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Auto image courtesy Ford Motor Company
This symposium will provide first-hand knowledge of recent innovations from leaders in this growing industry on topics ranging including energy storage innovations, power electronics, advanced powertrains, and many more, as well as reflections on what we have learned over the last decade.

This event is specifically designed to allow you the opportunity to network with leading professionals through panel discussions and in-depth technical sessions - all designed to give you the important information you need in this complex marketplace.

To download presentations from the SAE 2013 Hybrid/EV Symposium after the event, go to: http://www.sae.org/events/training/symposia/hybrid/presentations/anaheim2013/

User: 2013Hybrid
Password: Anaheim

Please allow up to two weeks for processing.
| Tuesday  
February 19  
Hybrid Vehicle Symposium | Wednesday  
February 20  
Hybrid Vehicle Symposium | Thursday  
February 21  
Electric Vehicle Symposium |
|-------------------------|-------------------------|-------------------------|
| 7:00 a.m. – 5:00 p.m.  
Registration Hours       | 7:00 a.m. – 5:00 p.m.  
Registration Hours       | 7:00 a.m. – 5:00 p.m.  
Registration Hours       |
| 8:00 – 10:30 a.m.  
Technical Sessions      | 8:00 – 9:45 a.m.  
Technical Sessions      | 8:00 – 10:00 a.m.  
Technical Sessions      |
| 10:30 – 11:00 a.m.  
Networking Break        | 9:45 – 10:15 a.m.  
Networking Break        | 10:00 – 10:30 a.m.  
Networking Break        |
| 11:00 a.m. – 12:00 p.m.  
Technical Sessions      | 10:15 a.m. – 12:00 p.m.  
Technical Sessions      | 10:30 a.m. – 12:30 p.m.  
Technical Sessions      |
| 12:00 – 1:00 p.m.  
Lunch                    | 12:30 – 1:30 p.m.  
Lunch                    | 12:30 – 1:30 p.m.  
Lunch                    |
| 1:00 – 3:00 p.m.  
Technical Sessions      | 1:30 – 3:00 p.m.  
Technical Sessions      | 1:30 – 3:30 p.m.  
Technical Sessions      |
| 3:00 – 3:30 p.m.  
Networking Break        | 3:00 – 3:30 p.m.  
Networking Break        | 3:30 – 4:00 p.m.  
Networking Break        |
| 3:30 – 5:30 p.m.  
Technical Sessions      | 3:30 – 6:00 p.m.  
Technical Sessions      | 4:00 – 6:00 p.m.  
Technical Sessions      |
| 5:30 – 7:00 p.m.  
Networking Reception    | 6:00 – 7:30 p.m.  
Networking Reception    | **Registration Hours** |

- **Technical Sessions**
  No audio or video recording of presentations is permitted, except by SAE. Please turn off all cell phones and pagers before entering the session room.

- **Visit the exhibits**, located in California C during breaks, lunches, and reception.

**Symposium Organizers:**

- **Craig Childers**  
  Air Resources Engineer  
  California Air Resources Board
- **John German**  
  Senior Fellow and Program Director  
  International Council for Clean Transportation (ICCT)
- **Ming L. Kuang**  
  Technical Lead  
  Vehicle Controls Electrification Research and Advanced Engineering  
  Research and Innovation Center, Ford Motor Company
- **Robert P. Larsen**  
  President  
  OboTech LLC
- **Owen Thunes**  
  Senior Project Engineer  
  Electric, Hybrid, & Fuel Cell Vehicles  
  Nissan Technical Center N.A.
- **Heraldo Stefanon**  
  Manager  
  Toyota Motor Engineering & Manufacturing North America, Inc. (TEMA)  
  Advanced Powertrain (APT), Gasoline Hybrid Group (GHv)
- **Justin Ward**  
  Advanced Powertrain Program Manager  
  Toyota Motor Engineering & Manufacturing North America, Inc. (TEMA)
SAE recognizes the dedication of the volunteer organizers who are a critical element to providing the event. We offer the organizers our sincere appreciation for their dedication and commitment to this Symposium.

**Craig Childers**  
California Air Resources Board  
Air Resources Engineer, Zero Emissions Vehicle (ZEV)

Mr. Childers is responsible for technical issues regarding zero emissions vehicles and for “ZEV enabling” advanced technology vehicles including hybrid electric vehicles. Prior to joining CARB, he was an electric vehicle engineer and project manager with the electric transportation dept. at the Sacramento Municipal Utility District (SMUD). Childers earned a BS degree in Mechanical Engineering from the University of California at Davis.

---

**John German**  
International Council for Clean Transportation

John German is a Senior Fellow and Program Director for the International Council for Clean Transportation, with primarily responsibility for technology innovation and U.S. policy development.

Mr. German has been involved with advanced technology and efficiency since joining Chrysler in 1976, where he spent 8 years in Powertrain Engineering working on fuel economy issues. He then spent 13 years doing research and writing regulations for EPA's Office of Mobile Sources' laboratory in Ann Arbor, MI, followed by 11 years as Manager of Environmental and Energy Analyses for American Honda Motor Company, with an emphasis on being a liaison between Honda’s R&D people in Japan and regulatory affairs. Mr. German is the author of a variety of technical papers and a book on hybrid gasoline-electric vehicles published by SAE. He was the first recipient of the Barry D. McNutt award, presented annually by SAE for Excellence in Automotive Policy Analysis.

He has a bachelor’s degree in Physics from the University of Michigan and got over half way through an MBA before he came to his senses.
Ming L. Kuang
Ford Motor Company

Ming Kuang is a Technical Leader in vehicle controls at Research and Innovation Center of Ford Motor Company, leading the development of global vehicle control architecture and advanced hybrid vehicle controls. He started his career at Ford as a control engineer in electric vehicle programs in 1991. He has worked in both research and production organizations in the area of vehicle dynamics and controls, electric and hybrid electric vehicles technology, and vehicle controls. In his prior position, Mr. Kuang was a Technical Expert in hybrid controls, and played an instrumental role in the development of hybrid vehicle controls and the successful launch of the first Escape Hybrid - the first America’s hybrid SUV and 2005 NAIAS Truck of the Year. He was recognized by the company with a Henry Ford Technology Award in 2005 for his contributions to the Escape Hybrid success. His current responsibilities and interests range from developing and implementing global vehicle controls architecture, establishing vehicle control system development and implementation methodologies, to advancing vehicle control algorithms for vehicle electrification.

Mr. Kuang has authored and co-authored 36 technical papers published on IEEE journal, ASME, ACC, CDC, DSCC, SAE and other engineering conferences. He holds 39 U.S. patents and 14 oversea patents. He has received major awards from both internal and external of Ford, Technical Achievement Award in 2008 and 2011, SAE International Henry Ford II Distinguished Award for Excellence in Automotive Engineering in 2007, and Henry Ford Technology Award in 2005, to name a few.

Mr. Kuang is a member of SAE International. He holds a Master of Science degree in mechanical engineering from University of California, Davis, and a Bachelor of Science degree in mechanical engineering from South China University of Technology in the People’s Republic of China.
Robert P. Larsen
OboTech LLC

Robert P. (Bob) Larsen is the President of OboTech LLC, a consulting company focused on electric drive vehicle and renewable fuels technologies. Bob Larsen is the principal author of SAE J 2880 – the Green Racing Protocols – and one of the main architects of the Green Racing Initiative – a joint program of the U.S Department of Energy, U.S. Environmental Protection Agency, and SAE International. He is currently a consultant to the American Le Mans Series to develop and implement Green Racing 2.0, the centerpiece of their strategic vision for the future.

Mr. Larsen retired last November from the Center for Transportation Research at Argonne National Laboratory (ANL) after a career that spanned over 32 years. He served as the Center’s Director from 2001 to 2006 playing an instrumental role in building the programs and facilities at ANL for renewable fuels, advanced powertrain, and vehicle development. Bob began working on electric-drive vehicles in 1991 focusing first on hybrid electric vehicles and later encompassing plug-in electric and fuel cell vehicles. Under Bob’s direction, ANL developed industry-leading vehicle simulation software Autonomie and specialized vehicle integration and testing capabilities represented by the Advanced Powertrain Research Facility.

Bob was instrumental in bringing the methanol class into Formula SAE, a collegiate design competition, in 1987. From there he developed the U.S. Department of Energy-sponsored collegiate Advanced Vehicle Technology Competition program starting in 1989 using the full range of alternative fuels and electric drive technologies in modified production vehicles that continues to this day. Bob has been involved in organizing and operating over 40 collegiate vehicle competitions from solar cars to fuel cell vehicles. He also originated the Junior Solar Sprint, an STEM educational program for middle school students.

Bob is a long-time organizer of SAE’s Hybrid and Electric Vehicle Symposia and serves on several SAE technical committees. He was elected to the Society’s Board of Directors in 1997 and served on the Finance and Strategic Planning Committees. Mr. Larsen was also the Technical Director and later the Race Director for the Progressive Insurance Automotive X-PRIZE 100 MPG vehicle competition.

Bob is also the Vice-President of Research and Product Development for Catalyst Energy Technologies, a start-up company working on distributed energy technologies. He earned a National Technology Transfer Award, an R&D 100 Award, the Top Competition Organizer of the 20th Century Award from DOE, and two Argonne Pacesetter awards.

Owen Thunes
Nissan Technical Center N.A.

Owen Thunes is a Senior Project Engineer with Nissan, having joined the company in 2004. His first assignment was in development and testing of the Altima Hybrid, based at the Arizona Proving Ground. After model launch in 2007, he transferred to the California Fuel Cell Partnership. Here he continues to work in R&D of electric-based vehicles including EV, HEV and FCV. Mr. Thunes also served in the US Navy, recently retiring after a career spanning twenty-one years of active and reserve duty, with tours across the globe. He holds undergraduate degrees in Computer Science from University of Maryland and Mechanical Engineering from Boise State University. His first graduate work at UC Davis specialized in Plug-In Hybrid Vehicles, where he earned an MSME. More recently, he returned to UC Davis, completing an MBA.
Heraldo Stefanon
Toyota Motor Engineering & Manufacturing North America, Inc.

Heraldo Stefanon is a Manager in the Advanced Powertrain – Gasoline Hybrid Group (APT-GHV) of Toyota Technical Center (TTC), the R & D arm of Toyota Motor Engineering and Manufacturing North America (TEMA). Since entering Toyota in 1993, Mr. Stefanon has dedicated his time to the development of the Tundra in the US, being responsible for the emission development and compliance. In 2009, he transitioned to the APT GHV Group to assist with the development of local calibration for hybrid vehicle projects. He is now in charge of hybrid powertrain related software development for North America. Prior to joining Toyota in 1993, Mr. Stefanon's engineering career started with the marine industry at Volvo Penta of Brazil with a brief stint at the Southern CA Rapid Transit District where he supported the development of the emission laboratory for heavy duty vehicles.

Mr. Stefanon received a Bachelor of Science in Mechanical Engineering degree from Pontificia Universidade Catolica in Rio de Janeiro, Brazil in 1989. He enjoys outdoor sports and promoting environmentally friendly and healthy ways of living.

Justin Ward
Toyota Motor Engineering & Manufacturing North America, Inc.

Justin Ward is the General Manager of Toyota’s Powertrain System Control (PSC) department at Toyota Technical Center (TTC), located in Gardena, California. TTC, Toyota’s North American R&D center, has been a division of Toyota Motor Engineering & Manufacturing, North America, Inc. (TEMA) since 2006. PSC responsibilities include suitability testing of advanced powertrain technologies in North America, coordinating development of new or improved powertrain software, coordinating Toyota’s contributions to North American Codes & Standards related to advanced powertrains, and supporting technical outreach.

Mr. Ward began his career at TTC in 2001, when he joined the company to support the opening of Toyota’s first facility in North America dedicated to Fuel Cell Vehicle development, located at the California Fuel Cell Partnership (CaFCP) in West Sacramento, California.

Mr. Ward earned a Bachelor of Science degree in Mechanical Engineering from the University of California Davis in 1999.

Engineering at UC Davis in 2002 while conducting research on plug-in hybrid technology. He has since had a career focused on the development of advanced powertrains.
Emergency Hotline 1-800-581-9295
In the event of an emergency or a major disruption to the schedule of events at the Hybrid & Electrical Vehicle Technologies Symposium, attendees and exhibitors may call this number to receive further information about the resumption of this event. Updates will also be provided via the SAE website at www.sae.org.

Location:
Hilton Anaheim
777 Convention Way
Anaheim, CA 92802
714-750-4321
www.hiltonanaheimhotel.com

Hours of Operation
Registration
California Ballroom Registration Desk
Monday, February 18, 2013
4:00pm-6:00pm
Tuesday, February 19, 2013
7:00am-5:00pm
Wednesday, February 20, 2013
7:00am-5:00pm
Thursday, February 21, 2013
7:00am-5:00pm

Exhibition
California C
Tuesday, February 19, 2013
7:00am-7:00pm
Wednesday, February 20, 2013
7:00am-7:00pm
Thursday, February 21, 2013
7:00am-4:00pm

Event Operations Office
Mezzanine ABC
Monday, February 18, 2013
7:00am-7:00pm
Tuesday, February 19, 2013
7:00am-7:00pm
Wednesday, February 20, 2013
7:00am-7:00pm
Thursday, February 21, 2013
7:00am-7:00pm

Special Events and Networking Opportunities
Tuesday, February 19, 2013
Reception California C
5:30pm-7:00pm
Wednesday, February 20, 2013
Reception California C
5:30pm-7:00pm

Hotel Amenities
• Heated outdoor pool and hot tubs, family-friendly water play area
• 25,000 sq. ft. newly renovated Health Club with Precor equipment, group exercise classes, massage & spa services, steam rooms, locker facilities, indoor pool and hot tub
• Coin operated laundry center
• In-room dining
• On-site Enterprise car rental
• Disney Desk sells park tickets
• Hilton Serenity Bed, overfilled down comforters, “Touch of Down” pillows
• Wireless and wired high-speed internet access available
• 32” or larger flat screen TVs in HD
• Personal Cuisinart coffee maker, iron, ironing board, hairdryer, individual climate control and laptop-sized safe
• USA Today each weekday morning
• Valet dry cleaning and laundry
• Non-smoking & ADA accessible rooms
On-site Services

**Business Center** - Full Service UPS Store located in the lobby offers business services, printing, shipping/receiving and self-service work stations.

**Parking** - $16.00 per day for guests (in and out privileges) and $12.00 per day for non-guests ($5.00 first hour, $1.00 per half hour after that)

**Restaurants:**
- The new Mix Restaurant serves globally inspired dishes in a contemporary setting.
- Starbucks in lobby
- Mix Lounge is a perfect place to gather and entertain in the Hilton’s central lobby.
- Hilton Anaheim Food Court featuring Sbarro, Baja Fresh, Just Grillin’ & Submarina

Local Attractions/Things to Do

**Disneyland Resort**
**Downtown Disney** - Ever-changing shopping, dining and entertainment destination.

**GardenWalk** - Dining, shopping, bowling, movies and nightlife.

**Newport Beach** - A glistening wedge of ocean.

**Angels Stadium** - Los Angeles Angels Baseball

**The Honda Center** - Anaheim Ducks NHL Hockey

**Knott’s Berry Farm Amusement Park**

**Numerous Golf Courses**
Topics and speakers are subject to change

Symposium Organizers: Craig Childers, CARB; John M. German, ICCT; Ming Kuang, Ford Motor Company; Robert Larsen, OboTech; Owen Thunes, Nissan; Heraldo Stefanon and Justin Ward, Toyota Technical Center

7:00 am
Registration / Continental Breakfast

8:10
Welcome/Introductions
Ray Bakerjian, SAE International

8:15
CHAIR: OWEN THUNES, NISSAN MOTOR COMPANY (see biography on page 6)
“How Far Have We Come in 10 Years?”, 10th Anniversary for the Symposium
Shinichi Abe, Toyota, Hybrid System Management Department (see biography on page 16)

8:45
Car and Driver’s fun, slightly cynical, definitely opinionated, and possibly accurate view of the hybrid and EV marketplace
Aaron Robinson, Car & Driver (see biography on page 17)

9:15
Alternative Powertrains: What does the customer want and what are they willing to pay for over the next decade
Alexander Edwards, Strategic Vision (see biography on page 17)

9:45
The Future of Energy and the Automobile: How Will It Go
David Greene, Energy Information (see biography on page 18)

10:15
Question and Answer Period

10:30
Break

11:00
Beyond Fuel Economy - The Ford Fusion Energi
Mazen Hammoud, Ford (see biography on page 26)

11:30
Chevrolet Volt In-Use Overview
Matt Laba, GM (see biography on page 19)
12:00 pm

**Lunch**

1:00

**CHAIR:** MING KUANG, FORD MOTOR COMPANY (see biography on page 5)

**Tech Development of Prius Family**

Heraldo Stefanon, Toyota (see biography on page 7)

1:30

**Development of Parallel Hybrid System for FF and AWD**

Owen Thunes, Nissan (see biography on page 6)

2:00

**Overview of Chrysler Group LLC Electrified Powertrain PHEV and BEV Technology and Field Experience**

Abdullah Bazzi, Chrysler (see biography on page 20)

2:30

**BMW Vehicle Electrification**

Cliff Fietzek, BMW (see biography on page 20)

3:00

**Break**

3:30

**Volkswagen’s Roadmap of electrification in the MQB**

Oliver Schmidt, VW (see biography on page 20)

4:00

**Introduction to PHEV Technology Applied to the 2014 Honda Accord**

Takeshi Kato, Honda R&D Americas (see biography on page 21)

4:30

**OEM Hybrids Panel Discussion**

Moderator, Robert Larsen (see biography on page 6)

THEME: Ten Years Later: New Potential for HEV Technologies?

5:30

**Reception** immediately following adjournment
7:00 am
Registration / Continental Breakfast

8:00
Welcome/Introductions
Ray Bakerjian, SAE International

8:15
CHAIR: BOB LARSEN, OBO TECH LLC (see biography on page 6)

The Need for Electric Drive Vehicles to Meet Environmental Standards
Tom Cackette, CARB (Retired) (see biography on page 22)

8:45
On-Road Results from Charging Infrastructure and Grid Connected Vehicle Fleets
Richard “Barney” Carlson, INL (see biography on page 22)

9:15
Air Emissions and Oil Displacement Benefits from Plug-in Vehicles
Jeremy Michalic, CMU (see biography on page 23)

9:45
Break

10:15
Fuel Cell Electric Vehicles in California: Status and Roadmap to Market Launch
Dr. Dan Sperling, Fuel Cell Partnership (see biography on page 23)

10:45
Road to Fuel Cell Vehicle Commercialization
Justin Ward, Toyota (see biography on page 7)

11:05
Fuel Cell OEM
Speaker TBD, Daimler

11:25
Uncovering the Progress on Fuel Cell Electric Vehicles
Lance Atkins, Nissan (see biography on page 24)

11:45
Lessons Learned from GM’s Hydrogen Fuel Cell Program
Alex Keros, GM (see biography on page 25)
12:05
Department of Energy Development and Demonstration of Hybrid Battery-Fuel Cell Systems on Heavy-Duty and Medium-Duty Commercial Vehicles
Peter Devlin, Department Of Energy (see biography on page 25)

12:30
Lunch

1:30
Speaker and Topic TBD

2:00
CHAIR: JOHN GERMAN, ICCT
Supplier Discussions
THEME: Technology Advances for HEV/PHEV Development
R. Shaw Lynds, Maxwell (see biography on page 27)
Alexandra Cattelan, AVL (see biography on page 28)
Jeffrey Gonder, National Renewable Energy Laboratory (NREL) (see biography on page 29)
Gary Meyers, Magna eCar Systems (see biography on page 30)
Pierre-Emmanuel Strohl, Valeo (see biography on page 30)

3:00
Break

3:30
Menahem Anderman, Advanced Automotive Batteries (see biography on page 31)

4:00
Advanced Lithium Battery Electrolytes for PHEV/EV Application
Zhengcheng Zhang, ANL (see biography on page 31)

4:30
Energy Storage Systems Panel Discussion
Moderator, John German (see biography on page 4)
THEME: Batteries: Still the Limiting Factor?
SungHoon Kim, Samsung (see biography on page 32)
Bob Taenaka, Ford (see biography on page 33)
Dr. Prabhakar Patil, LG Chem Power (see biography on page 33)
Tom Watson, Johnson Controls (see biography on page 34)
Kenji Takahashi, Toyota (see biography on page 34)
Menahem Anderman, Advanced Automotive Batteries (see biography on page 31)
Dr. Daniel Zhang, Advanced Electronics Energy (see biography on page 31)

6:00
Reception immediately following adjournment
**TECHNICAL PROGRAM**

**DAY 3 – THURSDAY**
February 21

7:00 am

**Registration / Continental Breakfast**

7:50

**Welcome/Introductions**
Craig Childers, CARB and Ray Bakerjian, SAE International

8:00

**EV/HEV Racing Talk**
Angus Lyon, Drayson Racing Technologies (see biography on page 35)

8:30

**Electric Vehicles: Understanding the Long-Term Context**
John Voelker, High Gear Media (see biography on page 35)

9:00

**Plugless Power: Evatran’s Approach to Wireless EV Charging**
Brian Normann, EVATRAN (see biography on page 36)

9:30

**Wireless Charging Guideline, SAE TIR J2954: Performance, Safety and Interoperability Considerations for the Wireless Charging of Plug-in Vehicles**
Jesse Schneider, BMW (see biography on page 36)

10:00

**Break**

10:30

**Global Vehicle Usage Studies – Who Can Really Use an Electric Car?**
Dr. Michael Tamor, Ford (see biography on page 37)

11:00

**Predictive Evaluation of EV Performance in an Urban Taxi Fleet**
PT Jones, ORNL (see biography on page 38)

11:30
Speaker TBD, Tesla

12:00

**RavEV Development**
Greg Bernas, Toyota
12:30  
**Lunch**

1:30  
**Chevrolet Spark Electric Vehicle Propulsion System**  
Steve Tarnowsky, GM (see biography on page 39)

2:00  
**Hybridisation and Electrification for Premium Luxury Vehicles**  
Paul Bostock, Jaguar/Landrover (see biography on page 40)

2:30  
**Honda’s Technology and Strategy Regarding EV**  
Koichi Shinmura, Honda (see biography on page 39)

3:00  
John Schnoes, Nissan (see biography on page 40)

3:30  
**Break**

4:00  
David Patterson, Mitsubishi (see biography on page 39)

4:30  
**BMW Electric Mobility**  
Jesse Schneider, BMW (see biography on page 40)

5:00  
**OEM Panel Discussion**  
Theme: Mitsubishi  
Moderator, Craig Childers, CARB (see biography on page 4)

6:00  
**Conclusion**
Chair: Owen Thunes
Nissan
See page 6 for Bio

How Far Have We Come In Ten Years?

Shinichi Abe
Toyota Motor Corporation

Shinichi Abe is General Manager, Hybrid System Management Department within Toyota Motor Corporation’s Hybrid Vehicle System Engineering Division.

His current responsibilities include overseeing engineering and development of all system controls, including driving force, energy management, engine control, motor control and electric battery control for all Toyota hybrid vehicles.

Abe joined Toyota in 1981 as Engineer in charge of development of engine controls in the company’s Engine Development Division. In 1991, he served as Manager and Coordinator in charge of exhaust emissions related government affairs at Toyota Technical Center, U.S.A., Inc. in Gardena, Calif. He returned to Japan in 1994 as Manager in charge of advanced development of LEV exhaust system at the Higashifuji Technical Center, Powertrain Control Development Division. In March of 1996, he was named Manager in charge of the development of the engine control system for the Toyota Prius. In September of that year, his responsibilities were expanded to include the system control and development of driving force control for the Prius.

In 2000, he was appointed General Manager of the Hybrid Vehicle Control Development Department, with the responsibility for development of engine control, system control and driving force control for all Toyota hybrid vehicles. In 2003, he was appointed General Manager of Hybrid System Management Department and in 2006 his responsibilities were expanded to include development of electric battery control.

Abe has both an undergraduate and Masters Degree in mechanical engineering from Nagoya University. He is a member of the Japan Society of Mechanical Engineers and the Society of Automotive Engineers of Japan.

Abe is married and has two grown children. He was born on April 20, 1956.
TUESDAY
February 19, 2013

Car and Driver’s fun, slightly cynical, definitely opinionated, and possibly accurate view of the hybrid and EV marketplace

Aaron Robinson
Car & Driver Magazine

Ann Arbor, Michigan-based Aaron Robinson joined the staff of Car and Driver magazine in 2000 as technical editor responsible for road testing and evaluation of new vehicles. In 2012 he became executive editor, responsible for both writing and editing magazine content. With a circulation of 1.3 million, Car and Driver is the world's largest automotive consumer magazine and conducts instrumented tested of more than 200 new vehicles annually. Before joining Car and Driver, Robinson was the engineering reporter for Automotive News in Detroit, and associate editor of Automotive Executive, the monthly publication of the National Automobile Dealers Association. He is a graduate of the University of Michigan and an owner and restorer of vintage automobiles.

Alternative Powertrains: What Does the Customer Want and What are they Willing to Pay For Over the Next Decade?

Alexander Edwards
Strategic Vision

Alexander Edwards, President of Strategic Vision, Inc., has worked in the automobile industry for over twenty years. In addition to automotive, Edwards is responsible for all facets of customer research across categories from political parties to paper plates. Edwards has been a key developer in research tools for the automotive market such as NVES (New Vehicle Experience Study) and DAO (Delight and Opportunity) as well as Strategic Window, a tool to give instant access to consumer verbatims on specific vehicle aspects. Edwards is recognized as the leading industry expert in automotive research and is frequently quoted in widely-distributed publications.

Abstract
The values and priorities associated with both the today’s customers and future intenders, combined with the product attributes and vehicle imagery, will have a direct impact on sales of these vehicles. Results of Strategic Vision’s (SV) New Vehicle Experience Study (NVES) that surveys 350,000 new vehicle owners annually will be reviewed. The familiarity, usage and purchase desire of alternative fueled vehicles will be connected to personal attitudes about driving, consideration process, transaction, vehicle experience, loyalty and future providing a complete picture of who the customer of tomorrow will be.
The Future of Energy and the Automobile: How Will it Go?

David Greene  
Energy Information

David L. Greene is a Corporate Fellow of Oak Ridge National Laboratory, a Senior Fellow of the Howard H. Baker, Jr. Center for Public Policy at the University of Tennessee and author of 250 publications on transportation and energy issues. He is a Lifetime National Associate of the National Academies and 2013 recipient of the Transportation Research Board’s R.W. Crum award. He is an SAE member since 1985 and recipient of the 2004 Barry D. McNutt Award for Excellence in Automotive Policy Analysis. He holds a B.A. from Columbia University, M.A. from the University of Oregon, and a Ph.D. from The Johns Hopkins University.

Development of Parallel Hybrid System for FF and AWD

Owen Thunes  
Nissan

See Page 6 for Bio

Maximizing Performance and Utilization of Military Hybrid Electric Vehicles with In-Hub Drive

Andrew Silveri  
General Dynamics Land Systems

Andrew Silveri joined General Dynamics Land Systems in 2008, where he held leadership positions as Hybrid Electric Section Manager and Principle Investigator for research and development projects including vehicle electronics architecture, vehicle power management and vehicle power prognostics. He is currently the Subsystems Thrust Lead with responsibility for leading technology research and development for vehicle electronics and subsystem architecture. Prior to joining General Dynamics Land Systems, Andrew acquired 18 years of Automotive experience developing powertrain and hybrid electric vehicle controls, software, and electronics.

He has had several assignments on international programs involving travel to Brazil, England, Sweden and Germany including a foreign assignment to move a large diesel truck electronics controls program to the United States. Andrew holds 27 US and 16 International Patents in hybrid electric vehicle related technology. He holds a BSEE from Lawrence Technological University and a Masters Degree in Software Engineering from University of Michigan Dearborn.
Chevrolet Volt In-Use Overview

Matt Laba
GM

Matt serves as Engineering Group Manager of GM’s Electric Motor Development and Validation department and is responsible to oversee the development of all of GM’s high voltage traction motors. For the past 10 years, in various roles, he has managed the development of a number of electric traction systems for a number of GM’s hybrid systems. Matt has worked on electric vehicle systems since 1996. Prior to his current assignment, Matt started his career with General Motors by working on GM’s EV1 and Electric S-10 pickup truck as a release engineer for the Electric Drive Unit. In the past, he has worked at General Dynamics Land Systems in various engineering roles. Matt holds a BSE in Mechanical Engineering from the University of Michigan, Ann Arbor, and a MS in Mechanical Engineering from Wayne State University.

TUESDAY AFTERNOON
February 19, 2013

Chair: Ming Kuang
Ford Motor Company
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Owen Thunes
Nissan
Development of Parallel Hybrid System for FF and AWD
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Heraldo Stefanon
Toyota
Tech Development of Prius Family
See page 7 for Bio
Overview of Chrysler Group LLC Electrified Powertrain PHEV and BEV Technology and Field Experience

Abdullah Bazzi
Chrysler

Abdullah A. Bazzi, senior manager at Chrysler Group LLC, is responsible for the Electrified Powertrain Integration Management and the Principal Investigator of the DOE PHEV funded project.

Abdullah has been working at Chrysler since 1985 and have held a number of increasing positions in product development. He holds a MSEE degree from Wayne State University and a BSEE degree from University of Michigan – Dearborn.

Abstract

The world of vehicle electrification development and available technologies are fast emerging and the challenges to compete in such an environment and understand the customer and contain field issues are great. One of the key components is the energy storage, and how it performs under various operating modes.

I will present a highlight of the Department of Energy PHEV Vehicle Electrification Technology Fund project and the specific features offered on the vehicle, field performance, and experiences. I will also discuss the recently launched Fiat 500 Battery Electric Vehicle energy storage system.

BMW Vehicle Electrifications

Cliff Fietzek
BMW

Cliff Fietzek, Manager of connected e-mobility is responsible for all development related topics on BMW’s electric car’s within BMW of North America. He started his assignment with BMW of North America in May 2010. Prior to this assignment, he was responsible for the electric / electronic integration of the hybrid power train into the BMW X6 Active Hybrid. The hybrid components were jointly developed at the Hybrid Development Center in Troy, MI, a cooperation between General Motors, Chrysler, Daimler and BMW.

Cliff Fietzek has been with BMW since 2003 and holds a Master of Engineering from the University of Applied Sciences Kaiserslautern, Germany.

Volkswagen’s Roadmap of Electrification in the MQB

Oliver Schmidt
VW

Oliver started working in the Volkswagen engine development in 1997 after achieving a degree of mechanical engineering from the University of Applied Sciences in Hanover. Throughout his career within Volkswagen, Oliver has claimed various positions in Development, Marketing and Production, always staying connected to the powertrain development.

Oliver’s most recent job before he came to the US in March 2012 was the head of Powertrain Product Management for the VW brand. In the US, he is responsible for everything that is related to tailpipe emissions, starting with regulatory, leading to certification and in the end taking care of the defect reporting up to 15 years in a cars life.
Overview of the Honda Plug-In Hybrid Electric Vehicle

Takeshi Kato
Honda R&D Americas

Takeshi Kato is Manager of Hybrid Electronic Drive Development at Honda R&D Americas, Inc., a position he has held since July 2012. In this capacity, he is responsible for HEV design and test activities performed at the Ohio Center. Prior to this position, Mr. Kato served as Chief Engineer for HEV power conversion systems. His primary focus has been in the research of next generation inverters for Honda HEV systems, and the development of electric power conversion systems for both IC engines and micro gas turbine generators. Mr. Kato joined Honda in 1990, after receiving his BSEE degree from Tokyo Metropolitan University.

Abstract
In today’s challenge to protect the environment and meet increasing energy demands, the need to reduce automotive CO2 emissions is required. In the reducing of CO2, introducing FCVs, EVs, and other zero-emission vehicles are all necessary to meet that goal in the long term. However, HEVs and plug in HEVs which couple to the internal combustion engine will pay greater roles in the short term. Honda announced the following technologies as the next step of electrification under the banner of Earth Dreams Technology, which realizes our dreams of embodying “Fun to drive,” while contributing to the global environment we must protect. The next step of electrification under the banner of Earth Dreams Technology consists of the following key technologies:

- Intelligent Dual-clutch drive for small sized vehicles.
- Intelligent multiple mode drive applied to mid-sized vehicles.
- Sports Hybrid SH-AWD to achieve the fuel economy of an in-line 4 engine, drivability of a V8 engine, while providing superior handling and response.

All these technologies premiered last year. Today’s explanation will cover the technology of the new ACCORD PLUG-IN equipped with this two-motor hybrid technology named “Intelligent Multi-Mode Drive”.

OEM Hybrids Panel Discussion

Moderator: Robert Larsen

THEME: Ten Years Later: New Potential for HEV Technologies?

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WEDNESDAY
February 20, 2013

Chair: Robert Larsen
OboTech, LLC

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The Need for Electric Drive Vehicles to Meet Environmental Standards

Tom Cackette
CARB (Retired)

Mr. Cackette was with the Air Resources Board from 1982-2012 and most recently served as the Chief Deputy Executive Officer. He managed the Board’s motor vehicle emission control program, which develops regulations and other programs to reduce vehicle emissions. He also managed the Board’s Monitoring and Laboratory Division, which performs ambient air quality monitoring and develops test methods. Overall, 400 professional and support staff are dedicated to these programs, which are contributing to a steady decline in air pollution in California’s major urban areas. Mr. Cackette has been involved in many aspects of air pollution control since 1974. He served as a Legislative lobbyist for the ARB and worked eight years for the U.S. Environmental Protection Agency Motor Vehicle Emission Laboratory in a variety of technical, management and policy positions. Prior to that he was involved in rocket engine production and test and flight performance analysis at Rocketdyne in Los Angeles, where he gained first-hand knowledge of living in the smoggiest city in the U.S. He holds a Masters of Science degree in Engineering and a Bachelor of Science in Aeronautics. He has published papers for the Society of Automotive Engineers and Air and Waste Management Association, and is a frequent speaker on air quality issues. He lives in Sacramento with his wife and two children.

On-Road Results from Charging Infrastructure and Grid Connected Vehicle Fleets

Richard “Barney” Carlson
INL

Richard “Barney” Carlson is a research engineer at the Idaho National Laboratory in support of the US DOE’s Advanced Vehicle Testing Activity. Barney has been developing, testing, and analyzing Plug-in Hybrid Electric Vehicles since 1994. He is currently working on data collection and analysis activities for multiple Grid Connected Vehicle fleets. These fleet activities include thousands of EVSE and over 1,000,000 miles accumulated by several thousand Grid Connected Vehicles.

Abstract
The Idaho National Laboratory is analyzing and reporting on data collected from grid-connected electric drive vehicles and charging infrastructure in five large-scale, multi-year demonstrations taking place across the United States. These demonstrations, funded by the U.S. Department of Energy, include The EV Project infrastructure demonstration, led by ECOtality North America; Coulomb Technologies’ ChargePoint America infrastructure demonstration; General Motors’ Chevrolet Volt extended range electric vehicle demonstration; Chrysler’s Ram plug-in hybrid electric vehicle demonstration; and the Ford Escape plug-in hybrid electric vehicle advanced research fleet demonstration. This presentation will examine charging and driving behaviors of plug-in electric vehicle drivers and their use of charging infrastructure in these demonstrations over the past year. Results will be presented to identify patterns in charging and driving behavior and changes in these patterns due to external factors. Topics of discussion include driving style, driving range between charging, charging frequency, and the use of public versus home charging infrastructure.
Air Emissions and Oil Displacement Benefits from Plug-in Vehicles

Jeremy Michalek
CMU

Jeremy J. Michalek is an Associate Professor of Mechanical Engineering and of Engineering and Public Policy at Carnegie Mellon University. He is the founding director of the Design Decisions Laboratory, founding co-director of the Vehicle Electrification Group and an active member of the Green Design Institute and the Center for Climate and Energy Decision Making. His research focuses on systems optimization, design for market systems, green design, environmental policy, and vehicle electrification.

Jeremy earned his B.S. from Carnegie Mellon (1999) and his M.S. (2001) and Ph.D. (2005) from the University of Michigan in Mechanical Engineering. He worked as a postdoctoral research fellow at the University of Michigan before beginning his current faculty position at Carnegie Mellon.

Jeremy teaches courses in design, product development, economic analysis, and optimization. His research has appeared in the Washington Post, Bloomberg News, CNN Money, U.S. News and World Report, and MIT Technology Review, and he has coauthored and presented policy briefs on Capitol Hill. He has earned awards including the ASME Design Automation Committee's Best Paper Award, the International Journal on Research in Marketing's Best Article Award, the George Tallman Ladd Research Award for outstanding research and professional accomplishments, the ASME Design Automation Outstanding Young Investigator Award, and the National Science Foundation CAREER Award. Jeremy is involved in the American Society of Mechanical Engineers (ASME), The Institute for Operations Research and the Management Sciences (INFORMS), and the Transportation Research Board (TRB).

Fuel Cell Electric Vehicles in California: Status and Roadmap to Market Launch

Dr. Dan Sperling
Fuel Cell Partnership

Daniel Sperling is Professor of Civil Engineering and Environmental Science and Policy and founding Director of the Institute of Transportation Studies at the University of California, Davis. He also holds the transportation seat on the California Air Resources Board and is chairman of the California Fuel Cell Partnership for 2013. He received a 2010 Heinz Award for his “achievements in the research of alternative transportation fuels” and is author or editor of 200+ papers and 12 books, including Two Billion Cars.
Road to Fuel Cell Vehicle Commercialization

Justin Ward
Toyota

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Fuel Cell OEM – Daimler

Bio and Photo not available at Time of Press

Uncovering the Progress on Fuel Cell Electric Vehicles

Lance Atkins
Nissan

Lance Atkins serves as Principal Engineer for the Nissan Technical Center North America, Zero-Emission Research department conducting hybrid, EV and fuel cell test activities at their Sacramento office. He has 18 years experience in electric and fuel cell vehicles including 12 years as Nissan’s representative to the California Fuel Cell Partnership. He holds a Bachelors in Mechanical Engineering and has conducted several multi-year field test & demonstration projects including the 1998 Nissan Altra EV program which provided the data basis for the 2011 Nissan LEAF design.

Abstract
Fuel Cell Electric Vehicle technology has been accused of perpetually being 10 years away. Although prolonged PR hype surrounding FCEV's has given this impression, a review of often obscured technical details gives a different impression. The presented technical details of Nissan’s fuel cell vehicle development along with anecdotes from test and demonstration experiences at the California Fuel Cell Partnership provide a sketch of the true advancements made in fuel cell vehicles over the last decade and the trends pointing to their zero emission future.
Alex Keros
GM
Alex Keros is a Senior Project Engineer for General Motors working on the development of alternative fuel infrastructure solutions. In this role he is responsible for hydrogen and electric infrastructure planning and implementation for GM’s Project Driveway and the launch of the Chevrolet Volt.

Alex has extensive background in the nascent hydrogen infrastructure industry. He has led the design, permitting, installation and operation of hydrogen stations in multiple regions, including California. He leads technical review and approval of all hydrogen fueling equipment and has experience and working relationships with every major hydrogen equipment provider.

Alex also works closely with Plug-in Electric Vehicle industry stakeholders, including the electrical utilities, to streamline the home charging installation process that is key to customer satisfaction and broad acceptance of plug-in vehicles. Alex is actively engaged in multiple electric vehicle forums and working groups, including co-chairing the PEV Collaborative Infrastructure Working Group.

Alex began his career in environmental consulting, managing the assessment and remediation of hazardous waste sites and has extensive experience in environmental policy design and implementation. Alex earned a B.S. in Natural Resource Management and a Masters in Business Administration from the University of Michigan in Ann Arbor.

Development and Demonstration of Hybrid Battery-Fuel Cell Systems on Heavy-Duty and Medium-Duty Commercial Vehicles

Peter Devlin
Department Of Energy

As Market Transformation and Intergovernmental Manager for the Fuel Cells Technologies Office within DOE Office of Energy Efficiency and Renewable Energy, Pete directs activities related to developing strategies and actions for commercializing technologies and fostering early technology adoption by government and industry. Prior to his current position of which he has been in for the past seven years, Pete was responsible for research and development in alternative fuel technologies including advanced combustion engine and fuel cell technologies for eight years at DOE. Also at DOE for eight prior years, he worked on developing technologies for large power generation systems. Pete spent the first 12 years of his career in private industry engineering electric power generation systems using natural gas and coal sources. Trained and educated as an industrial engineer, Pete received his Bachelors of Science degree from Virginia Polytechnic Institute.
Beyond Fuel Economy - The Ford Fusion Energi

Mazen Hammoud
Chief Engineer, Electrified Powertrain System, Ford

Dr. Mazen Hammoud is Ford’s Electrified Powertrain Systems Chief Engineer. He leads system sizing, supplier strategy, controls, and calibration for all HEV, PHEV, and BEV programs globally to deliver cost-effective best-in-class fuel economy and a superior driving experience. Mazen joined Ford Research in 1998 to lead camless engine development. He was nominated for the Ford Product Development Leadership Program in 2002 where he held positions in manufacturing and chassis system design. In 2003, he was appointed Powertrain Controls Hardware Manager delivering a cost and complexity reduction strategy for Powertrain control modules while improving quality.

In 2006, Dr. Hammoud was promoted to Powertrain Calibration Manager responsible for global gasoline powerpacks including the V6 and I4 EcoBoost applications. He delivered multiple programs that earned industry awards with best-in-class status for driveability and fuel economy at the heart of the One Ford turnaround strategy. He held this position until his most recent promotion in 2012.

Prior to joining Ford, Mazen spent 8 years at General Motors leading the small block V8 engine combustion system development and was awarded the GM Ph.D. fellowship. He taught heat transfer and fluid mechanics as part time Mechanical Engineering faculty at Lawrence Technological University in 1997-98.

Mazen has been an active member of SAE since 1991. He is an SAE Fellow and an SAE Foundation trustee. He has also served on the SAE International Board of Directors from 2007 to 2009 and as SAE Detroit Section Chairman in 2004 and 2005.

Dr. Hammoud holds a BS (WSU, 1991), MS (UoFM Dearborn, 1993), and Ph.D. (UoFM, 1996) in Mechanical Engineering and an MBA in Organizational Behavior (UoFM, 2000). He is the author of several technical papers and international patents and has participated in management panel discussions and delivered several industry speeches.

Abstract
Ford provides consumers a broad choice of electrified vehicles globally, including full hybrids, plug-in hybrids and all-electric vehicles. The 2013 model year Fusion Energi Plug-in Hybrid utilizes the third generation (Gen III) of Ford hybrid technology and builds off the nearly 500 patents Ford now holds for its hybrid technology. This presentation discusses the Ford Gen III hybrid powersplit architecture and components, as well as the charging capability and human machine interfaces used in the Fusion Energi Plug-In Hybrid.
Supplementary Discussions

Chair: John German
ICCT

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THEME: Technology Advances for HEV/PHEV Development

Ultracapacitors for Hybrid and Electric Vehicles

R. Shaw Lynds
Maxwell Technologies, Inc.

R. Shaw Lynds is a Sr. System Engineer at Maxwell Technologies Inc. Shaw is active in the development of next generation ultracapacitor modules and hybrid systems. He holds a BS degree in mechanical engineering from the University of California at Santa Barbara, and MS in Mechatronics from California Polytechnic in San Luis Obispo.

Abstract
It has long been proposed that ultracapacitors could be a benefit to hybrid and electric vehicles as either a replacement or as a complement to the batteries that dominate this market today. Not surprisingly, there have also been multiple studies and demonstrations conducted in a variety of technology fields, including automotive applications, that substantiate this proposed benefit. This paper looks at the range of requirements presented by the hybrid and electric vehicle market and compares them to the requirements posed by the hybrid transit bus market that has been much quicker to adopt ultracapacitor technology. A comparative analysis is then presented for a cross section of the energy storage architectures combining ultracapacitors and batteries, illustrating the benefits of each in consideration of the rigorous demands of the hybrid and electric vehicle markets. A consistent analysis approach is presented for comparing these different architectures, and a method is proposed for determining and quantifying which architecture is optimum for any proposed vehicle application. Finally this paper looks to the future of hybrid and electric vehicle industries and offers some thoughts and insights about how ultracapacitors could best be used in these future vehicles and their complex architectures.
Alexandra Cattelan  
Chief Engineer, AVL North America

Alex is the Chief Engineer at AVL North America for Hybrid and EV Vehicle and System applications. Prior to working at AVL, Alex worked for General Motors, primarily in alternative propulsion programs. She held several positions within General Motors including Assistant Chief Engineer on the Chevrolet Volt Program and Vehicle Performance Manger on the Midsize Hybrid Programs. She has successfully designed, developed and validated alternative propulsion technology, taking vehicles from concept to production.

Abstract

AVL has developed the EVARE (standing for: electric vehicle and range extender) – a demonstration vehicle for urban use that has an all-electric, emission-free range of 50 km. Yet it can go far further still than this: by using a range extender based on a rotary engine it has a total range of 250 km, giving it the flexibility to venture out of cities and on to the open road. As the high-voltage battery today still belongs to the most expensive and largest components, it needs to be optimized to suit normal daily driving requirements and, consequently, downsized significantly. The solution approach: combine the space-saving and cost-efficient HV battery with a smaller-sized range extender (RE) – a compact combination of rotary piston engine (RPE) and generator – which is integrated in a pure serial architecture and, in a manner of speaking, serves as the electric vehicle’s ‘spare fuel can’. This solution meets the demand for an affordable and compact battery as well as the customers’ need for an electric vehicle that has a total range of around 250 km and rapid “re-charging” capability.

Compact and low-NVH Range Extender

The RE utilizes the high energy density of fossil fuels by the internal combustion engine (ICE)-driven generator to deliver the additional electric energy for the customer expected total vehicle range capability. The paper summarizes the technical approach for the RE’s best ICE, generator and integration concept. Key parameters are derived from the intended vehicle concept and it’s relation of the battery electric driving to those driving conditions which need to be supported by the RE. The clear focus on the battery electric driving within the typical daily driving ranges requires other design priorities for the ICE of the RE than those known from conventional drivetrains. Noise, vibration and harshness, system weight, level of RE system integration and box dimensions for good packaging are in the lead, while the development effort for the best possible efficiency are of less importance because of the reduced contribution of the ICE operation within the daily driving ranges.

One forward looking approach to fulfill the unique RE requirements is introduced in detail by AVL’s completely new RPE design in a compact common-shaft assembly with the generator. The thermodynamic layout was carried out for EU6 emission legislation and a demanded electric output power of 15kW @ 5000rpm. The specific combustion chamber volume of 254ccm represents a compromise between the boundary conditions compactness, low fuel consumption, little wear and beneficial airborne sound emissions. The RE’s limited number of engine operation points allows optimizing the thermodynamic layout by Atkinson Cycle. The late exhaust-port opening and the extended expansion phase not only reduces exhaust-gas temperatures, improves specific fuel (sfc) and HC emissions, it also reduces the acoustic relevant pressure pulses in the exhaust system. The achievement of sfc and EU6 emission targets requires optimized engine start procedures which have been developed by comprehensive model based simulation and test-bed validation.

Intelligent operating strategy:

To make its operation as efficient as possible, an electric vehicle requires a complex electronic control system. Besides the AVL Vehicle Control Unit (VCU) which is in charge of all vehicle functions, general operation strategy and energy management the EVARE vehicle has further control systems for the electric traction motor, the battery and the RE. The need is to incorporate use-

continued on next page
based control intelligence. An example for this is the RE's intelligent operation control that ensures a sufficiently high battery charge condition in interurban operation for it then to be able to continue the drive through the city with zero emissions. Another application is the range mode where RE and battery work together in such a way to achieve maximum range. For this navigator, geodetic information and an analysis of the driver's habits can be considered. This means that a very compact RE is able to resolve the 'range anxiety' problem of today's electric vehicles that nonetheless still have high battery costs and thus overall vehicle costs.

Generally speaking, the intelligent operating strategy and an affordable purchase price are the key to widespread acceptance of all-electric vehicles. People have experienced in fleet operation that zero-emission driving in cities with a compact battery and RE is indeed possible. Therefore, the AVL EVARE concept is an enabler for customer oriented electric mobility.

Development and Operation of a Test Platform to Evaluate Lower-Energy Energy Storage Alternatives for Full-Hybrid Vehicles

Jeffrey Gonder
National Renewable Energy Laboratory (NREL)

Jeff joined NREL in 2005, where he has led both simulation and hardware testing projects to study conventional, hybrid, plug-in and fuel cell vehicles. His research interests include optimal design/size selection for the energy storage systems and other components in these advanced vehicles. Jeff also investigates the impact of drive cycle and intelligent vehicle technologies on fuel economy.

Jeff holds a B.S. in Mechanical Engineering from the University of Colorado and an M.S. in Mechanical Engineering from Penn State University. His work prior to joining NREL included developing a plug-in hybrid fuel cell vehicle for Anuvu (“A new view”), Inc. in Sacramento, CA.

Abstract

Automakers have been mass producing hybrid electric vehicles (HEVs) for well over a decade, and the technology has proven to be very effective at reducing per-vehicle fuel use. However, the incremental cost of HEVs such as the Toyota Prius or Ford Fusion Hybrid remains several thousand dollars higher than the cost of comparable conventional vehicles, which has limited HEV market penetration. The battery energy storage device is typically the component with the greatest contribution toward this cost increment, so significant cost reductions/performance improvements to the energy storage system (ESS) can correspondingly improve the vehicle-level cost vs. benefit relationship. Such an improvement would in turn lead to larger HEV market penetration and greater aggregate fuel savings.

In recognition of these potential benefits, the United States Advanced Battery Consortium (USABC) asked the National Renewable Energy Laboratory (NREL) to collaborate with a Workgroup and analyze the trade-offs between vehicle fuel economy and reducing the decade-old minimum energy requirement for power-assist HEVs. NREL's analysis showed that significant fuel savings could still be delivered from an ESS with much lower energy storage than the previous targets, which prompted USABC to issue a new set of lower-energy ESS (LEESS) targets and issue a request for proposals (RFP) to support their development. Following award of the USABC LESS development contracts, the Department of Energy (DOE) began supporting NREL to develop an HEV test platform for in-vehicle performance and fuel economy validation testing of the hybrid system using such LESS devices. This presentation will describe development of the vehicle test platform, and initial evaluation results using a lithium-ion capacitor (LIC) energy storage system (i.e., an asymmetric electrochemical energy storage device possessing one electrode with battery-type characteristics and one with ultracapacitor-type characteristics).
Gary Meyers
Magna eCar Systems

Gary Meyers has served as Vice President and General Manager of Magna E-Car Systems’ Components Group since 2011. In this position, Meyers is responsible for the groups EV/HEV electronics engineering and manufacturing operations in North America. Previously with Magna E-Car Systems, Meyers served as Executive Director Components Group, North America.

Over the course of his 16-year career, Meyers has developed a passion and expertise for product development, strategic planning, and the processes required for its effective execution. His technical background and experience serving in multiple technical, operational, and business capacities give him the ability to balance the operational efficiency and long range product planning required in the global automotive industry.

Prior to joining Magna E-Car Systems, Meyers was Director, Business Planning and Strategy for BluWāv Systems, acquired by Magna in 2008 to expand its alternative propulsion capabilities. In this role, Meyers was responsible for development of the company’s business plan, business development, and financial management.

Earlier in his career, Meyers held a variety of engineering and business development positions including Associate Engineer for Electronic Data Systems, Advanced Development Engineer and Product Marketing Specialist at Visteon, and Product Development Manager at WaveCrest Laboratories.

Meyers holds a bachelor's degree in Mechanical Engineering from the University of Michigan – Dearborn and master’s degrees in Product Development and Business Administration from the University of Detroit Mercy. He is a member of the Society of Automotive Engineers and Vistage Michigan.

Pierre-Emmanuel Strohl
Product Marketing Director
Valeo

As Product Marketing Director for the Valeo Powertrain Business Group, Pierre-Emmanuel is responsible for Valeo Powertrain product strategy. This include innovation such as dual clutch module, stop-start, 48V hybrid system, Air Intake Modules, electric supercharger and of course Electric motors and power electronics for Hybrid & Electric.

Prior to his current position, he was Marketing Manager in components for comfort & driving assistance at Valeo.

Before joining Valeo, he worked for Bosch in France. At Bosch, he was a part of Engine Management development programs for Renault & PSA.

Pierre-Emmanuel holds a Bachelor degree in Electrical Engineering ('96) from ESIEA Paris and an MBA ('00) from IAE in Paris.

 Plug in Hybrids, The Market Challenge to Meet 2025 regulation

Pierre-Emmanuel lives in the suburb of Paris, France. He was born on February 12th, 1972. He is married with 2 children.

Abstract
Powertrain electrification is an essential lever to achieve the 2017-2025 U.S. fuel economy standards.

Valeo’s assessment, through 4 different prospective scenarios, is that the U.S. market will need in all scenarios HEV and PHEV solutions for SUVs and full size sedans to comply with regulation targets.

Valeo’s P2 Hybrid Module is a Full & Plug-in hybrid module integrated between the engine block and gearbox. It comprises a dual mass flywheel, a damper, a dry clutch with electromechanical actuator, a 70kW water-cooled electric machine, and a combined inverter-charger.

As such, it converts any powertrain into a cost efficient Plug-in Hybrid.
Menahem Anderman
Advanced Automotive Batteries

Dr. Anderman’s career in the battery industry includes positions as technical director, director of business development, VP of technology, and VP and General Manager. Internationally known as an inventor, speaker, and advisor, Dr. Anderman has spent the last 14 years conducting single-client, multiclient and government-sponsored technology and market assessments of battery technologies and advanced vehicle energy-storage systems with the newest Multiclient Report: ‘The x-EV Industry Insider Report’ to be published March 2013. Dr Anderman founded and has been chairing the Advanced Automotive Battery Conference (AABC), which is now in its 13th year and, with its two annual events, attracts over 1500 delegates.

Zhengcheng Zhang
ANL

Dr. Zhang is a principle chemist and a team lead at Argonne National Laboratory. His current research focus is to develop advanced electrolyte technology for Li-ion battery for PHEV/EV applications, including high voltage electrolyte, SEI passivation additive, and redox shuttle additive. He also has expertise in the organic cathode materials and batteries beyond lithium ion including Li-air and Li-S. Dr. Zhang has published more than 50 papers in the peer-reviewed journals and was invited to speak on various conferences in the field of energy storage.

Abstract

Low-voltage HEV configurations
Energy-storage options for low-voltage systems
High-voltage hybrid expansion
Li-Ion batteries for HEVs current status and future prospect.
HEV vehicle and battery market forecast

Advanced Lithium Battery Electrolytes for PHEV/EV Application

Abstract

Tremendous progress has been made in the field of the Li-ion battery electrode material. To accommodate the material development, tailored electrolytes with improved safety, high voltage stability and high power are in great need for the vehicle batteries. In this talk, new electrolyte technologies recently developed at Argonne will be presented, including electrolyte for high operating voltages (i.e. 5V vs Li+/Li), redox shuttle for overcharge protection and electrolyte additive for stabilized electrolyte/electrode interfaces.
WEDNESDAY AFTERNOON
February 20, 2013

Energy Storage Systems Panel Discussion

Moderator: John German
ICCT

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THEME: Batteries: Still the Limiting Factor?

Prismatic Cell with Optimized Electrode Materials for Electric Vehicle

SungHoon Kim
Samsung

Date of Birth: 23 Mar., 1969
Scholarship: A master of inorganic chemistry
Responsibility: Principal engineer who responsible for high power cell development

Experiences: 16.5 years in lithium ion battery field, First 9.5 years for consumer cell (electrode design & failure analysis) Later 7 years for xEV cell (chemistry design & validation). Currently controlling several power cell projects for HEV.

Abstract:
Samsung SDI have developed prismatic cells for electric-vehicle use. To achieve the best cell performance, SDI have tried many of electrode materials and found an optimum material combination. SDI would like to suggest NCM and Graphite combination for realizing excellent characteristics where 4 main areas, capacity, power, life and safety.

SDI have adapted this combination for two kinds of cell type, PHEV and HEV cell. Especially SDI has been developed prismatic cells with a focus on the most competitive chemistry design. This presentation will introduce the main cell performances based on SDI own cell design.
Energy Storage Systems Panel Discussion - continued

Advanced Battery Systems

Bob Taenaka
Technical Leader
North American Product Development Ford Motor Company

Bob Taenaka is a technical leader in Advanced Battery Systems at Ford Motor Company, responsible for battery cell selection/validation in support of Ford's present and near-term future production hybrid and electric vehicles. Bob's team also carries out battery system sizing, performance, and life modeling/validation activities. In this role, Bob is also responsible for technical oversight of battery cell suppliers, helping to bring their cell design and manufacturing quality processes to automotive standards.

Prior to joining Ford in 2001, Mr. Taenaka spent 18 years with Hughes Space & Communications, serving as battery engineer for the Galileo Probe mission to Jupiter; principal investigator or program manager for several nickel-hydrogen and sodium-sulfur battery development efforts; a lead engineer in development and production implementation of high-capacity nickel-hydrogen cells for Hughes satellites; and responsibility for satellite customer and ground station in-orbit support on battery usage.

Dr. Prabhakar Patil
Chief Executive Officer, LG Chem Power, Inc. (LGCPI)

Prabhakar Patil is chief executive officer (CEO) of LG Chem Power, Inc. (LGCPI), the North American subsidiary of lithium-ion battery-maker, LG Chem (LGC), Korea. In this position, he has overall responsibility for the strategic direction, business development, engineering, and manufacturing activities of the company.

Prior to joining LGCPI in 2005, Dr. Patil spent his entire professional career of 27 years at Ford Motor Company in various engineering and management positions.

He served as chief engineer for Ford’s Hybrid Technologies during 2003 and was also chief engineer for the Ford Escape Hybrid from 1998 to 2003.

Dr. Patil received his undergraduate degree from IIT, Bombay, and his PhD in Aerospace Engineering from The University of Michigan, Ann Arbor. He has 12 patents, published 25 articles and received the Henry Ford Technology Award in 1991 for his work in Electric Vehicle Powertrain Development. He was elected a Fellow by the Society of Automotive Engineers (SAE) in 2007.
Energy Storage Systems Panel Discussion - continued

Tom Watson
Vice President and Vehicle Systems Domain Leader
Johnson Controls Power Solutions

Career: Tom Watson serves as the Vice President of Advanced Systems Optimization at Power Solutions. He is responsible for leading the development of new technologies to support the Start-Stop and HEV application segments which will enable further optimization levels for OEM vehicle systems. In his three years at the company, Mr. Watson has held positions in engineering, technical planning, and R&D. Prior to joining Johnson Controls, Watson spent two years at ArvinMeritor as Vice President of Engineering and Technical Planning for the Light Vehicle Systems business.

Kenji Takahashi
Toyota

Kenji Takahashi is an Engineer in battery monitoring and management system with combined experience in electrochemical analysis and mathematical / computer modeling of Li-ion batteries. Kenji has been with the Toyota Motor Corporation in the Hybrid Vehicle Battery Unit Development Division since 2007. He attended the Osaka Prefecture University from 1999-2007 where he completed his Ph.D. in Chemistry with materials Science. In his current role at Toyota Motor Corporation, he is responsible for the development of battery monitoring and management systems, elucidation of degradation mechanism of Li-ion batteries and the electrochemical degradation modeling of Li-ion batteries.

Takahashi was awarded with the best presentation at the 84th Annual Meeting of the Chemical Society of Japan in 2005, the best student presentation at the 85th Annual Meeting of the Chemical Society of Japan in 2006 and the best post award at the 4th Symposium of Japanese Sol-Gel Society in 2006.

Menahem Anderman
Advanced Automotive Batteries

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Watson also spent 18 years at Ford, eight of which were focused on leading global systems integration of hybrid electric and fuel cell vehicles. He served as Chief Engineer of the 2006MY Ford Focus FCEV and as Hybrid Propulsion System Manager of the 2005MY Ford Escape Hybrid among other positions.

Awards, Recognition and Service: Watson was named “Engineer of the Year” by Design News for his efforts in leading the Escape Hybrid team to deliver best-in-class fuel economy and emissions for an SUV. He has served on various committees and boards throughout his career.

Education and Background: Watson holds a Bachelor of Science in Mechanical Engineering from the University of Illinois and a Masters of Business Administration from the University of Michigan.
Angus Lyon
Drayson Racing Technologies

Over 20 years, Angus has gained extensive experience of all areas of the automotive and motorsport industries. Starting at Rover/BMW developing active suspension systems he then moved to Prodrive developing engine, transmission, vehicle dynamics and hybrid technologies for road and rally cars. 8 years in F1 motorsport followed developing all aspects of chassis control systems with Honda and championship winning teams Renault F1 and Brawn. Angus then moved to Protean Electric developing in-wheel electric motors and vehicle control and safety systems. In 2010, Angus joined Drayson Racing Technologies to head up electric drivetrain technology development.

Abstract
Formula E, the first FIA EV world championship commences in 2014 and will provide a platform for accelerated development of EV technologies as well as raising the profile and appeal of EVs worldwide. In this talk, Angus Lyon, from Drayson Racing Technologies will explain how motorsport and a motorsport approach to engineering can speed up development of technologies to the benefit of the automotive industry. Giving examples from their own projects including the fully electric LMP race car the ‘B12’ Angus will show how electric racing and its contribution to the greater development of EVs is becoming a reality.

John Voelcker
High Gear Media

John Voelcker is an automotive journalist and industry analyst. He specializes in advanced technologies, particularly powertrains and the energy policies that affect them. As senior editor at (venture-funded) High Gear Media, he edits GreenCarReports.com and contributes to TheCarConnection.com and MotorAuthority.com. His work also appears in Wired, Popular Science, Technology Review, IEEE Spectrum, and other periodicals, and he is a regular guest on Fox Car Report and Sirius Satellite Radio. He covers the market prospects for electric-drive vehicles between now and 2025 for UK industry analyst Just-Auto, and has been invited to speak on that topic to automakers and at industry events. John received a bachelor’s degree in Industrial Engineering from Stanford University. He splits his time among New York City, San Francisco, and the Catskill Mountains, and still has hopes of becoming an international man of mystery.
Abstract

Many automakers have released models or released launch plans for plug-in hybrid electric vehicles. With an increasing demand for luxury electric vehicles, a need for more convenient charging solutions has emerged. To meet the needs of EV owners for safe, reliable, and convenient vehicle charging, Evatran Group of Wytheville, VA will launch its Plugless Power Level 2 wireless charging system for Volts and Leafs in 2nd quarter 2013. Information about the system design, vehicle integration, and user interaction with the Plugless Power system will be shared, including basic design decisions for methodology of power transfer, control, communications, alignment, and operator feedback.

Wireless Charging Guideline, SAE TIR J2954: Performance, Safety and Interoperability Considerations for the wireless charging of plug-in vehicles

Jesse Schneider
BMW

Over 18 years in the automotive industry, Mr. Schneider held leading engineering project roles in the area of electric and fuel cell vehicles internally at German OEMs and suppliers and holds patents in these areas. Prior to this, he worked in conventional vehicle engineering production projects from systems development to full vehicle integration engineering.

Externally, he has served externally in several standard organizations teams and partnerships, such as the Society of Automotive Engineers, US Department of Energy Technology Teams, USCAR, and the California Fuel Cell Vehicle Partnership.

Since 2001, Mr. Schneider has spearheaded a number of worldwide-first collaborative efforts to bring zero emission vehicles to market within these organizations. Specifically, he established the first FCEV vehicle emergency response guidelines, unified fueling connector, communications and fueling protocol and quality for the hydrogen vehicle which are now harmonized worldwide between ISO & SAE.

Jesse Schneider is currently the Manager of Development for EV, Fuel Cells and standards for the BMW North America. He recently moved from BMW's central office Group's Clean Energy Systems Department in Munich, Germany where, he was responsible for technical specifications for the high voltage electric, storage systems, fuel cell and vehicle integration.

In 2010, Jesse Schneider established the SAE J2954, the Wireless Charging and Alignment Taskforce, a coalition of automotive OEMs, wireless charging suppliers, infrastructure efforts, universities, and national laboratories from each continent working together to make an international standard.
Dr. Michael Tamor
Executive Technical Leader for Energy Systems and Sustainability Research
Ford

Mike Tamor is Executive Technical Leader for Energy Systems and Sustainability Research at Ford. His present activities are focused on global electrification, renewable fuel, and sustainable energy systems research. He also leads materials and system design research targeting true commercialization of fuel cell propulsion technology. Previously Dr. Tamor led Ford’s research on hybrid-electric vehicle and electric vehicle propulsion technologies. He led a hybrid-electric vehicle program by Ford, the Midwest Research Institute, and the U.S. Department of Energy that developed the P2000 lightweight aluminum hybrids and the 80 mpg Prodigy hybrid concept. He also developed and brought to concept readiness the Ford plug-in hybrid electric vehicle system now in production as the C-max and Fusion Energi hybrids. Dr. Tamor began his work at Ford in 1982 in the Physics Department of the Scientific Research Laboratory before joining the Alternative Power Source Technology Department in 1994. He is a Fellow of the American Physical Society, has published over 60 referred journal articles, authored chapters in four books, and holds over 25 patents. He obtained a BS in Physics from UCLA and a PhD in Physics from the University of Illinois at Urbana-Champaign.

Abstract
The attractions of electric vehicles - zero-emissions, efficiency and silence - are offset by their limited range and long ‘refueling’ time. At present, nearly all discussion of how many customers might accept an EV, and how much fuel they would save in so doing, is based on such simplistic – and very popular - as ‘because 70% of all daily travel is accomplished in less than 100 miles, mass deployment of 100 mile EVs will electrify 70% of all travel.’ Such statements are based on collections of one-day travel reports such as the National Household Travel Survey, and so effectively ignore the complexities of individual needs. We have analyzed the day-to-day variations of individual vehicle usage in multiple regions and draw very different conclusions. Most significant is that limited EV range results in a level of inconvenience that is likely to be unacceptable to the vast majority of vehicle owners, and for those who would accept that inconvenience, battery costs must be absurdly low to achieve any economic payback. In contrast, the plug-in hybrid (PHEV) does not suffer range limitations and delivers economic payback for most users at realistic battery costs. These findings appear to be universal in developed nations, with labor market population density being a powerful predictor of personal vehicle usage. This ‘scalable city’ hypothesis may prove to a powerful predictor of the evolution of transportation in the large cities of the developing world’.

Global Vehicle Usage Studies – Who Can Really Use an Electric Car?
Predictive Evaluation of EV Performance in an Urban Taxi Fleet

PT Jones
ORNL

P.T. Jones is a recent addition to the R&D Staff at Oak Ridge National Laboratory. Mr. Jones is involved in vehicle systems research supporting the DOE’s Vehicle Technologies Program, and is also an active participant in the Green Racing Working Group. P.T. has been performing vehicle testing, research and design for more than 18 years. He began his automotive career at Automotive Testing Laboratories in Mesa, Arizona as a project and test engineer working primarily on EPA vehicle testing and protocol. This work led to an opportunity with General Motors, where he worked as a design and release engineer for alternative fuel systems, a development engineer for multiple programs at both the Milford and Desert Proving Grounds and was the engineering program manager for the GM/DOE sponsored Challenge X competition until he left the automotive industry. Mr. Jones spent 4 years in the marine industry providing engineering management and test support before returning to clean automotive technologies consulting with Sentech, Inc. in 2009, which transitioned into a direct ORNL position in November 2010. He earned a Bachelor of Science degree in Aerospace Engineering from Iowa State University in 1990.

Abstract
In support of an upcoming field evaluation of Electric Vehicles (EVs) outfitted for deployment in taxi service by the New York City Taxi and Limousine Commission (NYCTLC), previous field and laboratory data was used to create appropriate drive cycles and math models for the proposed vehicle. Approximately 3000 trips taken by a Ford Hybrid Escape operating as a NYC taxi cab were recorded by Ricardo and used in this study. ORNL has developed a drive cycle generation (DC_Gen) tool capable of creating appropriate drive cycles using time speed data as the input. Laboratory test data obtained from testing done by Argonne National Laboratory on a Nissan Leaf EV over conventional drive cycles was used to correlate the basic Leaf EV simulation created in Autonomie by ORNL researchers. After validation of the math model and evaluation of the generated drive cycles, the math model was exercised over variations of the drive cycle. Further, estimations were made with regards to the impact on energy consumption for HVAC use in taxi service; appropriate in-lab observations were used to confirm the HVAC impacts. The model was then run using variations to the expected power loads on the vehicle to provide information confirming the suitability of a Nissan Leaf powertrain for taxi application. Although this example used data specific to NYC, it is expected that these results are sufficiently close to other major urban cities in North America to shed light on the appropriateness of EVs for broad application in taxi service in major metropolitan areas.

The results of the simulations were presented to the NYCTLC, DOE and INL in support of the pending EV taxi service evaluation, expected in 2013. Based on the performance projections of this study, the NYCTLC is considering certain route limitations and charging locations that will facilitate EV introduction into taxi service in New York City. These kinds of accommodations to current operating procedures are likely to be necessary for successful EV use in taxi service in other metropolitan areas. It is expected that the results of this study will be correlated with actual vehicle data from in-service operation beginning next year.
Chevrolet Spark Electric Vehicle Propulsion System

Steve Tarnowsky
GM

Steven Tarnowsky joined General Motors in 1994 where he has worked in areas of battery charging systems, electrical safety, validation and program management on numerous electric and hybrid-electric vehicle programs including the EV1 and eAssist. Mr. Tarnowsky is currently the Engineering Group Manager for Electrification Architecture.

Prior to joining General Motors, Mr. Tarnowsky was employed by GM Hughes Electronics Corporation. While at Hughes, he spent four years as a Senior Systems Engineering Consultant to General Motors and four years as a systems engineer on the NASA Magellan mission to Venus.

Mr. Tarnowsky earned a bachelor’s of science degree in electrical engineering from the University of Michigan and a master’s of science degree in electrical engineering from the University of Southern California. He is also a licensed Professional Engineer in the state of Michigan.

Mr. Tarnowsky has been happily married for the past 27 years and has three children. When not working or with his family, Mr. Tarnowsky spends his spare time on his passion for music as a guitarist and singer / songwriter.

Hybridisation and Electrification for Premium Luxury Vehicles

Paul Bostock
Jaguar/Landrover

Mr. Paul Bostock has worked in Jaguar Land Rover for 22 years. Starting in electrical and electronic engineering, in various technical roles including power supply, integration and networks, and concept architectures, Paul has been involved with vehicle hybridisation and electrification for 15 years. In 2005, he became a founding member of the Jaguar Land Rover hybrid engineering group with responsibilities for systems design. More recently he has been leading the hybrids and electrification strategic planning function.

David Patterson
Mitsubishi

Mr. Patterson is Mitsubishi Motors R&D’s Chief Engineer responsible for Mobile Emissions Certification and Regulatory Affairs. As the technical and government liaison for vehicle emissions compliance in North America, he maintains Mitsubishi’s new vehicle certification, Federal and State vehicle emission compliance, and in-use vehicle issues.

Dave obtained a Bachelor of Science in Mechanical Engineering from California State University Fresno. He is a Professional Engineer of Mechanical Engineering licensed by the State of California and a member of the Society of Automotive Engineers.
Mr. Koichi Shinmura  
Senior Chief Engineer  
Honda R&D Co., Ltd.  
Automobile R&D Center  
1985 - 2002: Research and development of a gas turbine engine in Wako research center.  
2003 – 2005: Manager of electric power plant research division  
2006 – 2008: Transferred Automobile R&D Center, Senior Manager of Fuel-cell vehicle research and development division  
2009 - 2010: Operating Officer and General Manager of the electric power plant research and development division.  
2011 - Current: Planning of electric power plant development and strategy of the hybrid vehicle and EV.

John Schnoes  
Director Electrical & Electronics  
Nissan Technical Center North America  
April 2007 – Present (5 years 10 months)Nissan Technical Center North America  
Manager Electronics Design  
Nissan Motor Company  
April 2002 – March 2007 (5 years)  
Design Manager  
Visteon Corporation  
1999 – 2002 (3 years)  
Systems Design Engineer and Supervisor  
Ford Motor Company  
1993 – 1999 (6 years)  
Education  
Michigan Technological University  
BSME, Engineering  
1986 – 1991  
Activities and Societies: Jazz Band

BMW Electric Mobility

Jesse Schneider  
BMW  
See Page 36 for Bio
OEM Panel Discussion

Moderator: Craig Childers

See Page 4 for Bio

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