

Welcome to PHEV News, the latest news and information on Plug-in Hybrid Electric Vehicles program at The Ohio State University, Center for Automotive Research.

The [Center for Automotive Research](#) at [The Ohio State University](#) has launched a new program focused on Plug-in Hybrid Electric Vehicles (PHEVs), Electric Vehicles (EVs) and intelligent charging.



Inaugural Meeting of Members

SMART@CAR will hold its first Advisory Board meeting in the afternoon (12-5 pm) of Thursday, October 23, 2008 at CAR. This initial meeting will “welcome” all SMART@CAR members, as well as those organizations that have recently been invited to join SMART@CAR.

A Novel Approach to an Exciting Opportunity

By Scott Potter – Senior Energy Advisor, OSU Institute for Energy and the Environment

Electric cars are not a novel idea. Thinking about electric propulsion as a possible way to address the current energy and environmental challenges facing our nation may be novel, but perhaps also much closer to reality than one might think. SMART@CAR offers a comprehensive interdisciplinary approach to the research and development of plug-in cars that is truly novel. The Ohio State University's Institute for Energy and the Environment and OSU's College of Engineering made the decision to support the SMART@CAR program because this program brings together the broad array of stakeholders necessary to collaboratively develop not just an economically viable plug-in electric hybrid vehicle (PHEV), but also the support systems, life-cycle plans, infrastructure, and public policies that are necessary to successfully deploy, operate and maintain PHEVs.

PHEVs may offer more than relief at the local gas pump. Terry Boston, President, and CEO of PJM Interconnection, in his July testimony to the U.S. Senate Energy and Natural Resources Committee, succinctly highlighted the potential of the PHEV beyond the gas pump.

Plug-in hybrid vehicles represent an exciting new opportunity to provide both ancillary services to the grid and utilize the power system assets more efficiently. If done right, plug-in hybrid vehicles can enhance the efficiency of the grid by shifting load to off-peak nighttime hours. On the other hand, if everyone plugs in their car at 5 p.m. and there are no economic incentives or communication and control technology to drive different customer behavior, then we could be worse off.

PHEVs may be just the vehicle we have been looking for to reduce our transportation need for oil, improve the efficiency and reliability of our electricity transmission system, and reduce greenhouse gas emissions. The OSU Institute for Energy and the Environment and OSU's College of Engineering believe we all have a responsibility to engage in bold and immediate research that may hold such grand benefits in the not so distant future.

Founding Members

- American Electric Power
- CAR Industrial Research Consortium (Caterpillar, Chrysler Motors, Eaton, Ford Motor Company, General Motors Corporation, Hitachi, Oshkosh Corporation, and TRC Inc)
- Duquesne Light Company
- Juice Technologies, LLC
- The Ohio State University- College of Engineering
- Vanner, Inc.

Affiliates

- Buckeye Power, Inc.
- BottomLine Resource Technologies LLC

The following organizations are currently evaluating our request for participation:

- Argonne National Laboratory
- Dayton Power and Light
- Duke Energy
- Electric Power Research Institute
- Honda
- Hyundai Kia
- Nissan
- PJM Interconnection, LLC
- ST Microelectronics
- Toyota

News

In search for alternative solutions to the rising cost of transportation fuels, Channel 6 WSYX, local ABC affiliate, visited and interviewed Giorgio Rizzoni (OSU-CAR) and Rich Housh (Juice Technologies) to learn about plug-in hybrid-electric vehicles and smart grid technology. [Watch the video.](#)

SMART@CAR: Meetings and Events

Special sessions on PHEVs and intelligent charging at 2008 IEEE International Conference on Vehicular Electronics and Safety

September 22-24, 2008, Columbus Ohio, USA.

SMART@CAR organized an invited session on *Plug-in hybrid electric vehicles: technology and control* and a panel discussion on *Plug-in hybrid electric vehicles and the Smart Grid: industry-government-university partnerships*.

The focus of the sessions was on technical and control challenges for the engineering community, both on the vehicle and on the infrastructure side. [Session Program.](#)

Panel discussion speakers:

- Giorgio Rizzoni, Director, *Center for Automotive Research, The Ohio State University*
- Larry Dickerman, Director, Distribution Engineering Services, *American Electric Power*
- Madhu Raghavan, Manager, HEV Architectures, R&D Planning, *General Motors Corporation*
- Justin Ward, Advanced Powertrain Program Manager, *Toyota Motor Engineering & Manufacturing North America*
- Rich Housh, President, *Juice Technologies LLC*

The following papers were presented during the technical session:

- *Energy and Economic Evaluation of PHEVs and Their Interaction with Renewable Energy Sources and the Power Grid*, V. Marano and G. Rizzoni, Center for Automotive Research, The Ohio State University
- *Computationally Efficient Optimal Power Management for Plug-In Hybrid Vehicles Based on Spatial Domain Two-Scale Dynamic Programming*, Q. Gong (Univ. of Wisconsin-Milwaukee), Y. Li (Univ. of Wisconsin-Milwaukee), Z. Peng (Univ. of Florida)
- *Impact of Battery Sizing on Stochastic Optimal Power Management in Plug-In Hybrid Electric Vehicles*, S. Moura, D. Callaway, H. Fathy, J. Stein (Univ. of Michigan)
- *The Road to Electrification for Specialty Vehicles*, A. Cook, Vanner Incorporated

CAR Industrial Research Consortium projects review:

The 2007-08 annual [CAR Industrial Research Consortium](#) projects review was held on September 18th at the Ford Motor Company Research and Innovation Center, Dearborn, MI. Invitees included representatives from Caterpillar, Chrysler Motors, Eaton, Ford Motor Company, General Motors Corporation, Hitachi, Oshkosh Corporation, and TRC Inc . Among the several projects presented two are related to SMART@CAR activities:

- Aging characterization and life extension oh PHEV batteries (Y. Guezennec, V. Marano, G. Rizzoni)
- Energy Management of PHEVs (V. Marano, G. Rizzoni)

Current and prospective partners:

- Representatives from [PJM](#) visited CAR on August 5th to discuss the involvement of PJM in this program.
- Representatives from [Vanner, Inc.](#) visited CAR on August 6th to discuss the involvement of Vanner, Inc. in this program.

Current Research:

• Vehicle and energy storage technology

Battery testing both at cell and module level, battery aging and management, power electronics, V2G and V2B interface and communications, smart charging and charging devices, charging protocols, etc.

• Modeling and simulation

1. Vehicle design, energy management and control strategies for PHEVs

Tools for PHEV vehicle design, energy analysis and energy management, with the aim of analyzing the effect of vehicle characteristics and control strategies on performance, fuel economy, range and battery life.

2. PHEVs and their interaction with renewable energy sources and the grid

Model interdependencies between PHEVs and the grid. Energy cost, investment and benefits modeled as a function of load, renewable available energy, energy markets, policy, etc.

- **Peak and off-peak:** analysis of charging/discharging at different time of the day; effects on grid load, economics and overall emissions.
- **Charging via renewable energy:** effects of charging vehicles via renewable energy. Benefits and barriers for renewable based charging and opportunities for zero emissions ecosystems.
- **V2G (vehicle to grid), V2H (vehicle to home) and V2B (vehicle to building) value propositions study:** grid operations, backup power, ancillary services, power quality benefits, demand response, parking lots and garages, rental fleets, university campuses etc.

• Macroeconomics and regulations/policy

Study the effect of current regulatory policy on EV and PHEV and provide advice for state and national public utility regulation and energy policy. With proper price signals and interactive communication, the implementation of EV and PHEV should increase the utility's overall load factor, thereby decreasing overall utility costs and increasing the utility's return on its existing infrastructure. To enable the use of wind, solar, and fuel cell generation by PHEVs, public utility regulation needs to address interconnection and pricing issues, such as net metering of surplus power, back-up generation, dynamic pricing that allows for off-peak or real time prices, emergency back-up power, and rates for demand responsive load. Properly designed regulation can provide the utility with an incentive to provide these benefits, while also passing on an overall benefit to those implementing EV and PHEV.

- **Fleet studies**

Development of standards for data formats and acquisition systems, so that data collected across pilot studies can be meaningfully managed. By 2009 a fleet of 10-20 PHEVs is expected to be available in Columbus area; a detailed set of data related to real world duty cycles and battery aging will be collected and shared with the members. Standards and protocols will be provided so that data can be uploaded on our server, organized, processed and used for modeling purposes. The availability of real world data will also help estimating the effects of PHEV penetration into the automotive market on the power grid, in terms of economics, emissions and load.

The program will provide a database and knowledge repository function for its members, including the ability to upload and download data on a secure website.

Contact Information

For additional information and to join the program, please visit SMART@CAR website or contact:

Dr. Vincenzo Marano, Program Manager

OSU CAR, 930 Kinnear Road

Columbus, OH 43212

marano.8@osu.edu

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