

2013 CERV

CONFERENCE₂
ELECTRIC
ROADS & VEHICLES

ONSITE PROGRAM

ENERGIZING
DRIVING
IDEAS
PARTNERSHIPS

FEBRUARY 4-5, 2013

NEWPARK RESORT & HOTEL

PARK CITY, UTAH, USA

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We gratefully acknowledge the following sponsors for their contributions to the Conference on Electric Roads & Vehicles. This program is possible due to the support and generosity of these organizations. Please take a moment during the Conference to personally thank our sponsors.

CONFERENCE

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WELCOME

Welcome to our second 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.

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CONFERENCE
SCHEDULE AT-A-GLANCE*

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

MONDAY

FEBRUARY 4, 2013

- 7:30 AM – 5:00 PM** Registration Open
- 8:00 AM – 9:30 AM** **Pre-conference Tutorial**
“An Introduction to Wireless Power Transfer: Past, Present & Future Directions”
- 10:00 AM** Conference Introduction & Welcome
- 10:30 AM – 11:45 AM** **Roundtable: Insights from Industry Executives**
- 11:45 AM – 1:15 PM** **Lunch Provided**
- 1:15 PM – 2:30 PM** **Roundtable: Wireless Charging & EV Public Policy: A Look into the Future**
- 2:30 PM – 3:00 PM** Refreshment Break
- 3:00 PM – 4:15 PM** **Roundtable: Issues & Challenges of Infrastructure Integration**
- 4:15 PM – 4:30 PM** Break
- 4:30 PM – 5:45 PM** **Roundtable: Synergies between Electric Roads & Vehicle Automation**
- 5:45 PM** Conference Sessions End
- 6:30 PM – 8:30 PM** **Evening Social** - Swaner EcoCenter

TUESDAY

FEBRUARY 5, 2013

- 7:30 AM – 8:15 AM** Continental Breakfast
- 8:00 AM** Conference Announcements
- 8:15 AM – 9:15 AM** **Keynote Address: Inductive Charging of Electric Vehicles: A European Perspective**
- 9:15 AM – 9:20 AM** Break
- 9:20 AM – 9:55 AM** **SPOTLIGHT Presentation: Opportunities & Challenges in Public Transit Applications**
- 9:55 AM – 10:30 AM** Networking Break
- 10:30 AM – 11:55 AM** **Recent Advances Session**
- 12:00 PM – 1:15 PM** **Lunch Provided**
- 1:20 PM – 2:35 PM** **Roundtable: Emerging International Standards**
- 2:35 PM – 2:45 PM** Break
- 2:45 PM – 4:10 PM** **Broader Deployment Considerations Session**
- 4:10 PM – 4:25 PM** Beverage Break
- 4:25 PM – 5:30 PM** **SPOTLIGHT Session: Research Interests of the U.S. Department of Energy**
- 5:35 pm** Conference Conclusion

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

NOTICE

CONFERENCE PRESENTERS

Speakers must deliver their presentation to be uploaded to the server on or before 3 PM on Monday, February 4.

TUESDAY SPEAKERS & SESSION CHAIRS are required to attend an audiovisual meeting on Tuesday from 7:30 AM – 7:55 AM in the Conference Center.

EXHIBIT INFORMATION

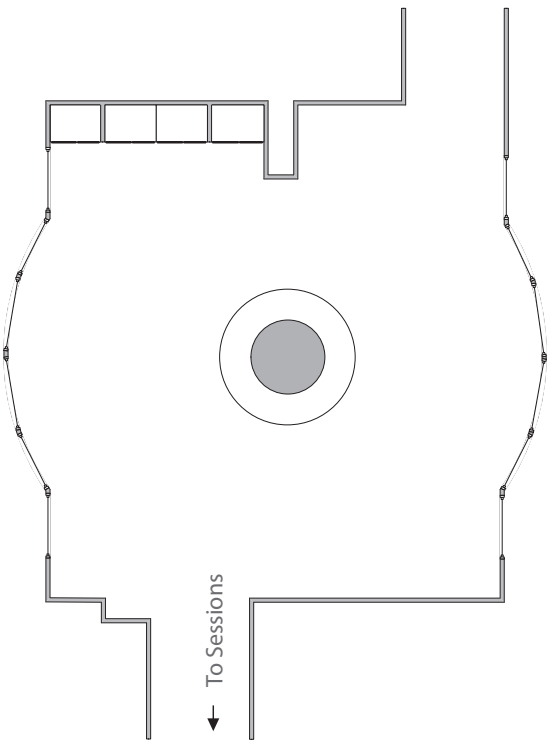
Exhibit Hours

MONDAY, FEBRUARY 4, 2013

7:30 AM – 12:30 PM Check-in/Set-up
1:00 PM – 5:30 PM Show Open

TUESDAY, FEBRUARY 5, 2013

8:30 AM – 3:00 PM Show Open
3:00 PM – 5:00 PM Take Down



EXHIBITOR DESCRIPTIONS



CONFERENCE AGENDA
FEBRUARY 4
MONDAY

7:30 AM – 5:00 PM

Registration Open

8:00 AM – 9:30 AM

PRE-CONFERENCE
TUTORIAL

An Introduction to Wireless Power Transfer:
Past, Present & Future Directions

This tutorial will provide useful background information to those new to the field of Wireless Power Transfer. The overview will include:

- A] Background of inductive systems, understanding of why resonance and options for tuning, common magnetic topologies for stationary and compatibility with dynamic charging
- B] Aspects of both stationary and roadway multiphase systems with examples of commercial developments

PRESENTER

Grant Covic
University of Auckland

PRESENTER

Jürgen Meins
Technical University in Braunschweig

10:00 AM

Conference Welcome
Cody Stewart
*Governor's Energy Advisor,
State of Utah*

10:15 AM

Conference Introduction & Overview
Jeff Muhs
Conference Chair

10:30 AM - 11:45 AM

ROUNDTABLE
Insights from Industry Executives

MODERATOR

Jeff Edwards
President & CEO
Economic Development
Corporation of Utah



PANELIST

Rebecca Hough
CEO & Co-Founder
Evatran

PANELIST

John English
Director
WAVE
Former CEO
Utah Transit Authority



PANELIST

David Schatz
Vice President
WiTricity Corporation

1:15 PM – 2:30 PM

ROUNDTABLE



Wireless Charging & EV Public Policy:
A Look into the Future



MODERATOR

Brian Wynne
President
Electric Drive Transportation Association
(EDTA)

11:45 am – 1:15 pm

LUNCH

Provided at the Swaner EcoCenter



PANELIST

Janet Kavinoky

Executive Director

**Transportation & Infrastructure, U.S.
Chamber of Commerce**

Vice President

**Americans for Transportation Mobility
Coalition**

PANELIST

Joshua Schank

President & CEO

Eno Center for Transportation



PANELIST

Lee Slezak
Manager, Vehicle Systems, Vehicle Technologies Program
U.S. Department of Energy

2:30 PM – 3:00 PM

Networking Break

3:00 PM – 4:15 PM

ROUNDTABLE

Issues & Challenges of Infrastructure Integration



MODERATOR

Kevin Womack
Associate Administrator for Research, Development & Technology
U.S. Department of Transportation

PANELIST

Terry Bergan
President & CEO
(IRD) International Road Dynamics Inc.

PANELIST

Andrew Daga
Founder & CEO
Momentum Dynamics Corporation

PANELIST

Carlos Braceras
Deputy Director
Utah Department of Transportation

4:15 PM – 4:30 PM

Break

4:30 PM – 5:45 PM

ROUNDTABLE

Synergies between Electric Roads & Vehicle Automation

MODERATOR

Steve Shladover

*Program Manager, Mobility at the
California PATH Program of the Institute of
Transportation Studies*
University of California, Berkeley

PANELIST

Chris Borroni-Bird

Vice President of Strategic Development
Qualcomm Technologies Inc.

PANELIST

Sven Beiker

Executive Director
**Center for Automotive Research at
Stanford – CARS**

PANELIST

Paul Schmitt
*Manager, North America New Technology,
Technology Strategy & Innovation,
Research & Development
Volvo Group Trucks Technology*

5:45 PM Conference sessions end for the day
(free time, hotel check-in, networking, etc.)

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



**EVENING
SOCIAL**

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:

MONDAY, FEBRUARY 4, 2013 | SWANER ECOCENTER
6:30 PM - 8:30 PM

FEBRUARY 5, 2013

TUESDAY

7:30 AM – 8:15 AM

Continental Breakfast

8:00 AM

Conference Announcements

8:15 AM – 9:15 AM

KEYNOTE

ADDRESS

*Inductive Charging of Electric Vehicles:
A European Perspective*

PRESENTER

Jérôme Perrin

Director & General Manager

**Mov'eoTec Foundation & VeDeCoM
Institute**

9:15 AM – 9:20 AM

Break

9:20 AM – 9:55 AM

SPOTLIGHT

PRESENTATION

Opportunities & Challenges in Public Transit Applications

PRESENTER

John Miles

ARUP/Royal Academy of Engineering

Professor of Transitional Energy Strategies

Cambridge University

9:55 AM – 10:30 AM

Networking Break

10:30 AM - 11:55 PM

RECENT ADVANCES SESSION

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

SESSION CHAIR

John Boys

Professor, Department of Electrical & Computer Engineering
University of Auckland

10:35 AM

Wireless EV Charging, Optimum Design Selection, Validation & Compliance for Public Trials

Grzegorz Ombach

Qualcomm

Abstract: Over the last decade understanding of environmental problems has grown. Car producers - OEMs strive to reduce fuel consumption and pollution. In order to fulfil these aims new technologies have been launched and rolled out like: Plugin Hybrids Vehicles (PHEV) and Electric Vehicles (EV). Most of the major car manufacturers have already PHEV and EV series design programs at various stages of development. Some models are already available for purchase, and more are slated for release in 2013. Gaining mass-market adoption of any new product, especially EV, brings new challenges. The main challenges discussed in many public forums and articles are: cost, comfort of use, range of EVs and infrastructure.

Qualcomm, as the world leader in next-generation mobile and wireless technologies, has a history of innovation in mobile technology and thus has experience in robust compliance and engineering evaluation requirements. Based on this broad experience, Qualcomm has developed technology which will support the early adoption of EVs. The technology is known as a resonant magnetic induction charging ^[1], also referred to as wireless EV charging (WEVC). It removes the need to charge-up by plugging-in, brings simplicity and ease-of-use for EV drivers, and opens up new charging and business model opportunities.

This presentation focuses on the demonstration of Qualcomm's WEVC complete solution which is used in a public trial. Following points will be discussed:

- General requirements for public trial
- Magnetic design

Reference

[1] T. Boys, G. A. Covic, IPT Fact Sheet Series: No. 1 – Basic Concepts, 2012

- Interoperability
- Parking tolerance for ease of use
- Foreign object detection, both metallic & living/moving
- Compliance of wireless EV as it moves towards mass adoption
- Public trial

10:55 AM

A Wireless Power Transfer System with Active Rectification on the Receiver Side

Omer Onar

Oak Ridge National Laboratory

Abstract: This paper proposes an active rectifier based wireless power transfer system for electric and plug-in hybrid electric vehicle charging applications. Conventionally, the receiver side of the wireless power transfer system consists of a receiver coil and a tuning capacitor, a diode bridge rectifier, a filtering capacitor, and the battery. The proposed topology in this study replaces the diode bridge rectifier with an active rectifier. The active rectifier can step-up and step-down the receiver coil voltage; therefore, provides improved efficiency on the high-frequency inverter. This is due to the fact that higher voltages can be applied on inverter input that results in reduced current on power electronic devices of the inverter. In addition, the possible need for a step-down or step-up DC/DC converter can be eliminated. Furthermore, active rectifier can provide faster switching than the diode-bridge rectifier; therefore, the size, volume, and cost of the passive components can be reduced on the battery side. Active rectification also provides flexibility for the overall control system; i.e., the battery charging power or the reference current or voltage to be applied on battery terminals can be effectively controlled. One other benefit of the active rectifier is that it can be utilized through the vehicle's onboard charger; therefore, the number of components added on the vehicle for wireless charging application can be reduced. Full paper submission will include the operating modes and principles of the active rectifier and will provide detailed operational waveforms. Control systems of the proposed topology will also be covered along with the results and discussions.

11:15 AM

Wireless Charging Of Electric Vehicles Using Highly-Resonant Wireless Power Transfer

Katie Hall

WiTricity Corporation

11:35 AM

Conductive Electric Road Systems – Experiences from a Full Scale Test

Paul Schmitt

AB Volvo

Abstract: A full transfer from fossil fueled combustion to renewable energy used in EV's will most likely never take place, if stationary charging of the EV's is the only energy transfer method and batteries the only on board energy storage. Either Charging Time or Range will be hampered by limitations in charging power and energy density. A continuous supply of energy while driving changes the game fundamentally. There are several technologies for this form of energy transfer, in particular inductive or conductive solutions, but even capacitive are conceivable. Several of these are in prototyping state or in early commercialization phase. This paper reports some experiences from a full scale, real road, conductive test track built with the same generic technology as Alstom is using in their APS-system for energy supply to trams. The APS-technology is slightly rebuilt and adapted to "rubber wheel vehicles" and installed in a test road. A heavy truck is equipped with a "pick up" able to connect to the road and conduct electric power (>1 MegaWatt) from the road to the truck electric drive train. The APS system is proven both safe and robust during more than 9 years and 11 million kilometers of Tram supply operation, but this is the first time that it is applied to conventional roads and vehicles. The concept will be described and some of the experiences shared in the presentation at CERV.

12:00 PM - 1:15 PM

LUNCH

Provided at the Swaner EcoCenter

1:20 PM – 2:35 PM

ROUNDTABLE

Emerging International Standards

MODERATOR

Jesse Schneider

SAE Charging & Alignment Taskforce Chair

BMW

PANELIST

Joe Bablo

Principal Engineer - Automotive Equipment & Associated Technologies, Product Safety

Underwriters Laboratories (UL), LLC

PANELIST

Mark Klerer

Senior Director of Technology

Qualcomm

2:35 PM – 2:45 PM

Break

2:45 PM – 4:10 PM

BROADER DEPLOYMENT

CONSIDERATIONS SESSION

Deployment considerations such as estimating the life-cycle costs and benefits of wireless power transfer and roadway electrification. Additional topics include determining optimal operational approaches, synergies with vehicle automation technologies, and defining sensible deployment staging strategies that are technically, economically, and politically supportable.

SESSION CHAIR

Katie Hall

Chief Technology Officer

WiTricity Corporation

2:50 PM

Structured Optimization of Inductive Power Transfer Systems from the Perspective of Production

Stefan Guenther

University of Erlangen-Nuremberg

Abstract: Despite all the concerns against inductive power transfer systems in charging applications for electric vehicles in the past, the technological definition of these systems is already very sophisticated by now. They are not only accepted as an alternative charging concept, but also as a more powerful solution than wired chargers due to the achievable benefits in comfort, vandalism-safety, and smart-grid abilities. Nevertheless, manufacturers face further challenges for the prospective mass production of inductive power transfer components, particularly in regard to:

- reliable and automated production processes,
- the specification of tolerances for dimensions, placing, and manufacturing,
- material characterization regarding the mechanical, electrical, and chemical performance of suitable substances.

As a result, no integrated concept for an automotive-suitable, industrialized process chain for the production of inductive power transfer systems exists. Both the components and the complete system offer optimization potentials regarding weight, costs, and manufacturability. Moreover, some process steps, such as the contacting and handling of high-frequency litz wires or the placing and fixation of ferrites, are not set up for partly and fully automated large scale production today. To meet these challenges, a holistic perspective is necessary to identify the interactions on material-, component- and system-level and to develop the distinguished potentials. Therefore, the Institute for Factory Automation and Production Systems (FAPS) at the Friedrich-Alexander-University Erlangen-Nuremberg develops test-routines to examine the influence of different materials, varying tolerances and alternative production processes on the efficiency of the power transfer system. A test-center is built up including a test-bench for repeatable procedures, the required measuring equipment for electrical, mechanical, and chemical parameters, and the relevant production processes. Thus, it is the aim of this presentation to illustrate the significant parameters in the production process of inductive power transfer systems and the associated measuring methods as well as related production processes. Additionally, the optimization potentials are discussed which can be reached by a holistic system approach through examining material and process parameters.

3:10 PM

Evaluating the Cost Effectiveness of Long-Haul Trucks Using an Electric Roadway

Aaron Brooker

National Renewable Energy Laboratory

Abstract: Previous studies have shown that electrifying the interstate highway system is a key enabler for light duty electric vehicles. It reduces the cost and eliminates the low range and long recharge time challenges. Long-haul trucks may improve the case for installing the infrastructure. Since they consume about 10 percent of the Nation's oil, they provide the potential to significantly reduce the US dependency on foreign oil. And with the infrastructure in place, the industry has a financial incentive to change over the fleet to use it. The fuel cost is one of the primary expenses of long haul trucks. It is over four times that of the vehicle purchase price, and often the greatest annual expense. The ability to use electricity can cut that expense by more than half. This is an especially unique opportunity for long-haul trucks since other fuel saving alternatives do not work as well. Batteries do not provide the cost, range and recharge characteristics needed to travel long distances. Hybridizing isn't as effective since the drive cycle is more constant speed, reducing the amount of regenerative braking benefit hybrids provide. This presentation will describe the benefits and cost effectiveness of long-haul trucks using an electrified interstate highway system. It will estimate the petroleum and GHG emissions impacts, and compare the powertrain component and fuel costs.

3:30 PM

A Wireless Battery Charger Concept with Lightweight and Low Cost Vehicle Equipment: eCPS

Faical Turki

Vahle GmbH & Co.KG

Abstract: One of the major development requirements of inductive battery chargers for electric vehicles is the system costs and especially the required volume and weight of the on-board components. The energy transfer chain consists of two subsystems: the stationary infrastructure part that produces the required primary magnetic field and the mobile vehicle part that transforms the primary field into electric power. Assuming the system complexity is constant, the optimization towards better market acceptance and lower pricing leads to a solution involving shifting the complexity to the infrastructure side and keeping the vehicle components as simple as possible. Obviously this is only given by also taking safety requirements into account and fulfilling the applicable standards and regulations. This work demonstrates a wireless charging concept with minimalistic vehicle equipment, its hardware realization and results.

3:50 PM

Wireless Charging for Electric Vehicles – Integration Challenges

S. Kuemmell, R. Wascheck

IAV

Abstract: Convenience for users of electric vehicles (EV), range-extended electric vehicles (REEV) and plug-in hybrid electric vehicles (PHEV) would benefit from wireless charging. Hence wireless charging could be a key technology for acceptance and establishment of electric vehicles. In addition wireless charging while driving has the potential to solve problems for the electric vehicle caused by the limited energy density of the on-board storage. To realize this potential a lot of challenges have to be overcome and the implementation of static wireless charging in series vehicles will be an important step.

Any new system in a vehicle has to be integrated mechanically, electrically and functionally under special consideration of safety. For a wireless charging system the optimum position in the vehicle has to be identified for all relevant drive trains fulfilling the requirements of the vehicles for different use cases in respect to drivability and interoperability. Energy transferred from the infrastructure has to be supplied to the on-board storage – or electric drive train in case of charging while driving – safely and efficiently. Neither passengers nor on-board systems shall be compromised by the new system.

Therefore a wireless charging system in a vehicle has to communicate with the different existing on-board systems to work and to unlock the full potential of this technology for best user experience based on existing communication protocols. Communication with the infrastructure side is also very important to guarantee safety.

For wireless charging a threat might arise from the electro-magnetic field which is necessary to transfer energy from the infrastructure side to the vehicle side. It's most important for a series automotive application to be safe and reliable. For a wireless charging system this can be achieved by an integration in a non-public area and other measures to minimize indirect threats e.g. of heated foreign objects. A market introduction without incidents is important for customer acceptance and application of wireless charging for future means of transport.

4:10 PM – 4:25 PM

Break

4:25 PM – 5:30 PM

SPOTLIGHT SESSION:

Research Interests of the U.S. Department of Energy

4:30 PM

Update on ARPA-E Workshop on Rapid Charging Needs

Amul Tevar

ARPA-E Fellow

Abstract: This talk will focus on the output from the ARPA-E workshop focused on rapid charging needs on both the battery and system/infrastructure sides. The workshop gathered thought leaders from distinct science, engineering, and commercial communities to collectively develop new ideas and identify key needs and potentially transformational technological approaches for enabling rapid charging of electric vehicle batteries. The main theme of this workshop was to support radical new ideas on energy storage and charging system technologies that would allow rapid, reversible and safe charging of EV batteries.

Specifically, ARPA-E is interested in exploring opportunities to enable rate charging systems that could potentially allow rates on the order of >30 miles/min of charge. Additionally, there is interest in developing rapid discharge systems to improve safety. The discussion was divided into two parts, with a section treating the battery as a black box and focusing on the surrounding system and infrastructure innovations needed to deliver energy through rapid charging. The other section focused on the battery innovations needed assuming that the surrounding systems were in place. The output indicated a variety of technological gaps that would need to be addressed for the rapid charging to be safely implemented.



4:50 PM

Idaho National Laboratory Update on DE-FOA-000667 Wireless Charging for Electric Vehicles

Brent Warr

Idaho National Laboratory

Abstract: The Idaho National Laboratory (INL) on behalf of the Department of Energy (DOE) provides an update on DE-FOA-000667 Wireless Charging for Electric Vehicles. An update is given of the awardees and the deliverables expected from the FOA and a timeline of milestones. An update is given of procedures for efficiency and EMF emission tests at various inductive power transfer coil offsets and ambient temperature ranges conducted by INL. Results to date are shown for conductive EVSE efficiency baseline testing and wireless charging benchmark testing.

5:10 PM

U.S. Department of Energy Update

Lee Slezak

Vehicle Technologies Program, Office of Energy Efficiency & Renewable Energy



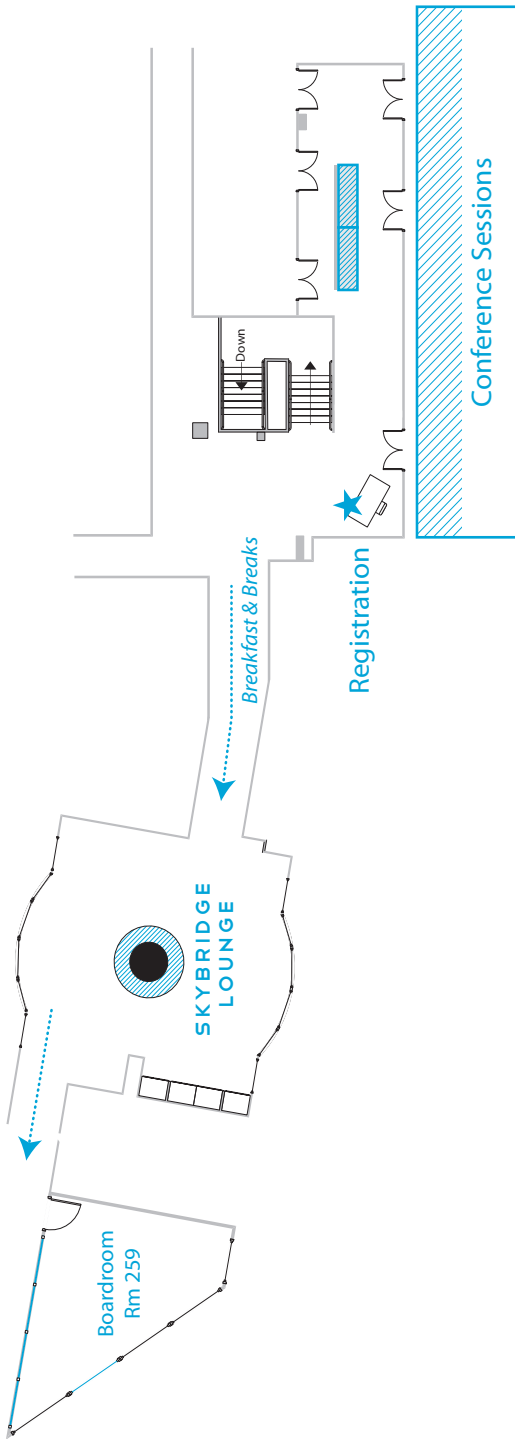
5:35 PM

Conference Conclusion



CONFERENCE MAP

Newpark Resort & Hotel - 2nd floor



CONFERENCE MAP

Directions to the Swaner Eco Center



CONFERENCE PROVIDED SERVICES

Visit the CERV Headquarters for Registration and Hospitality located outside the Conference Center if you have questions about the Conference and happenings in Park City. Among the information available is a list of area restaurants, shopping, and local attractions and entertainment. A message board is available to exchange messages or post information. Stop by!

Registration and Hospitality Desk Hours

Monday, February 4 7:30 AM – 5:30 PM
Tuesday, February 5 7:00 AM – 5:30 PM



Speak Up

We want to hear from you! Be sure to complete a Conference evaluation form, found in your program. Your responses will help us to offer an even better Conference in the future.

Keeping you Wired and In Touch!



Wireless Password & Instructions
Provided at check-in to the
Newpark Resort & Hotel



Computer & Printer
Available in the Newpark Lobby



Copies – available at the Front Desk.
Prices: black and white = \$. 20/page
color = \$.25/page

Meeting/Interview Room

Newpark Board Room 259 is available to Conference participants and exhibitors for meetings.

Reservations can be made at Conference Headquarters.

CONFERENCE MENUS

Hungry? We've got it covered – continental breakfasts, breaks and lunches provided by Le Croissant Catering with all service on eco-friendly disposables. You may purchase additional tickets for guests at Conference Headquarters.

Refreshment Breaks

Whether you need a boost of caffeine or crave a sweet or a protein-packed snack, the refreshment breaks will give you a much-needed boost while you network. All A.M. and P.M. Breaks will be held in the Skybridge Lounge.

Continental Breakfast

Start the day off with pastries, fresh fruit, yogurt, assorted juices, coffee and tea. Continental breakfast will be available from 7:30 AM – 8:15 AM in the SkyBridge Lounge.

Lunch & Buffet Menus

Monday, February 4

Chicken Crepes
Roasted Red Potatoes
Spinach Mandarin Salad
Rolls
Dessert
Sparkling Mango Lemonade

Tuesday, February 5

Chicken and Vegetarian Fajitas
Green Chile Rice
Refried Beans
Tortillas
Chips and Salsa
Tossed Green Salad with Cilantro Ranch dressing
Dessert
Sparkling Raspberry Limeade



Coffee, tea and water
will be available all day
in the Conference Center.

Catering provided by:

NOTE: Accommodations have been made for those participants who requested special dietary considerations on the registration form. Please speak with a Conference or catering staff member at each meal regarding your requests. Regrettably, we may not be able to accommodate on-site requests.



www.cervconference.org