation of Utah. He is Chairman of the PacifiCorp/Rocky Mountain Power Foundation Board of Directors.

Walje received a Bachelor of Science degree in electrical engineering in 1984 and a Masters of Business Administration degree in 1991, both from the University of Utah. He is a member of the Tau Beta Pi and Eta Kappa Nu honor societies and was ecognized as an outstanding alumnus of the University of Utah's electrical and computer engineering school in 2008.

PARTICIPANT

Brian Wynne
President
Electric Drive Transportation Association (EDTA)

Brian Wynne was appointed President of the Electric Drive Transportation Association (EDTA) in April 2004. He acts as chief staff executive of this member-based international organization, which promotes battery, hybrid, plugin and fuel cell vehicles and infrastructure.

Mr. Wynne brings in-depth experience in transportation and technology applications gained in leadership roles with trade associations and public-private partnerships. He has previously served as Senior Vice President for business and trade at the Intelligent Transportation Society of America. Prior to that role, he led a global technology association as CEO of AIM International, Inc. Mr. Wynne started his career as a legislative assistant to US Senator Charles Percy and has served on several not-for-profit Boards.

Currently, Mr. Wynne serves on the US Department of Energy's Electricity Advisory Committee, as a key representative for the electric drive industry. He also serves as President of the World Electric Vehicle Association (WEVA), an international organization launched in 1990 with the objective of promoting the research, development and dissemination of electric vehicles on a global scale.

He holds a Bachelor's degree from the University of Scranton and a Master's degree from the School of Advanced International Studies, Johns Hopkins University. Mr. Wynne was also a Fulbright Scholar at the University of Cologne in Germany.

3:15 PM | Exhibit & Networking Break

4:00 PM - 5:30 PM

ROUNDTABLE

R&D Laboratory Executive Roundtable

PARTICPANT

Dale Gardner
Associate Director for Renewable Fuels & Vehicle Systems
National Renewable Energy Laboratory (NREL)

As the Associate Director for Renewable Fuels & Vehicle Systems at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, USA, Mr. Gardner oversees the applied research and development activities for biofuels, fuel cells and hydrogen, and advanced transportation technologies within the Laboratory. These efforts support national energy initiatives conducted by NREL's National Bioenergy Center, the Hydrogen Technology and Systems Center, and the Center for Transportation Technologies and Systems, respectively. He is also the Co-chairperson of the Member Governance Board for the National Advanced Biofuels Consortium. During his first two years at NREL Gardner served as the laboratory's Associate Director for Systems Integration.

Previously he was with TRW Inc and Northrop Grumman Corporation in Colorado Springs, the National Aeronautics and Space Administration (NASA) at the Johnson Space Center in Houston Texas, and the U.S. Navy. He has a B.S. degree in Engineering Physics from the University of Illinois, Champaign/Urbana, Illinois, USA.

PARTICIPANT

Douglas K. Lemon
President
Utah State University Research Foundation

Since May 2010, Dr. Douglas K. Lemon has been the president of the Utah State University Research Foundation (USURF). He is also currently serving as the interim director of USURF's Energy Dynamics Laboratory (EDL). Dr. Lemon joined USURF in 2008 as director of the Space Dynamics Laboratory (SDL) and later served as USURF executive vice president and director of laboratories.

Prior to joining USURF, Dr. Lemon served for over 30 years as a scientist, program manager, and senior executive with Pacific Northwest National Laboratory (PNNL). Dr. Lemon has led the development of next-generation, high technology solutions for clients in space, aerospace, intelligence, national defense and homeland security. His technical and programmatic work has focused on advanced methods and applications of satellite and aerial image processing, ultrasonic measurements, and other advanced electronic systems.

Dr. Lemon holds a Bachelor of Science and Ph.D. in Physics, both from Utah State University.

PARTICIPANT

Thomas E. Mason
Director
Oak Ridge National Laboratory (ORNL)
President and Chief Executive Officer
UT-Battelle, LLC

Thomas Mason graduated from Dalhousie University in Halifax, Nova Scotia, with a BS in physics and completed his postgraduate study at McMaster University in Hamilton, Ontario, Canada, receiving PhD in experimental condensed matter physics.

He held a postdoctoral fellowship at AT&T Bell Laboratories, then became a Senior Scientist at Risø National Laboratory, Denmark. In 1993 he joined the faculty of the University of Toronto. Dr. Mason joined Oak Ridge National Laboratory (ORNL) in 1998 as Scientific Director for the Department of Energy's Spallation Neutron Source (SNS) project. In April 2001 he was named Associate Laboratory Director for SNS and Vice President of UT-Battelle, LLC, which manages ORNL for the DOE. In 2006 he became Associate Laboratory Director for Neutron Sciences and in 2007 was named Director of ORNL and President and CEO of UT-Battelle.

He has received an Alfred P. Sloan Foundation Research Fellowship and has been named a Fellow of the American Association for the Advancement of Science, the American Physical Society, and the Neutron Scattering Society of America. He received the Distinguished Alumni Award for the Sciences from McMaster University in 2008 and the degree of Doctor of Laws, honoris causa, from Dalhousie University in May 2011.

PARTICIPANT

Anthony J. "Tony" Tether
President and Chief Executive Officer
The Sequoia Group (TSG)
Former Director
Defense Advanced Research Projects Agency (DARPA)

Dr. Anthony J. Tether was Director of the Defense Advanced Research Projects Agency (DARPA) from 2001 to his retirement in 2009. As Director, Dr. Tether was responsible for management of the Agency's projects for high-payoff, innovative research and development. In 2009, Dr. Tether re-formed The Sequoia Group (TSG), which serves government and industrial clients by providing program management and strategy development services. He is also a Distinguished Fellow with the Council on Competitiveness located in Washington DC.

In addition to serving industry in a variety of leadership positions, he has held numerous posts in the Department of Defense, serving as Director of DARPA's Strategic Technology Office and as Director National Intelligence in the Office of the Secretary of Defense. Dr. Tether has served on Army, Navy and Defense Science Boards, and on the Office of National Drug Control Policy Research and Development Committee. In 1986, Director of Central Intelligence Bill Casey and the Secretary of Defense Casper Weinberger honored him with the National Intelligence Medal and the Department of Defense Civilian Meritorious Service Medal respectively. In 2009, Secretary of Defense Robert Gates honored him with the Department of Defense Outstanding Public Service Medal.

Dr. Tether received his BS in Electrical Engineering from Rensselaer Polytechnic Institute, and his MS and Ph.D. in Electrical Engineering from Stanford University.

5:30 PM | Conference sessions end for the day

6:30 PM - 8:30 PM

EVENING SOCIAL

Thursday, February 16, 2012

Swaner EcoCenter

JOIN US
FOR GREAT FOOD & COOL DRINKS
IN A GREEN VENUE!

Gather at the Swaner EcoCenter, one of Park City's community treasures. The EcoCenter, a LEED Platinum building, is a powerful expression of our relationship to the environment. Two-story walls of glass overlook an expansive meadow while exhibits depicting nature's beauty create the perfect backdrop for a truly unique setting. Enjoy the peaceful sounds of the 1,200 acre preserve from spacious decks or spot wildlife from a four-story observation tower.

Catering provided by:

CULINARY CRAFTS

7:30 AM - 8:15 AM Continental Breakfast

8:00 AM Conference Announcements

8:05 AM - 10:10 AM

WIRELESS POWER TRANSFER & VEHICLE INTEGRATION SESSION

State of the art advances in wireless power transfer will be discussed, including component- and system-level performance and efficiency, alignment and gap tolerances, vehicle integration, and new concepts for both stationary and in-motion applications.

Session Chair
Laura Marlino
Oak Ridge National Laboratory

8:05 AM
Inductive Power Transfer:
From the Laboratory to the Reality
Oliver Hirsch, Gilles Hernandez
Conductix-Wampfler AG, Delachaux Group

Abstract: Charging electric vehicles using plugs and cables will become quite a challenge very soon. Indeed the charging infrastructure will become a disturbance in public areas and alongside the streets. The way to come around it is currently being paved: inductive power transfer (IPT®) is coming out of the lab, making the plug-in charging obsolete very soon.

This technology needs demonstration to convince. Therefore full functional demonstration vehicles are on the road to gather experience.

Transfer enough energy through an air gap to charge EVs is proven in the lab but in order to use this technology in a public environment, several requirements have to be taken into account. The most important are safety, efficiency and user friendliness. Beside these, the integration into EVs and public infrastructure has to be addressed as well. We will describe these requirements in detail and explain how simulations did settle the basis for creating functional prototypes. Before putting these prototypes into EVs, test bench measurements have been done to validate the main parameters, e.g. EMC compatibility, power transfer efficiency. The integration into the mechanical and electrical architecture of the vehicles has been investigated as well and solid solutions have been worked out.

8:30 AM
ORNL's In-motion WPT System
John Miller
Oak Ridge National Laboratory

Abstract: Wireless power transfer (WPT) as a convenient, safe and autonomous means for plug-in electric vehicle (PEV) charging has seen rapid growth in recent years for stationary applications. In the 1990's there were isolated cases of inductive charging and other non-contacting means proposed, but it wasn't until the mid-2000's when DOE took interest and then in 2008 investigated evanescent wave power transfer that private industry escalated their efforts. Oak Ridge National Laboratory (ORNL) is now expanding its efforts into charging of in-motion electrified vehicles. This paper summarizes some of ORNL's recent activities in WPT charging of in-motion PEV's. Laboratory experimental results are presented that highlight the wireless transfer of power to a moving receiver coil as it passes a pair of transmit coils.

8:55 AM
System Level Considerations for Integration of Resonant Capacitors in High Power Wireless Charging
T. Von Kampen, M. A. Brubaker, H. C. Kirbie, T. A. Hosking
SBE, Inc.

Abstract: Mass adoption of electric vehicle technology is highly dependent upon ease of recharging at the consumer level. Various strategies including battery swapping, improved battery efficiency, and wireless charging have emerged to address this issue. In the context of wireless charging, implementation options range from local hotspots in the user's garage and public parking areas to energized roads. While a great deal of attention has been focused on the coupling coils and drive circuitry for wireless charging, the resonating capacitors are equally important components and must be carefully considered. Typical resonant frequencies range from 10 kHz to over 150 kHz which can be supported by both film and ceramic capacitor technology. However, there are significant compromises between cost and performance that remain to be clearly defined. Furthermore, capacitor performance can be significantly impacted by the hostile operating environment, which will include heating from stray magnetic fields and high-temperature coil components. An investigation of optimized hybrid film/coil capacitors

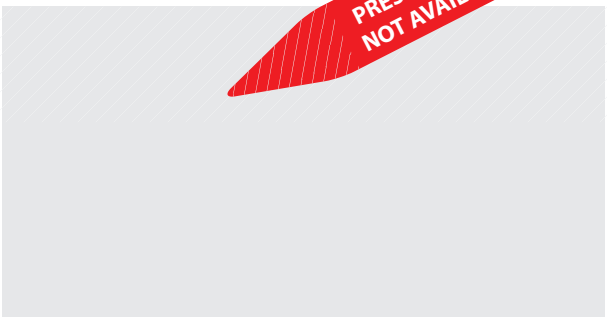
has been undertaken to define the frequency and voltage operating regime where stability, cost, and graceful aging can balance dissipation losses. Test results for polypropylene film capacitors in a coupled coil resonant circuit are presented along with discussion of system level implementation.

9:20 AM

Integration of Wireless Charger and On-board Charger for EV/PEV

Charles Zhu

Delta Products Corporation



9:45 AM

Wireless Charging of Electric Shuttle Buses

Ron Bailey

University of Tennessee at Chattanooga

Abstract: The Center for Energy, Transportation and the Environment at the University of Tennessee at Chattanooga, with support from the Federal Transit Administration under Cooperative Agreement TN-26-7034, has developed a demonstration of wireless charging for electric shuttle buses using Inductive Power Transfer (IPT) technology provided by Conductix Wampfler. The system includes a 60 kW track supply that provides power at 20 kHz to a coil embedded in the roadway. The power is transferred to the bus through an air gap to a pick up coils mounted on a mechanism under the bus that drops the coil into position 40 mm above the embedded coil. The demonstration is set up at the Advanced Vehicle Test Facility that includes a one mile track that was purpose build for testing electric vehicles. For purposes of this demonstration, the test protocol consists of three laps around the track with three stops each lap to emulate CARTA's down town circulator route. At the end of each three mile trip, the bus pauses for a three minute charge during the time that passengers would normally be boarding the bus. This short "opportunity" charge provides enough traction energy to power the bus for approximately three miles, thereby eliminating the normal range constraint that, until now, has required battery swapping during the day to cover the required distance, which for CARTA is approximately 100 miles. Overall efficiency from the grid to the vehicle has been demonstrated to be more than 90%, resulting in an energy cost per mile of less than $.10 while producing zero tailpipe emissions. Measurements of electromagnetic field strength at the edge of the coils near street level and at all locations inside the bus have been below 0.2 µT, well below recommended exposure levels. This presentation will provide an overview of system components and power electronics that have been integrated on the bus to manage the wireless charging and communicate with the stationary components.

10:10 AM - 10:40 AM Exhibit and Networking Refreshment Break

10:40 AM - 11:30 AM

WIRELESS POWER TRANSFER & VEHICLE INTEGRATION SESSION *(Continued)*

10:40 AM

A 90 Percent Efficient 5kW Stationary Inductive Charging System for EVs

Hunter Wu, Aaron Gilchrist, Ky Sealy, Dan Bronson, Paul Israelsen, Jeff Muhs

USU/Energy Dynamics Laboratory

Abstract: This paper presents the design of a high efficiency 5kW inductive charging system for electric vehicles (EVs). High efficiency above 90% is maintained from grid to battery over a wide range of coupling conditions at full load. Experimental measurements show that the magnetic field strength meets the stringent International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for human safety.
In addition, a new dual side control scheme is proposed to optimize system level efficiency. Experimental validation showed that a 7% efficiency increase and a 25% reduction in loss under light load conditions are achievable. The authors believe this paper is the first of its kind to show that such high efficiency operation is feasible at level 2 inductive charging system and really reduces its the comparative disadvantages against plug-in charging systems.

The stationary inductive charging system uses a front end rectification and power factor correction (PFC) stage, an LCL converter stage, and a secondary boost controller system. The two WPT pads are represented as L1 and L2. The primary LCL converter takes the DC input voltage and transforms it into high frequency AC current through L1. The H-bridge and the LCL network operates at 20kHz.

The two WPT pads are loosely coupled by mutual inductance M, which will induce a voltage in the secondary pad L2. A parallel tuning circuit is used to increase the output power and a rectifier is then used to convert this to DC. A decoupling/boost controller topology is used to control power flow in the system and regulate the output voltage to around 300V. The desired charging characteristics for a wide range of battery chemistries can also be easily implemented.

11:05 AM

An Analysis of Inductive Coupled Power Transfer Technology Supported by Connected Vehicle and Infrastructure Systems

Yiming He, Mashrur Chowdhury,
Andre Lorico, Joachim Taiber
Clemson University International Center for Automotive Research

Abstract: While electric vehicle (EV) technology becomes a viable alternative to Internal Combustion Engine vehicles, several challenges are still affecting the wide consumer acceptance of EVs. Increasing EV's driving range and the associated added cost and mass represent a main challenge, as the battery pack cost often accounts for over one half of the vehicle cost, which leads to a coupled trade-off between vehicle's range, cost and mass. Inductively Coupled Power Transfer (ICPT) is being proposed and analyzed in this paper as a potential solution and a decoupling method for the vehicle range-cost relationships as the current battery technology suffers from the constraints of providing sufficient capacity with reasonable size and desirable cost.

The focus of this paper is to study the impact of ICPT on EV operations. This paper utilizes a simulated highway network with EV and ICPT, connected vehicle and the corresponding infrastructure systems. This study evaluates (1) comparative benefits and costs of ICPT with other EV charging options, (2) real world implementation issues of ICPT, and (3) efficacies of a connected EV and infrastructure systems in supporting EV charging through ICPT.

11:30 PM - 12:15 PM

KEYNOTE

U.S. Department of Energy Keynote Address

David L. Anderson
Technology Development Manager
Vehicle Technologies Program
Office of Energy Efficiency and Renewable Energy

David Anderson is a Technology Development Manager for the U.S. Department of Energy's Vehicle Technologies Program. As a member of the Vehicle and Systems Simulation and Testing team, he is responsible for managing DOE's vehicle modeling and simulation efforts, as well as vehicle component and systems evaluation activities. In addition, his team conducts DOE's Advanced Vehicle Testing Activity, supports the development of grid-connected vehicle codes and standards, and researches mechanisms to reduce parasitic loads in both conventional and electric-drive vehicles. David's team also has responsibility for DOE's $400 million Transportation Electrification initiative – the largest deployment of electric-drive vehicles and support infrastructure ever undertaken in the U.S. – funded through the American Recovery and Reinvestment Act.

David received his Bachelor of Science degree in Computer Engineering from Clemson University in 1994, and worked as a design engineer in the semiconductor industry for thirteen years, earning three patents related to his design work. He returned to academia in 2007 to earn a Master of Environmental Management degree from Duke University, where he conducted research into the advanced automotive battery industry, and has worked with DOE's Vehicle Technologies Program since 2009.

12:15 PM - 1:15 PM | Lunch provided - located at the Swaner EcoCenter

1:20 PM - 2:05 PM

KEYNOTE

U.S. Department of Transportation K[illegible]ess

PRESENTATION NOT AVAILABLE

Kevin Womack

Associate Administrator

Office of Research, Development and Technology

[illegible]5, 2011 Dr. Womack began his tenure as the Associate Administrator for Research, Development and Technology within the U.S. Department of Transportation. Prior to accepting this position he was a Professor of Civil Engineering and Director of the Utah Transportation Center at Utah State University, where he began work in 1989. Also while at Utah State University he served in the university's central administration as an Associate Vice-President for Business and Finance.

Dr. Womack received his Bachelor of Science degree (1980) and Ph.D. degree (1989, civil engineering) from Oregon State University, with a Masters degree in civil engineering from the University of Pennsylvania (1985).

Outside of academia Dr. Womack served as an AAAS Congressional Fellow, with sponsorship by the American Society of Civil Engineers, in 2001-2002. He worked for Senators James Jeffords and Harry Reid as majority staff (Democrats) on the Senate Environment and Public Works (EPW) Committee. His primary responsibility for EPW was to draft the research title of the Senate version of the surface transportation authorization bill known as SAFETEA.

Dr. Womack recently completed his term as one of two At-Large Directors for the American Society of Civil Engineers (ASCE). His term as an At-Large Director ran from October, 2009 to October of 2011. He was elected a Fellow in the American Society of Civil Engineers in April of 2010.

Dr. Womack's past activities include a six year term on the ASCE National Transportation Policy Committee (3 years as chair, ended in November 2008); service as the ASCE Student Chapter advisor for Utah State University for seven years (1989-1996); and a six year term on the National Academies Research and Technology Coordinating Committee (advisory to the FHWA).

Dr. Womack is a registered professional engineer in the State of Oregon.

2:05 PM - 2:25 PM | Refreshment Break

2:25 PM - 4:35 PM

BROADER DEPLOYMENT CONSIDERATIONS SESSION

Deployment considerations to be discussed include estimating the life-cycle costs and benefits of roadway electrification as well as determining optimal operational approaches, including synergies with automation technologies. Studies provide a good basis for defining a sensible deployment staging strategy that is technically, economically, and politically supportable.

2:30 PM

Preparing the Electrical Infrastructure Workforce for a Wireless Power Transfer Future

Bernie Kotlier, Co-chair

Electric Vehicle Infrastructure Training Program

Abstract: Are electrical contractors and electricians ready to install wireless power transfer (WPT) equipment and infrastructure? Do they even know what it is?

The Electric Vehicle Infrastructure Training Program (EVITP) is developing the training curriculum and certification standards that will facilitate the installation and maintenance of WPT stations from pilot projects to the mainstream networks of the future.

EVITP is a non-profit, volunteer, electric vehicle industry collaborative that trains and certifies electricians to safely and effectively install all types of electric vehicle supply equipment (EVSE). More than 150 EVITP instructors have thus far trained and certified approximately 1,000 U.S. electricians in conventional EVSE infrastructure.

After providing an introduction to the organization, its mission, and its members, EVITP's co-chair will present the EVITP roadmap for developing WPT infrastructure curriculum and training. Based on EVITP's participatory structure, Mr. Kotlier will explain how industry organizations - including CERV participants - will have an opportunity to contribute training and standards content material.

2:55 PM

Electric Road Systems

Mats Alaküla, Jan Hellåker, Staffan Lundgren, Niklas Thulin

AB Volvo

Abstract: For environmental and supply reasons it is urgent

to transfer road transportation from fossil energy to renewable. It is not realistic to expect bio fuels to have a capacity to replace more than a fraction of the current and future needs of energy supply for road transport. Thus other energy forms, like hydro-, wind-, wave-, solar-, and maybe even fission/fusion will be important sources of propulsion energy. These generate to electricity and the main drawback is the need for batteries on board the vehicles. For short distance transportation battery operated vehicles are and will be important but for long distance the requirement on battery weight as well as the charging requirements makes this alternative almost impossible. A 40 ton Long Haul Truck would running 1000 km a day would need about 20 tons of batteries with today's technology. If it should be charged in 1/10'th of the time it is driving it would need a charging connection in the MW-range.

A realistic option is Electric Road Systems (ERS), roads that are able to transfer electric energy to the vehicle while it is moving. Several such systems are currently emerging, both in a traditional form as trolley systems, and in newer implementations in the road surface underneath the vehicle. The later ones exist both as inductive (like Bombardier's Primove or Kaist's OLEV) and conductive (like Ansaldo's TramWave or Alstom's APS).

There are several reasons to be positive to solutions operating from underneath the vehicle. The main argument is that such systems can be used by both heavy and light vehicles. It is sometimes stated that light vehicles/cars could run mainly on Plug In and would not benefit much from ERS. In this paper it will be motivated that the societal value of ERS technologies that can be used by light traffic is huge and gives a strong preference for such solutions. The visual impact of such systems is also much better than that of trolley lines.

In the paper, a case study from a Swedish and European perspective is presented. The assumption is that all European and National roads are covered with ERS. Technology, cost, safety and business structures are discussed, as well as the technological impact on vehicle production. The analysis presented has a societal and national perspective including a prediction of development time.

3:20 PM

Evaluation of the Costs, Benefits, and Feasibility of Electric Roadway Technologies and Travel Scenarios

Matthew Earleywine, Jeff Gonder, Aaron Brooker
National Renewable Energy Laboratory

Abstract: Despite the recent introduction of the Nissan Leaf and the Chevy Volt, electric vehicles (EVs) and Plug-in Hybrid Electric Vehicles (PHEVs) still have many obstacles to overcome before they can achieve high market penetration and begin to replace the vast majority of conventional vehicles (CVs). The main obstacles facing EVs and PHEVs are the high upfront vehicle costs, limited electric range, and long recharge times. The energy storage systems required for such vehicles are large, heavy, and expensive, and greatly contributes to the high upfront vehicle costs. These same factors also contribute to limited electric ranges as the size of the battery packs are limited to maintain a reasonable weight, volume, and cost. In addition, these large battery packs take several hours to recharge from a typical wall outlet, while fuel tanks can be refilled in only a few minutes. Fast chargers are available that could recharge vehicles in about 20 minutes, but that is still longer than it takes to refill a tank of gas, and frequent fast charging can impact battery life. These factors limit the market acceptance and widespread penetration of EVs and PHEVs despite their environmental benefits and lower energy cost per mile. One potential solution to eliminating these problems is an electric roadway that could provide power to the vehicle while it is driving. If an electric roadway were to be installed along just a small fraction of heavily traveled roadways, it could accommodate the vast majority of overall vehicle miles traveled. Such a system would allow for reduced battery sizes while extending driving range, making EVs and PHEVs more desirable and marketable to consumers.

There are several possible options to implementing an electric roadway. This study will evaluate a variety of scenarios and electric roadway technologies. Each technology will be evaluated on its petroleum displacement, power and energy requirements, automation potential, ease of implementation, travel times, aesthetics, and safety for different congestion, time of day, and travel scenarios. Electrical infrastructure requirements such as additional substations, power lines, and the potential for distributed and/or renewable power generation will also be evaluated. Electric roadway technologies could also be implemented to charge the vehicles when they are parked at stoplights, in parking lots, or even at home. Using these technologies to charge the vehicle while parked could help transition to and/or supplement an electric roadway system that powers vehicles while in motion. The independent benefits of these stationary charging systems will be evaluated as well. This evaluation of technologies will provide insights that could lay the foundation for the development of future plans to rollout and implement an electric roadway.

3:45 PM

Production Processes for Electrified Roads (E|ROAD) *on Their Way to the Market*

Florian Risch, Joerg Franke

Institute for Manufacturing Automation & Production Systems, University Erlangen-Nuremberg, Germany

Abstract: A large-scale market introduction of electric powered vehicles is still being opposed by many barriers. Wireless power transfer systems are not only resistant to manipulation and vandalism; they also offer an increased charging convenience. Hence, they have the potential of becoming the key market driver for electric vehicles. In addition, the vehicles can be supplied with power while moving on roadways. With minimal energy storage, the problem of battery-caused range restriction can thereby be eliminated. This can support the widespread introduction of electric vehicles and lead to emission-free mobility with a reduced dependence on battery systems. To realize the vision of mobility concepts of wireless power transfer systems and electrified roads, a wide range of stakeholders from different industry sectors and disciplines need to work together, willing to share and broaden their knowledge. The strong coordination of the necessary sub-activities is of particular relevance, especially as a rapid and powerful implementation of the concepts can only be successful with the prospect of attractive business models for all players and a constant effort to reduce costs of the vehicle and infrastructure components. Therefore, the aim of this presentation is to illustrate the market potentials of the most attractive fields of application and opportunities through cost-efficient production processes for vehicle and infrastructure components in strong production networks.

4:10 PM

Synergy Between Roadway Electrification and Automation

Steven Shladover

University of California, Berkeley

Abstract: Both roadway electrification and vehicle automation technologies depend on close cooperation between vehicles and the roadway infrastructure.

Although the equipped vehicles would be capable of driving conventionally on any roads, they would gain specific benefits only when driven on suitably equipped roads. Gaining these benefits will require modifications to both the vehicles and to the roadway infrastructure, which will depend on significant and coordinated up-front investments of resources. There are real advantages to investing the intellectual and political capital needed to develop these cooperative systems together rather than trying to do them separately. Electrification can improve the environmental and energy implications of automation and automation can improve the efficiency and reduce the stray emissions from the electrification systems, so that each system will gain from being implemented in coordination with the other. One new roadway infrastructure will be needed and one new generation of advanced road vehicles could incorporate both technologies to bring the road transportation system firmly into the 21st century.

4:35 PM - 5:25 PM

CODES & STANDARDS SPOTLIGHT

Issues related to meeting existing codes and standards in such areas as:

- Technologies and components embedded in roadways
- Wireless communication protocols and control systems
- New wireless power transfer standards being developed such as SAE J2954 will be discussed

4:40 PM

An Update on SAE J2954 - Standards on Wireless Charging For Electric Vehicles

Jesse Schneider, Chair

SAE Wireless Charging and Alignment Taskforce

Abstract: Status and goals for adopting standards for wireless charging of electric vehicles are reviewed and presented. Additional public information on work being done throughout the world is presented.

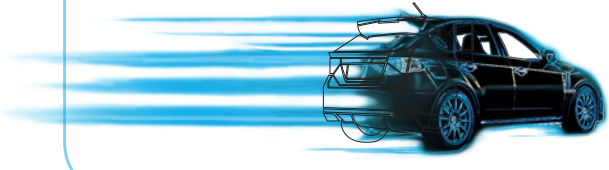
5:30 PM | Conference Conclusion

CERV

CERV

Conference Committee

Jeff Muhs, Conference Chair
Laura Marlino, Technical Content
Joerg Franke, Technical Content
Karen Wolfe, Sponsorships
Stephanie Halton, Conference Administrator



WWW.CERVCONFERENCE.ORG