

May 18-23, 2012 » Year One Competition » Los Angeles, CA



North America's Premier Collegiate Automotive Competition



DESIGN AND SIMULATION
YEAR ONE

Dear Participants and Friends of EcoCAR 2:

The U.S. Department of Energy is pleased to host what promises to be our best Advanced Vehicle Technology Competition yet. Now approaching a quarter-century of vehicle competition sponsorship, we continue to look forward to aiding in the development of students who will go on to find innovative approaches that meet our energy and transportation challenges.

It is through programs like EcoCAR 2, that we educate the students who will develop clean alternative energy transportation technologies that use less petroleum and further strengthen our energy security. The work that EcoCAR 2 participants are doing is so important. Given a conventional gasoline vehicle, students are challenged to apply their innovative spirit and technical knowledge to make it cleaner and more fuel-efficient, without compromising safety or performance. No easy task.

This year, President Obama was able to see first-hand the amazing efforts the students of this program are accomplishing when he visited The Ohio State University's EcoCAR 2 team. During his tour, the President noted that the work the students have done is a testament to their ingenuity and demonstrates what is essential to American leadership when it comes to energy – our brain power.

In this first year of the three-year competition, students have been hard at work designing their advanced vehicle architectures through modeling and simulation. After many hours of studying, designing, simulating and testing, students will put forth their best at the competition finale in Los Angeles, where their creative solutions will be judged by government and industry experts.

Through the years, one thing is evident – this program could not exist without the dedication and commitment of the EcoCAR 2 sponsors. It is this type of collaboration between government, industry and academia that propels these students forward making it the perfect preamble to future job success and a catalyst for workforce development in the United States.

We look forward to the exciting outcome of the competition and we are certain the results will continue to build on the success of previous Advanced Vehicle Technology Competitions.

Sincerely,

Patrick B. Davis

Program Manager
Vehicle Technologies Program
Energy Efficiency and Renewable Energy
U.S. Department of Energy

Dear Competitors and Friends of EcoCAR 2:

Welcome to EcoCAR 2 Year One Finals!

On the heels of EcoCAR: The NeXt Challenge, we're excited for our EcoCAR 2 students to take their stride this year at the year one finals in Los Angeles, California.

Rounding out the first full year of the program, students from the 15 universities have begun their three-year journey to optimizing a practical, realizable solution to energy efficiency and reduced emissions. They have done their homework – researching, comparing and selecting the appropriate advanced propulsion technologies. They have developed hardware, tested their powertrain and subsystems that they will integrate into 2013 Chevrolet Malibu next year.

We're excited that they are working on the all new 2013 Chevrolet Malibu. Their work on this vehicle is especially relevant, as consumers are moving toward smaller, more fuel-efficient vehicles. They are replacing the vehicle's already fuel-efficient four-cylinder engine and six-speed transmission with one that pushes efficiency and innovation to the next level.

As we continue to investigate ways to improve energy efficiency and reduce emissions industry-wide, these students are learning the practice and technology that engineers use every day. They are the future of the automotive industry, whose innovation can move us toward a cleaner, more fuel efficient future.

For this first year of the competition, the students' goals are to convey to sponsors, competition judges and organizers that their hardware and powertrain systems will reduce tailpipe emissions and fuel consumption, without compromising real world performance or safety. This is no easy feat. As we look forward to another two years of the program, we would like to thank everyone involved for their hard work – from our co-headline sponsor, the U.S. Dept. of Energy, to the 15 competing teams, and our 25 industry, government and academic partners whose support of this competition ensures its continued success.

Again, congratulations to the teams for their success thus far. We're eager to see your work and good luck over the next two years!

Sincerely,

Mary Barra

Senior Vice President, Global Product Development
General Motors Company



EcoCAR2

PLUGGING IN TO THE FUTURE

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EcoCAR 2: Plugging In to the Future

Design and Simulation

Since EcoCAR 2: Plugging In to the Future kicked off in April 2011, the 15 participating North American university teams have been hard at work modeling and designing their advanced propulsion technologies to incorporate in a General Motors-donated vehicle.

Their challenge is to reduce the environmental impact of a 2013 Chevrolet Malibu by improving its fuel efficiency and reducing its emissions while retaining its performance and consumer appeal.

The competition is modeled after GM's real-world vehicle development process (VDP) and is broken down into three academic years, each focusing on a different stage in the VDP:

Year 1: The teams select vehicle architectures by using modeling and simulation. They use hardware-in-the loop (HIL) simulators to develop and test their control strategies.

Year 2: The teams turn virtual designs into functioning prototype vehicles.

Year 3: The teams refine their vehicles to near-showroom quality.

Year One of the competition series emphasizes vehicle engineering and design. During this time, the teams select and modify the vehicle architecture that they designed, and as well as develop their control strategy through the use of controller HIL tools. The teams also design major subsystems, including hybrid powertrain, energy storage, thermal management, and high-power electrical systems.

During Years Two and Three, students will build the vehicle designed through their modeling efforts in Year One, and they continue to refine their simulation, testing, and hardware-control efforts while improving vehicle efficiency and functionality. The teams will deliver a running "mule" vehicle in Year Two. In Year Three, the focus is on improving the vehicle's operation and on refining and validating the vehicle simulation models with the test data from the vehicles they have built.

The teams will showcase their final vehicle designs at the Year One Competition held in Los Angeles, California, on May 18–23, 2012. Here they will participate in more than a dozen static events for more than \$100,000 in cash prizes from industry sponsors.

The headline sponsors — the U.S. Department of Energy and General Motors — have brought together this unique coalition of people from government, industry, and academia in order to explore sustainable vehicle solutions and to provide a new generation of engineers with real-world experience and training. Thus the EcoCAR 2 program will seed the automotive industry with hundreds of engineering graduates who have actual experience in designing and building green vehicles, and it is helping these students to be better prepared for the transportation- and energy-related challenges expected in the 21st century.

We encourage you to follow the teams during the Year One Competition and discover how they are contributing to future innovations in vehicle technologies.

Technical Goals

The technical goals are to design and integrate vehicle powertrains that, when compared to the production gasoline vehicle:

- ▶ Incorporate technologies that reduce petroleum energy consumption on the basis of a total-fuel-cycle well-to-wheel (WTW) analysis;
- ▶ Increase vehicle energy efficiency;
- ▶ Reduce WTW greenhouse gas (GHG) and criteria emissions;
- ▶ Maintain consumer acceptability in the areas of performance, utility, and safety.

Vehicle Architectures

All student-designed EcoCAR 2 vehicles are plug-in hybrid electric vehicles (PHEVs), which deplete an on-board battery to displace vehicle fuel. The powertrain components are configured to drive the vehicle in five unique combinations:

- ▶ Split-parallel,
- ▶ Series-parallel,
- ▶ Parallel through the road (PTTR),
- ▶ Series, and
- ▶ Hydrogen fuel cell series.



Team Architectures

EcoCAR 2 teams unveiled their vehicle architecture designs in February 2012. All EcoCAR 2 vehicles are plug-in hybrid electric vehicles (PHEVs), which deplete an on-board battery to displace vehicle fuel. The powertrain components are configured to drive the vehicle in five unique combinations: split-parallel, series-parallel, parallel through the road, series, and hydrogen fuel cell series.

Team	Architecture	Fuel	Power Plant	Generator*	Front Transmission	Front Traction Motor*	Rear Transmission	Rear Traction Motor*	Battery	kW-hr	Nominal Voltage
CALIFORNIA STATE, LOS ANGELES	PTTR PHEV	E85	GM LE9 2.4 L	N/A	GM 6T40	N/A	MAGNA E-DRIVE		6X15S3P	16.2	292
COLORADO STATE UNIVERSITY	FUEL CELL PHEV	H2	CUSTOM BUILT 4 KW FUEL CELL STACK		BORG-WARNER E-GEAR DRIVE	UQM PP 145 KW	N/A	N/A	7X15S3P	18.9	340
EMBRY-RIDDLE AERONAUTICAL UNIVERSITY	SERIES PHEV	B20	GM LUD 1.7 L	REMY HVH250-090S	GKN ETRANSMISSION	REMY HVH250-090S	N/A	N/A	6X15S3P	16.2	292
MISSISSIPPI STATE UNIVERSITY	SERIES-PARALLEL PHEV	E85	GM LUJ 1.4 L	N/A	GM 6T45	UQM PP 145 KW	N/A	N/A	7X15S3P	18.9	340
NORTH CAROLINA STATE UNIVERSITY	SERIES PHEV	B20	GM LUD 1.7 L	TM4 80 KW	N/A	N/A	MAGNA E-DRIVE		6X15S3P	16.2	292
OHIO STATE UNIVERSITY	SERIES-PARALLEL PHEV	E85	HONDA 1.8 L CNG	N/A	GM M32 6-SPEED	PARKER HANNIFIN 118 KW	BORG-WARNER E-GEAR DRIVE	PARKER HANNIFIN 118 KW	7X15S3P	18.9	340
PENN STATE UNIVERSITY	SERIES PHEV	E85	WEBER MPE 750	UQM PP 75 KW	MAGNA E-DRIVE		N/A	N/A	6X15S3P	16.2	292
PURDUE UNIVERSITY	PTTR PHEV	B20	GM LUD 1.7 L	N/A	GM 6T40	N/A	MAGNA E-DRIVE		6X15S3P	16.2	292
ROSE-HULMAN INSTITUTE OF TECHNOLOGY	SPLIT-PARALLEL PHEV	E85	GM LE9 2.4 L	BAS (15 KW)	GM 6T45	N/A	TBD	REMY HVH250	7X15S2P	12.6	340
UNIVERSITY OF TENNESSEE, KNOXVILLE	SERIES-PARALLEL PHEV	E85	GM LE9 2.4 L	UQM SR218H	GM 6T40	N/A	TBD	REMY HVH250-115A	7X15S2P	12.6	340
UNIVERSITY OF VICTORIA	SERIES-PARALLEL PHEV	E85	GM LE9 2.4 L	TM4 80 KW**	GM 6T40	TM4 80 KW**	MAGNA E-DRIVE		6X15S3P	16.2	292
UNIVERSITY OF WASHINGTON	PTTR PHEV	B20	GM LUD 1.7 L	N/A	GM 6T40	N/A	GKN ETRANSMISSION	REMY HVH250	7X15S3P	18.9	340
UNIVERSITY OF WATERLOO	SERIES PHEV	E85	GM LE9 2.4 L	TM4 105 KW	GKN EAXLE	TM4 105 KW	GKN ETRANSMISSION	TM4 105 KW	7X15S3P	18.9	340
VIRGINIA TECH	SERIES-PARALLEL PHEV	E85	GM LE9 2.4 L	KOLLMORGEN 40 KW	GM 6T40	N/A	BORG-WARNER E-GEAR DRIVE	UQM PP 125 KW	7X15S3P	18.9	340
WAYNE STATE UNIVERSITY	PTTR PHEV	E85	GM LE9 2.4 L	N/A	GM 6T40	N/A	TBD	2X REMY HVH250-090S	7X15S3P	18.9	340

* all electric motors/generators are rated in terms of peak power

** functions as a traction motor and a generator



PRE-COMPETITION DELIVERABLES

Design Reports | 315 POINTS

Event Captains: Brian Benoy, Argonne National Laboratory, Nicole Lambiase, Argonne National Laboratory, and Steven Boyd, U.S. Department of Energy

Throughout Year One, each team is required to submit five reports that detail their vehicle design progress. The purposes of the reports are to (1) fully describe the process the teams use to design and develop their vehicles, (2) ensure that the teams follow the “official” Vehicle Development Process (VDP), (3) provide updates on the progress that the teams have made, and (4) record a history of the processes used that can be used as a foundation for future work by the teams. The reports are to cover production vehicle modeling, vehicle architecture selection, controller hardware-in-the-loop (HIL) development, energy storage system and high-voltage subsystem design, and vehicle integration.

The winner of the Best Design Reports Award will receive a trophy and \$1,500, \$1,000, and \$500 for first, second, and third place respectively.

Final Technical Report | 85 POINTS

Event Captain: Patrick Walsh, Argonne National Laboratory

The Year One Final Design Report has to be written in Society of Automotive Engineers (SAE) one-column format in preparation for publication. It should cover the year’s engineering work and include, but not be limited to, topics such as powertrain selection, vehicle integration, energy storage system design, control algorithm design, and control system development.

The winner of the Best Technical Report Award will receive a trophy and \$500.

Facility Inspections | 60 POINTS

Event Captains: Nicole Lambiase, Argonne National Laboratory, Brian Benoy, Argonne National Laboratory, Patrick Walsh, Argonne National Laboratory, and Steven Boyd, U.S. Department of Energy

During March of Year One, one or more EcoCAR 2 technical representatives visit each university to inspect the team’s facilities, safety equipment, safety procedures, and any hardware it has received thus far. In addition, teams were required to build a high-voltage subsystem and create an exhibit that demonstrates a simplified yet functional “high-voltage” circuit. The purpose of the circuit demonstration is to show the team’s full knowledge of high-voltage rules and safety requirements, document the team’s design, and give the team an opportunity to develop a working schematic and test the implementation for functionality.

The winner of the Best Facility Inspection Award will receive a trophy and \$250.

Winter Workshop Controller HIL Evaluation | 30 POINTS

Event Captains: Santhosh Jogi, dSPACE, and Brian Benoy, Argonne National Laboratory

The teams received their controller HIL systems with running stock vehicle models around the time of the Fall Workshop. The teams then used the time between the arrival of this hardware and the Winter Workshop to develop safety critical systems and to design and develop a fault mitigation strategy, a design failure mode effects analysis (DFMEA), a fault tree analysis (FTA), etc. Teams are required to:

- ▶ Demonstrate the running of their supplied base model, with hardware interfacing to their supervisory controller. Controlled area network (CAN), analog (e.g. accelerator pedal), and digital (e.g., brake pedal switch) signals have to be implemented for critical stock vehicle systems.

- ▶ Establish a procedure for developing code and/or control/modeling architecture.
- ▶ Demonstrate a basic fault mitigation strategy that runs in real time on controller hardware.

The winner of the Winter Workshop Controller HIL Evaluation will receive a trophy and \$750, \$500, and \$250 for first, second, and third place respectively.

Business Plan | 10 POINTS

Event Captains: Carol Johnson, General Motors, and Lynda Palombo, Natural Resources Canada

Throughout Year One, each team was required to submit a draft and final business plan that cover all three years of the EcoCAR 2 program. The plans covered an overview of the team architecture; a situation analysis; a project management plan; team's structure; strategies and tactics for member recruitment and retention; team sponsorship; team budget; knowledge transfer, and a strategy for getting, communicating with, and maintaining support from university administration.

The winner of the Best Three-Year Business Plan Award will receive a trophy and \$500.

Business Progress Presentation | 5 POINTS

Event Captains: Carol Johnson, General Motors, and Lynda Palombo, Natural Resources Canada

During the Winter Workshop, each team was required to give a 20-minute presentation that provided an update on their Business Program. The presentations included an overview of the team's business activities that have occurred to date, including any recruitment events, updates or changes to the business plan, issues or challenges the team has faced, and strategies that could be taken to address or overcome those issues or challenges.

Communications Plan | 3 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

Each team was required to develop a one-year communications plan to raise awareness about the EcoCAR 2 program, the team's participation in the program, and advanced vehicle technologies. The plans included a situation analysis; communication goals; target audiences and activities; communication messages, strategies, and tactics; evaluation and measurement activities; and a budget.

The winner of the Best Communications Plan Award will receive a trophy and \$500.

Website | 5 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

For Year One, each team has to create a new team website that highlights the EcoCAR 2 program. It included information on the team and the university, key EcoCAR 2 program messages, sponsor information, a description of the vehicle architecture, an alumni section, a media center section, and more. Teams also had to create and film a team introduction video to be featured on the team website. The video introduced the team, described the vehicle architecture, and described the importance of EcoCAR 2 at the university.

The winner of the Best Website Award will receive a trophy and \$500.



Youth Education Presentation & Activity | 2 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

At the Winter Workshop, teams were required to present an interactive activity that is aimed toward youth (11- to 14-year-olds or middle school students). The activity included the team, key EcoCAR 2 program messages and background information, an introduction to advanced vehicle technologies and the team's vehicle architecture, data on the impacts that transportation has on the environment, and reasons why they should be interested in the environmental sciences. The evaluation metrics that would be used to demonstrate the effectiveness of this presentation when it is given to the students were also discussed at the Winter Workshop.

The winner of the Best Youth Education Presentation and Activity Award will receive a trophy and \$500.

Sponsor Collaboration Blog Post and Video | 2 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

The teams were required to submit a 3-minute video on a problem that was solved in Year One by a competition-level sponsor. The videos were then posted on the team's website, on the EcoCAR 2 blog, and on the sponsor's website for public viewing. Videos included a brief team introduction, a brief EcoCAR 2 introduction and key messages, an introduction to the sponsor, in-person interviews, phone interview voice-overs, etc., visual images of the hardware and software, an elaboration of the problem and solution, and an explanation of why the sponsor's technology is important.

The winner of the Best Sponsor Collaboration Blog Post and Video Award will receive a trophy and \$750.

Final Outreach Report | 2 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

Teams were required to submit a report describing the first year of their outreach activities at the end of Year One. These reports included details about outreach events, media relations, and social media metrics and provide an overview of the team website as well as metrics for it.

COMPETITION DELIVERABLES

Controls Presentation | 85 POINTS

Event Captain: Jim Kolhoff, General Motors

The Controls Event Presentation for Year One of EcoCAR 2 is focused on selecting the initial design for the control system and then analyzing the system. Selecting the control system architecture, choosing the control and diagnostic strategy, and defining the safety critical system are the major elements reviewed. Another critical element that is reviewed is the initial plans for integrating the physical system and validating the components and system. The presentation is designed to evaluate how effective the team has been in executing these Year One deliverables and to summarize the team's control system selection and design process and results.

The winners of the Controls Presentation Award will receive a trophy and \$750, \$500, and \$250, for first, second, and third place respectively.



Mechanical Presentation | 85 POINTS

Event Captain: Ed Argalas, General Motors

The Mechanical Event Presentation for Year One of EcoCAR 2 is focused on computer-aided design (CAD), the structural integration of new subsystems, and performance modeling to create a vehicle that meets the competition goals. The presentation is intended to summarize the team's mechanical design for the first year and evaluate how effective the team has been in executing the Year One mechanical track deliverables. The emphasis is on evaluating the completeness of the proposed mechanical architecture and the expected conformance to program requirements through simulation and analysis.

The winners of the Mechanical Presentation Award will receive a trophy and \$750, \$500, and \$250 for first, second, and third place respectively.

Electrical Presentation | 85 POINTS

Event Captain: Sean Bartolucci, General Motors

The Electrical Event Presentation is a focused technical presentation, detailing the integration of high- and low-voltage electric distribution systems. The presentation cover the design, safety, requirements, and serviceability of the electric system, and it should also look at how the system design is documented and will be communicated in Years Two and Three of EcoCAR 2.

The winners of the Electrical Presentation Award will receive a trophy and \$750, \$500, and \$250 for first, second, and third place respectively.



Project Initialization Approval (PIA) Presentation | 80 POINTS

Event Captain: Tim Campbell, General Motors

The PIA Event for Year One of EcoCAR 2 is focused on how the vehicle architecture and the major vehicle subsystems were selected to meet the team's VTS goals. The intent of the event is to give each team an opportunity to demonstrate its understanding of the vehicle architecture selection process, of the advantages and limitations of the architecture it has selected, and of how that architecture affects the overall balance between the vehicle and the VTS requirements. Teams are expected to demonstrate a high level of understanding of the vehicle integration areas (occupant packaging, subsystem packaging, mass, thermal performance, dynamic performance, noise and vibration performance, safety performance, and fuel economy).

The winners of the Project Initialization Approval Award will receive a trophy and \$750, \$500, and \$250, for first, second, and third place respectively.

Trade Show Evaluation | 40 POINTS

Event Captains: Steven Boyd, U.S. Department of Energy, and Kimberly DeClark, Argonne National Laboratory

The Trade Show Evaluation is an interactive event designed to show how effective a team has been in executing the Year One deliverables of EcoCAR 2. Because the event is cross-disciplinary — including engineering, business, outreach, and marketing content — communication among these subteams is crucial to prepare for it. The trade show event is aimed to give each team a chance to “sell” its progress in developing a vehicle in Year One to the judges. It is as if each team represents a company that wants to network and sell its product (i.e., Year One vehicle design and business and outreach efforts) to automotive industry executives (i.e., the judges).

The winner of the Trade Show Evaluation Award will receive a trophy and \$750, \$500, and \$250 for first, second, and third place respectively.



Final Controller HIL Evaluation | 90 POINTS

Event Captains: Santhosh Jogi, dSPACE, and Brian Benoy, Argonne National Laboratory

The Controller HIL Evaluation at the end of the Year One competition focuses on evaluating how well a team used its HIL test bench to develop and validate its supervisory controls. A team should be using the HIL simulation environment for emulating its intended vehicle and as a platform for developing and testing the control systems that are being implemented. By the end of the Year One competition, a team should have achieved the following HIL-related milestones:

- ▶ Running selected/intended vehicle architecture as a plant model on the HIL system in real time, with the intended supervisory controller being integrated with the HIL as it is expected to be integrated into the actual vehicle. The plant models should be able to emulate the intended operational modes of the vehicle and able to test supervisory control functions and failure conditions.
- ▶ Have a well-established baseline confidence in the plant models, which, in turn, provides a basis for having confidence in the design and functionality of the supervisory control strategy. By the end of the Year One competition, the team is expected to have its supervisory control strategies fully implemented and tested through the use of HIL, so they are ready to be integrated with the real vehicle in Year Two.
- ▶ Well thought-out test development approach, which goes hand in hand with the team's control development. The approach should cover how requirements for testing implementation, execution, reporting, and maintenance are defined.
- ▶ Developed test procedures for control functions and diagnostics and used the tests to validate developed supervisory controls. The proof of test execution and the test results should be documented. Completed testing should include a validation of safety critical system fault detection and mitigation, with correlations to DFMEAs and FTAs.

The winners of the Final Controller HIL Evaluation Award will receive a trophy and \$750, \$500, and \$250 first, second, and third place respectively.

Final Outreach Presentation | 6 POINTS

Event Captain: Lynda Palombo, Natural Resources Canada

The EcoCAR 2 Outreach Program contributes significantly to the overall public relations effort carried out for the competition. It increases the visibility of both the competition itself and the individual teams. The program also educates students in public relations and enhances their communication skills. The Final Outreach Presentation at the end of the Year One competition focuses on three areas: media relations, social media, and public outreach. Teams must give a presentation on their social media and public outreach activities and provide evidence of media coverage that appeared in local print, TV, radio, or online media outlets and trade publications.

The winner of the Best Media Relations Program Award and the winner of the Best Overall Public Outreach Award will each receive a trophy and \$500.

Final Business Presentation | 10 POINTS

Event Captains: Carol Johnson, General Motors, and Lynda Palombo, Natural Resources Canada

The EcoCAR 2 Business Program encourages teams to develop strategies for recruiting new team members, building team organization, creating a team budget, and developing sponsor relationships early in the advanced vehicle technology competition program. The Business Presentation at the end of the Year One competition focuses on all of these areas, since teams are required to give presentations on the following topics: project management, recruitment, sponsorship and fund-raising, budget, knowledge transfer, and communication with the university administration.

The winner of the Best Year One Business Program Execution Award will receive a trophy and \$250.

SPECIAL AWARDS

Dr. Don Streit Sportsmanship Award

This award is presented to the team that offers the highest level of assistance and support to other teams and organizers despite its own circumstances. This award is presented in honor of Dr. Donald Streit, who served as a dedicated faculty advisor to the Penn State University FutureTruck team and embodied the true meaning of sportsmanship. Although Dr. Streit's life ended prematurely, his memory and his example are carried on by the students who have and will continue to participate in advanced vehicle technology competitions for decades to come.

The winner of the Dr. Don Streit Sportsmanship Award will receive a trophy and \$500.

Ron Stence Spirit of the Challenge Award

This award, presented by the competition organizers, is presented in memory of Ron Stence, a former sponsor and competition organizer from Freescale, whose dedication and passion for the advanced vehicle technology competition and his pursuit of high technical standards was inspiring. This award is presented to the team that embodies that same spirit, by demonstrating exceptional perseverance in the face of adversity, maintaining a positive attitude throughout the competition despite significant challenges and obstacles, and pursuing exceptionally high technical standards.

The winner of the Ron Stence Spirit of the Challenge Award will receive a trophy and \$500.



Team to Watch Award

This award is presented by the competition organizers to a team worthy of special recognition, which has demonstrated impressive performance in the competition although it may not necessarily have scored in the top six places.

The winner of the Team to Watch Award will receive a trophy and \$500.

Spirit of Outreach Award

The Spirit of Outreach Award is given to a team by the Outreach Subcommittee to honor a special effort or achievement in the area of outreach.

The winner of the Spirit of Outreach Award will receive a trophy and \$250.

Best Creative Promotion of EcoCAR 2 Award

The Best Creative Promotion of EcoCAR 2 Award is given to a team by the Outreach Subcommittee. Teams are encouraged to develop an effective, creative and unique "out of the box" branding strategy for the team. The team with the best promotion of EcoCAR 2 wins this award.

The winner of the Creative Promotion of EcoCAR 2 Award will receive a trophy and \$250.



SPONSORED AWARDS



National Science Foundation (NSF) Outstanding Faculty Advisor Award

Event Captains: Don Senich, NSF, and Kristen De La Rosa, Argonne National Laboratory

The level of commitment required from a faculty advisor to establish a team of students and support their participation in U.S. Department of Energy advanced vehicle technology competitions (AVTCs) cannot be overstated. Often the huge amount of time, energy, and resources required can interfere with a professor's ability to conduct research or teach additional classes. Yet most students who participate, claim that EcoCAR is one of the highlights of their university experience. Since 1997, the Outstanding Faculty Advisor Awards, sponsored by the National Science Foundation, have recognized faculty advisors who, through their leadership and commitment to the AVTC program, are advancing the frontiers of science and engineering education while passing on a legacy to their students that extends throughout the automotive industry. Two awards are presented to the faculty advisors who best incorporate the EcoCAR goals, objectives, and activities into the undergraduate engineering curriculum and who have had the most significant impact on the engineering education of their students or have used the AVTC program to enhance the engineering education experience at their university. The award money is donated to each of the two winning EcoCAR teams to help the universities integrate the AVTC experience even more fully into their engineering curriculums.

The winner of the NSF Outstanding Incoming Faculty Advisor Award and the winner of the NSF Outstanding Long-Term Faculty Advisor Award will each receive a trophy and \$10,000.



Women in the Winner's Circle Foundation Outstanding Women in Engineering Award

Event Captains: Lyn St. James, WIWC Foundation, and Cindy Svestka, General Motors

The Lyn St. James Women in the Winner's Circle (WIWC) Foundation is sponsoring two awards to honor women engineering students who have demonstrated technical excellence and have made outstanding accomplishments through the EcoCAR program. The Outstanding Women in Engineering Award and the Rookie of the Year Award are intended to encourage more women to study engineering and pursue a career in automotive engineering after graduation. The WIWC Foundation is a nonprofit educational organization that provides leadership, vision, resources, and financial support to create an open environment for women's growth in automotive fields.

The winner of the WIWC Outstanding Women in Engineering Award and the winner of the WIWC Rookie of the Year Award will each receive a trophy and \$1,000 and \$500, respectively.

dSPACE dSPACE Embedded Success Award

Event Captains: Santhosh Jogi and Vivek Moudgal, dSPACE

The dSPACE Embedded Success Award is granted at the end of every competition year to the teams that demonstrate the most effective use of dSPACE tools to simulate vehicle architectures and develop their control strategies. The intent of this award is to recognize and promote best practices in control development with dSPACE products. At the end of Year One of EcoCAR 2, the dSPACE Embedded Success Award is judged during the HIL Event at the competition. The winners of this award are the teams that applied and used the donated dSPACE tools most successfully to meet competition expectations.

The winners of the dSPACE Embedded Success Award will receive a trophy and \$750, \$500, and \$250, for first, second, and third place respectively.



Freescale Innovation Award

Event Captain: John Cotner, Freescale

Freescale Semiconductor is one of the largest manufacturers of embedded hardware in the world. Almost every aspect of a vehicle is powered by a Freescale unit, including engine controllers, body electronics, driver information systems, critical safety systems, and much more. As an EcoCAR 2 platinum-level sponsor, Freescale supports the each team's development of a center stack by donating a touch screen display and i.MX53 computer. During their presentations for the Freescale Innovation Award, teams showcase their plans for the reconfigurable center stack (covering the number of screens, functionality of each screen, use of buttons and sliders, etc.). Teams also describe their current design progress, including their modifications to the user interface and interaction with HIL. The winners of the Freescale Innovation Awards are the teams that have the most innovative and complete designs.

The winners of the Freescale Innovation Award will receive a trophy and \$750, \$500, and \$250 for first, second, and third place respectively.



MathWorks Modeling Award

Event Captain: Paul Smith, MathWorks

This award recognizes EcoCAR teams that display the most creativity in applying MathWorks software products, including MATLAB and Simulink, to help achieve the overall competition objectives. Teams are evaluated on how well they applied model-based design with the MathWorks toolset to help achieve the overall competition objectives with respect to the areas of plant modeling, the design and tuning of controls, data analysis and visualization, hardware implementation, the overall development process they followed, the quality of their presentation, and lessons learned.

The winners of the Mathworks Modeling Award will receive a trophy and \$750, \$500, and \$250, for first, second, and third place respectively.



A123 Systems Energy Storage System Design Award

Event Captain: Tony Knakal, A123 Systems

The A123 Systems Energy Storage System Design Award is given to the EcoCAR team that designed the most innovative and highest quality battery pack while adhering to industry, competition, and A123 Systems standards. A123 Systems uses each team's report on its energy storage system's design that was submitted in the spring to determine which team produced the most innovative, safest, and highest-quality energy storage system design and integration.

The winners of the A123 Systems Energy Storage System Design Award will receive a trophy and \$750, \$500, and \$250, for first, second, and third place respectively.



U.S. Department of Energy

Best Collaboration with a Clean Cities Coalition Award

Event Captain: Marcy Rood-Werpy, Argonne National Laboratory

The Best Collaboration with a Clean Cities Coalition Award is given to the EcoCAR 2 team that has built the best relationship with a Clean Cities Coalition and highlighted that relationship in a video. Teams are evaluated on how well they worked with a Clean Cities Coalition to develop a strategy for collaboration and for leveraging resources in Year One, how well they were able to connect with a Coalition, how successfully they executed outreach initiatives, and how they plan to work with Clean Cities Coalitions throughout Years Two and Three. Teams are also evaluated on the quality and content of their videos.

The winner of the Best Collaboration with a Clean Cities Coalition Award will receive a trophy and \$3,000.



Executive Steering Committee



Kristen De La Rosa is director of the Advanced Vehicle Technology Competition (AVTC) program at Argonne National Laboratory, where she has organized and managed competitions since she started in 1997. Previously, Kristen served as Public Outreach Manager and Assistant Director for Public

Education/Media for the Alternative Fuels Research and Education Division of the Texas Railroad Commission (TRC). Kristen was introduced to the AVTC program in 1996, when the TRC sponsored the Propane Vehicle Challenge. Having served as a sponsor or key organizer for 20 of the 28 AVTCs in the program's history, Kristen has been at the forefront of defining, executing, and expanding the program for more than 16 years. Kristen leads all the day-to-day activities of the AVTC program, including the current EcoCAR 2: Plugging In to the Future series. She is also responsible for establishing and managing the program's multimillion-dollar sponsorship and fund-raising efforts and is the Chairperson of the EcoCAR Executive Steering Committee.



Nicole Lambiase is an Advanced Vehicle Technology Competition (AVTC) Mechanical Engineer for Argonne National Laboratory. She served as a technical coordinator for the last two years of EcoCAR: The NeXt Challenge and is continuing that role going into EcoCAR 2: Plugging In to the Future.

Nicole is a former EcoCAR Electrical Team Leader from Embry-Riddle Aeronautical University, where she earned a Bachelor of Science in Mechanical Engineering with a concentration in high performance vehicles.



Patrick Walsh is a technical organizer for EcoCAR 2 at Argonne National Laboratory. He serves as the event captain for all emissions and fuel economy testing and supports the controls activity. When not working on competitions, he works in Argonne's Advanced Powertrain Research Facility

conducting tests and analyzing advanced technology vehicles on chassis dynamometers. Patrick is a graduate of EcoCAR and served as the co-team leader for the Hybrid Electric Vehicle Team of Virginia Tech for two years as a graduate student. He focused his thesis on reducing the cold-start emissions and fuel consumption of the team-designed plug-in hybrid vehicle.



Brian Benoy is the Advanced Vehicle Technology Competition (AVTC) Controls and Simulation Engineer at Argonne National Laboratory. Brian currently holds a Bachelor of Science in Electrical Engineering from Kettering University, and he will complete his Master of Science in Electrical Engineering from

Mississippi State University in May 2012. As a graduate student in the AVTC program during EcoCAR: The NeXt Challenge, Brian gained valuable leadership and technical experience as the leader of the Controls Team for Mississippi State University.





Kimberly DeClark is the Advanced Vehicle Technology Competition (AVTC) Communications and Logistics Manager at Argonne National Laboratory. She is responsible for communications and logistics for EcoCAR 2: Plugging In to the Future, a position that includes managing the Outreach Program as well as overseeing the U.S. Department

of Energy (DOE's) Clean Cities University Workforce Development Program. Kimberly has a diverse background in public relations, media relations, and public affairs that has included positions at General Motors (GM), the White House National Advance Team/White House Press Corps, and agency experience. When Kimberly was Manager, Government, Policy and Technology Communications for GM, she managed and facilitated communications on public policy issues between government and corporate functions. She has a Master of Arts in Organizational Communications and Public Relations, and she graduated summa cum laude with a Bachelor of Arts in Public Relations and Speech Communications; both degrees are from Wayne State University.



Dana Bubonovich is currently the AVTC Communications and Logistics Coordinator at Argonne National Laboratory. At Argonne, she works on program logistics and outreach support for EcoCAR 2 and manages the Clean Cities University Workforce Development Program, a nationwide internship

program for the U.S. Department of Energy. Dana received her Bachelor of Arts in Public Relations from Penn State University in 2010, and she was the Outreach Coordinator for the Penn State EcoCAR: The NeXt Challenge team from 2008-2010. Dana is very active in the Public Relations Society of America (PRSA) and is the current Social Media Chair and Communications Liaison for both PRSA Chicago and PRSA Chicago Young Professionals Network.



Patrick Davis is the Program Manager of the Vehicle Technologies Program at the U. S. Department of Energy. The Vehicle Technologies Program manages \$330 million in annual research funding for hybrid drivetrains, advanced batteries, lightweight materials, advanced combustion and fuels, vehicle systems

integration, and Clean Cities deployment activities. He is responsible for three major government/industry partnerships: the U.S. DRIVE Partnership, 21st Century Truck Partnership, and National Clean Fleets Partnership. The Vehicle Technologies Program is responsible for \$2.8 billion in Recovery Act vehicle projects, which includes \$2.0 billion in advanced battery and electric drive component manufacturing facilities. Patrick also serves on the Board of Directors of the American National Standards Institute. Patrick has 31 years of public service, is a chemical engineer, and has devoted virtually his entire career to the development of vehicle, alternative fuel, and electrochemical technologies.



Connie Bezanson manages the education and outreach activities within the U.S. Department of Energy's Vehicle Technologies Program Office. In addition to managing the Advanced Vehicle Technology Competitions activities, she manages the Graduate Automotive Technology Education Program and

a portfolio that supports the transition to advanced electric transportation systems. She received a Bachelor of Science in Mechanical Engineering from the Catholic University of America.





Steven Boyd has worked at the US Department of Energy in the Office of Energy Efficiency and Renewable Energy (EERE) since 2006. In his current position as Technology Development Manager for EERE's Vehicle Technologies Program, Steven oversees research and development projects in hybrid and electric vehicle systems, including capacitor and magnet development for automotive power electronics and electric motors. Before coming to DOE, Steven participated in DOE's FutureTruck and Challenge X Advanced Technology Vehicle Competitions, and he currently sits on the EcoCAR 2 Technical Steering Committee. Steven received both his Bachelor of Science and Master of Science in Mechanical Engineering from Virginia Tech.



Kent Helfrich is Executive Director of Electronic Controls and Software at General Motors (GM) where he is responsible for GM's global software and controls engineering strategy and execution. He is GM's co-executive leader of the EcoCAR Challenge. Kent is a member of the Society of Automotive Engineers and the Institute of Electrical and Electronics Engineers and is a registered Professional Engineer.



John Haraf is currently the General Motors (GM) Director of Hybrid Vehicle Performance and Calibration. In this position, he is responsible for vehicle-level hybrid system integration/performance and calibration development for all of GM's hybrid, extended-range electric, and electric vehicles. John began his career with GM as an engine calibration engineer in the Cadillac Motor Car Division and has held a wide range of leadership positions in GM's Powertrain organization, including Premium V Engine Calibration Manager, Diesel/Big Block Truck Engine Integration Manager, Executive Technical Assistant for Powertrain Engineering, Director of Engine Management System Hardware Design/Release, and Director of Engine Development, Calibration and Verification for all of GM's North American gas engine vehicle applications. John is a licensed Professional Engineer and a member of the Society of Automotive Engineers.



Daniel Mehr earned his Bachelor of Science Mechanical Engineering from the University of Wisconsin in 2008 after participating in the FutureTruck competition and being a Team Leader in Challenge X. Upon his graduation, Dan joined General Motors (GM) as an energy storage system integration engineer. After working on three plug-in hybrid electric vehicle applications and completing a Master of Science in Energy Systems Engineering at the University of Michigan, he is now an energy storage systems performance analyst at GM's advanced vehicle design center, working on the next-generation Chevrolet Volt. While working at GM, Dan has continued to support AVTCs. In addition to his current assignment, Dan has served as GM's Mentor Lead and one of the GM Technical Leads for the EcoCAR program. He is now the GM Vehicle Technical Lead for the EcoCAR 2 competition.



Steve Gurski is an Algorithm Design Engineer in the General Motor's (GM) Hybrid and Electric Systems Engineering Group. He also serves as GM Powertrain's Technical Lead for EcoCAR 2. Prior to joining GM, Steve was a lead engineer for the Advanced Vehicle Technology Competition (AVTC) program at Argonne National Laboratory. Steve is a former FutureTruck team leader from Virginia Tech, where he earned his Bachelor and Master of Science degrees in Mechanical Engineering.



Cathy Cole has been involved in Advanced Vehicle Technology Competitions (AVTC) since 1999, beginning with Ethanol Vehicle Challenge, and she has provided logistics support as an Executive Steering Committee member. EcoCAR 2 will be her fifth AVTC. She works for GM Powertrain as a website designer and business process coordinator, and she has a BBA from Michigan State University. Previously, she spent five years at Magna Interiors as a validation engineer.



Lynda Palombo is Senior Manager, Business Strategy, for Transportation Energy Technologies at Natural Resources Canada. Lynda is responsible for strategic planning, reporting, and business development for alternative transportation energy technologies. She has worked on the U.S. Department of Energy's

Advanced Vehicle Technology Competitions for more than 11 years and is a member of the EcoCAR Steering Committee.



Niklas Ekstrom is a Research Officer with the Transportation Energy Technology Group at Natural Resources Canada. Niklas provides technical advice and manages projects related to alternative transportation. His current focus is the quality and engine performance of biofuels, but he has also been involved in

fuel-cell and other electric-drive-related projects. Niklas is a member of the EcoCAR 2 Technical Steering Committee.





General Motors Mentor Bios

Michael Abowd is the Engineering Group Manager for Vehicle Dynamics Controls and Software at General Motors (GM). He currently manages a team of controls and software engineers at the Milford Proving Grounds who develop production chassis software and electronics for GM vehicles. He graduated from Carnegie Mellon University in 1999 with a Master of Software Engineering from the School of Computer Science and an MBA from Tepper School of Business. Michael is the GM mentor for the University of Washington.

Bill Beggs is the Engineer Group Manager for General Motors (GM) Energy Execution Team. During his 15-year career with GM, Bill has been involved in developing fuel economy on various vehicle platforms for the U.S. market. He has a Bachelor of Science in Mechanical Engineering from Michigan Technological University and an MBA from Wayne State University. He is a licensed professional engineer. Bill is the GM mentor for Colorado State University.

Charles Hua received both his Bachelor and Master of Applied Science degrees in Chemical Engineering from the University of Waterloo in Ontario, Canada. He started his automotive career as part of the University of Waterloo Alternative Fuels Team in Challenge X and eventually became the team leader in Year Four. Charles, who has been with General Motors (GM) for the past three and a half years, currently works as a high-voltage battery performance engineer. He is the GM mentor for Embry-Riddle Aeronautical University's EcoCAR 2 team.



Amanda Kalhous graduated from the Royal Military College of Canada with a Bachelor of Science in Electrical Engineering and got a Master of Science in Electrical Engineering from Dalhousie University. She served in the Royal Canadian Air Force for nine years. She joined General Motors Canada in 2005 and has held positions as a designing engineer and vehicle software integration engineer. She is currently an engineering specialist working on advanced technology projects in the infotainment and telematics space. Amanda is the GM mentor for the University of Victoria EcoCAR 2 team.

Dale Klein is the Energy Modeling Lead at General Motors. He provides technical leadership for the development and use of energy integration models, which are used to design and build the world's best vehicles. Dale is passionate about energy; he enjoys hypermiling and monitoring his solar photovoltaic system while it charges a Chevrolet Volt on the grid. He is the GM mentor for Purdue University.

Dan Mephram has more than eight years of experience working at General Motors Canada, in areas that have included electrical architecture and software integration and powertrain and vehicle controls simulation. Dan is presently the Product Manager for the Chevrolet Volt in Canada, responsible for various aspects associated with launching the vehicle into the Canadian market. Dan is an active member of the Society of Automotive Engineers, involved in vehicle-to-grid standards development. Dan holds a Bachelor of Science in Electrical Engineering from the University of Waterloo. He is the GM mentor for the University of Waterloo EcoCAR 2 team.

Vanessa Ortis got her undergraduate degree in Mechanical Engineering from Michigan Technological University in 2008, and she will receive a Master of Science in Energy Systems Engineering in May 2012 from the University of Michigan. Vanessa worked for General Motors in engine software and algorithm development in 2008, and she transitioned to rear-wheel drive hybrid calibration development in 2010. Vanessa is the GM mentor for California State University, Los Angeles.

Zach Pieri is a hybrid propulsion system development engineer at General Motors (GM) and is the current Rose-Hulman GM Mentor. Zach received his Bachelor of Science in Mechanical Engineering in 2007 and will receive his Master of Science in Energy Systems Engineering in December 2012. He is the GM mentor for Rose-Hulman Institute of Technology.

Kelly Pietras has been with General Motors (GM) for more than 10 years, where her focus has been on design/release in automatic transmissions. She has a Bachelor of Science in Mechanical Engineering and an MBA from the University of Michigan. She works at the GM Powertrain World Headquarters in Pontiac, Michigan. Kelly is the GM mentor for North Carolina State University.

Paul Shoytush is a controls engineer in fuel cell activities at General Motors. He is currently working on fuel cell application support and software testing in Honeoye Falls, New York. He graduated from Morrisville State College with an Applied Associate Science degree in Automotive Technology and worked as an automotive technician until he returned to school at The Pennsylvania State University. He graduated from there in 1996 with a Bachelor of Science in Electrical Engineering. Paul is the GM mentor for the Penn State EcoCAR 2 team.

Kevin Storch received both his Bachelor and Master of Science degrees in Mechanical Engineering from the University of Michigan, where he participated in FutureCar. Kevin joined General Motors (GM) in 2000 and initially developed algorithms for GM's active fuel management system before becoming the software strategist for two of the electronic control module programs. He then moved to GM's Advanced Powertrain Controls Group, where he worked on a variety of future technologies. He has recently transferred back to the Engine Emissions and Fuel Group to carry the development of wide-range air-fuel sensors to the production stage. Kevin is the GM mentor for The Ohio State University.

Chris Trush began working at General Motors in 1985 as a GM Institute co-op student. He was hired full-time in 1990 in GM's Hydra-Matic organization and has spent the past 18 years working as an algorithm development engineer on a variety of transmission programs, products, and features. Chris was appointed as Engineering Group Manager of the Transmission Radio Control Transmission Software Team in 2008. He is the GM mentor for Wayne State University.

Chris Twarog, who is from Cape Cod, Massachusetts, moved to Michigan in 2005 to start work at General Motors (GM). He currently works in the Hybrid Vehicle Performance and Controls group at the GM Proving Grounds in Milford, Michigan. He has held various integration positions and been responsible for vehicle controls, high-voltage battery systems, and energy and drive quality. He has a Bachelor of Science in Electrical and Control Systems Engineering from Rensselaer Polytechnic University and a Master of Science in Systems Engineering from Oakland University. Chris is the GM mentor for the University of Tennessee, Knoxville.

Keith Van Houten is the Performance Integration Team Leader for Noise and Vibration on the Global Epsilon architecture. An alumnus of Virginia Tech, this is his eighth year mentoring its teams in the Advanced Vehicle Technology Competition program. He joined General Motors in 1991 and works at the Proving Ground in Milford, Michigan. Keith is the GM mentor for the Virginia Tech EcoCAR 2 team.

Sarah Vano, who is originally from Cleveland, Ohio, graduated from the University of Akron with a degree in Mechanical Polymer Engineering. She had also been on the university's Challenge X team. She moved to Michigan five years ago to begin working for General Motors in various areas associated with transmission development. Sarah is the GM mentor for Mississippi State University.

dSPACE dSPACE Mentor Bios

Sim Aktunc graduated from Paderborn University in Germany in 2008 with a degree in Mathematics and Mechanical Engineering. He had first joined dSPACE (also in Germany) as an intern in 2006. Now Sim works there as an Application Engineer in the Hardware-in-the-Loop (HIL) Group, focusing on automotive simulation models (ASMs), specifically ASM vehicle dynamics. For the EcoCAR 2 competition, Sim is the dSPACE mentor for Rose-Hulman Institute of Technology.

Abhijit Bansal got his Master of Science in Electrical Engineering, with a focus on controls, from The Ohio State University in December 2011, and he joined dSPACE in January 2012. While at Ohio State, he was a part of its EcoCAR: The NeXt Challenge team, working on the Controls Subteam, and he also did an internship with dSPACE in the summer of 2011. Currently he is the dSPACE mentor for the University of Waterloo team, helping and guiding it on working with dSPACE tools and software.

Erick Blank graduated from Lawrence Technological University with a Bachelor of Science in Biomedical Engineering. He worked for a short time at the university designing and building a bioreactor for ligament reconstruction; Erick led the development of motor controls, which included programming a controller and motor system to provide cyclical loads to a biomaterial scaffold. He currently works at dSPACE as a Technical Support Engineer, helping customers use dSPACE tools and giving them training. In addition to mentoring the team from California State University, Los Angeles, in EcoCAR 2, he works directly with many other teams providing ControlDesk® Next Generation and licensing support.

Thomas Buck graduated from Lawrence Technological University in 1998 with a Bachelor of Science in Electrical Engineering. For 11 years, he has been working with automotive OEMs doing powertrain calibration, system validation, and HIL testing. Thomas, who joined dSPACE in 2010, is currently a Senior Application Engineer responsible for HIL system development, commissioning, automation, and end-user support. For EcoCAR 2, Thomas mentors the Penn State University team.

Sean Carlson graduated from Michigan Technological University in 2008 with a degree in Computer Engineering. He worked in the areas of software engineering and embedded systems. Sean joined dSPACE Inc in June 2011 as an Application Engineer for rapid prototyping development projects. He is the dSPACE mentor for the University of Victoria EcoCAR 2 team.

Joe Cassar graduated from Wayne State University in 1998 with a Bachelor of Science in Electrical Engineering, and he joined dSPACE in the middle of that year. Joe started as a Technical Support Engineer and is currently Team Leader for Application Engineering in the product areas of rapid control prototyping, automatic code generation, and system architecture. He is involved with the EcoCAR 2 program as a mentor providing advice on dSPACE tool applications.

Bret Detrick graduated from Oklahoma State in 1992 with a Bachelor of Science in Mechanical Engineering. Bret worked in the area of emissions-related engine diagnostics until joining dSPACE in 1999. At dSPACE, he has supported customers from his office and at their sites, in both the rapid control prototyping and HIL areas. Bret is currently a mentor for Virginia Tech.

Tobias Eifler graduated from the University of Cooperative Education in Ravensburg, Germany, with a degree in Electrical Engineering. He joined dSPACE in late 2005, where he worked for three years in the area of HIL applications engineering at dSPACE's headquarters in Paderborn, Germany. In late 2008, Tobias transferred to dSPACE Inc. and worked as a Senior HIL Application Engineer for three years. Now he is a lead engineer for all the modeling activities of dSPACE Inc., which brings him in close contact with the EcoCAR 2 program as a mentor for all teams.

Justin McLeod is a graduate of Michigan Technological University, where he earned a Bachelor of Science in Electrical Engineering. His first position was a design engineer for Butler International Technical Group in Peoria, Illinois. Later he moved to Caterpillar as an Electrical Systems Engineer working with on-highway and machine engine systems. In 2011, Justin joined dSPACE as a HIL Application Engineer. For EcoCAR 2, he mentors Purdue University.



Sisay Molla received his Bachelor of Science in Mechanical Engineering from Addis Ababa University in 2006. Sisay subsequently earned a Master of Science in Mechanical Engineering from Clemson University in 2010. Since 2011, he has been working as a HIL Modeling/Application Engineer at dSPACE Inc., with responsibilities tied to HIL-related projects, model-based development, and ASM projects. Sisay mentors the Ohio State University team for EcoCAR 2.

Kunal Patil is currently completing a Ph.D. in Mechanical Engineering at Texas Tech University. He also worked as a controls leader for EcoCAR: The NeXt Challenge when he was a student there. He then took that EcoCAR real-world engineering experience and joined dSPACE, where he focuses on ASMs. His work involves the real-time modeling of automotive systems for use in developing and testing electronic control units. He is now serving as a mentor for Wayne State University in the EcoCAR 2 competition.

Chandrasekhar Puliroju graduated from the University of Hartford in 2007 with a Master of Science in Electrical Engineering and joined dSPACE later that year. There he worked in the area of technical support and applications engineering. Currently, he is an Applications Engineer for dSPACE Inc., responsible for software development for new solutions based on dSPACE products. As a mentor, Chandrasekhar works closely with Colorado State University.

Vincent Sabatini graduated from Embry-Riddle Aeronautical University in 2008 with a Bachelor of Science in Mechanical Engineering, and he is currently finishing up his Master of Science there. Vince was the Team Leader of the Embry-Riddle Aeronautical University EcoCAR: The NeXt Challenge team for the first two years, before joining dSPACE as a Technical Support Engineer in 2011. Besides helping mentor EcoCAR 2 teams, Vince works with General Motors to help the company use dSPACE's HIL products efficiently.

Donald Saldano is a licensed electrical engineer who got his degree from Missouri University of Science and Technology. He began working for dSPACE in the middle of 1999 and is currently the Lead Engineer for Training and Support. Donald is responsible for addressing customers' support needs and providing them with a learning environment where they can obtain the maximum benefit from their dSPACE systems. For EcoCAR 2, he is a senior mentor for all teams, focusing on training and coordinating technical support activity.

Behnam Salimbahrami studied Electrical Engineering and obtained a PhD from the Technical University of Munich in Germany in 2005. Behnam has worked in the areas of control systems, modeling and simulation, vehicle dynamics and HIL simulations. Currently he is a Senior Applications Engineer at dSPACE Inc., working on HIL systems and real-time simulations. For EcoCAR 2, he is the dSPACE mentor for the North Carolina State University team.

Niranjan Tallapally graduated with a Master of Science in Electrical Engineering from Gannon University in 2003 and a Master of Science in Imaging Science from Rochester Institute of Technology in 2008. Niranjan joined dSPACE as a Technical Support Engineer, and he is currently an Applications Engineer in the area of HIL simulation, supporting customers like General Motors. For EcoCAR 2, Niranjan is the dSPACE mentor for the Mississippi State University team.



dSPACE dSPACE Mentor Bios Cont.

Jeff Warra graduated from the National Institute of Technology in 1996 and then joined Kelsey-Hayes/TRW Automotive as a test engineer. Later, in 2004, he furthered his education in electrical and computer engineering at Siena Heights University. Jeff has held various positions at TRW Automotive in both the electrical and software laboratories, validating electronic control unit specifications and verifying software functionality, and he worked on major field issues in designing electrostatic discharge printed circuit board layouts, National High Traffic Safety Administration (NHTSA) investigations, and the “mad scientist” approach of mode14 testing. After eight years at TRW, Jeff joined Mercedes-Benz Technology on site at Daimler/Chrysler in the powertrain department. He joined dSPACE in 2006 as a Senior Application Engineer, progressed to a Project Engineer, and is currently the Application Engineering Team Leader for the HIL Group. His role is to manage HIL application engineers, mentor new employees, and further dSPACE’s operational and company goals. For EcoCAR 2, Jeff has a lead role in organizing mentor efforts and support for the dSPACE HIL systems.

Zhenhua Zhu graduated from West Virginia University with a Bachelor of Science in Mechanical Engineering. He joined dSPACE in 2011 after three years of experience as the Controls Team Leader in EcoCAR: The NeXt Challenge. Now Zhenhua is working there as an Application Engineer in the Automotive Modeling Group. His specialty is electrical components in the dSPACE ASM suite, including batteries, electric motors, and hybrid vehicles. For EcoCAR 2, Zhenhua mentors the University of Tennessee, Knoxville.



Joe Colon is a 1986 graduate of Youngstown State University with a Bachelor of Science in Industrial Engineering. He has 25 years of experience in the automotive industry working with power and signal distribution systems and vehicle interior components. Currently he is a Program Manager at A123 Systems, working with customers on prototype build orders.

Angela Duren is Product Manager for Automotive Starter Batteries at A123 Systems in Livonia, Michigan. She has 12 years of experience in the automotive industry. She has a Bachelor of Science in Mechanical Engineering from Michigan State University, a Master of Science in Mechanical Engineering from Wayne State University, and recently completed her MBA at the University of Michigan–Dearborn.

Scott Hooper earned a Bachelor of Science in Vehicle Design at Central Michigan University, where he graduated summa cum laude. He had received several certifications prior to that for computer-aided design (CAD) development, including CATIA V5 and NX5 Unigraphics design development. He has held positions as a CAD designer, design leader, design manager, and mechanical engineer. Before coming to A123, Scott spent five years working in Chrysler Styling as an Advanced Vehicle Engineer. Now he works for A123 as a Senior Mechanical Engineer.

Tony Knakal is a Program Manager at A123 Systems who focuses on prototype packs for military and commercial truck programs. Tony has been with A123 Systems for two years, and before that, he worked at General Dynamics Land Systems for nine years in thermal and propulsion systems. He earned his Bachelor of Science in Mechanical Engineering from Purdue University and his MBA from the University of Michigan.

Jim Miller has been a Program Manager at A123 Systems since October 2010, where he has managed work on hybrid bus pack systems and modules for hybrid electric delivery vehicles. Prior to joining A123 Systems, Jim worked in the automotive electronics industry for Ford Motor Company and Tier 1 supplier, Lear Corporation. Jim has a Bachelor of Science in Electrical Engineering.

Mike O’Kronley is currently the Director of ASG Business Development in the Program Management Group at A123 Systems. In this role, Mike oversees the new business development process and quotes for all new business opportunities. In addition, Mike is responsible for all A-Sample development/build activities, government solutions vehicle projects, and starter battery product management, and he is also responsible for supporting nontraditional automotive activities, such as those associated with EcoCAR and the U.S. Advanced Battery Consortium (USABC). Before joining A123 Systems, Mike worked for Metaldyne as the Director of Business Development, Director of Business Planning/Program Management, and a program manager. Prior to his job at Metaldyne, Mike worked for Bosch as a product manager, account manager, and engineer. Mike has both a Bachelor of Science in Mechanical Engineering and a Master of Science in Engineering Management from the University of Michigan.

Joe Salani is an Engineering Manager for the Business Acquisition Team at A123 Systems. He is responsible for all new customer technical interactions and battery pack development. Prior to joining A123 Systems, Joe worked at Chrysler LLC for 13 years, with his last assignment being part of the ENVI electric vehicle team. Joe received a Bachelor of Science in Mechanical Engineering from Oakland University and a Bachelor of Science in Mechanical Engineering from Michigan Technological University.



Final Technical Report

Craig Childers has worked as an Air Resources Engineer in the Zero Emissions Vehicle (ZEV) Implementation Section of the California Air Resources Board (ARB) since 1999. There he is responsible for addressing technical issues related to ZEVs and “ZEV-enabling” advanced technology vehicles, including hybrid electric vehicles. In 2003, Craig developed the advanced technology-partial (credit) ZEV (i.e., AT-PZEV) category within the California ZEV regulations. Most hybrids sold in California are now certified to meet this stringent standard. Craig has been part of the team that is revising and enforcing the California ZEV regulations since 1999, developed California ARB’s electric vehicle charging standard requirement, and is presently developing its transitional ZEV (i.e., TZEV) category requirements. Craig earned a Bachelor of Science in Mechanical Engineering from the University of California, Davis.

Roger Clark is senior manager of General Motors (GM) Energy Center. He also leads the GM North America (GMNA) Energy Expert Team and the Fuel Economy Learning Vehicle Program. Roger’s responsibilities include working on the development and integration of vehicle energy- and drive-quality-related requirements, fuel economy, the corporate average fuel economy (CAFE)/CO₂ strategy, and new technologies for vehicle fuel economy leadership.

Niklas Ekstrom See Executive Steering Committee

Dave Garrett has been GM’s Director of Emission Compliance and Certification since October 2006. His team, based at the GM Proving Ground in Milford, Michigan, is responsible for interpreting, analyzing, and influencing U.S. emission and fuel economy regulations; developing and executing certification plans; and fulfilling GM’s emission, fuel economy, and in-use compliance obligations. In addition to emission regulations, Dave’s previous assignments have involved engine control system development and calibration, powertrain controls architecture, and leading the engineering work for GM’s marine and industrial engine sales.

Patrick Walsh See Executive Steering Committee

Trade Show Evaluation

Micky Bly is Executive Director, Group Global Functional Leader, of Vehicle Engineering’s Electrical Systems, Infotainment and Electrification for General Motors. Named to this position in June 2010, Bly oversees the design and development of traditional electrical and infotainment systems, OnStar engineering, and hybrid and electric vehicles, including work on the Chevrolet Volt’s vehicle integration and advanced battery development. Previously, he was Executive Director of Engine Hardware Analysis, Design, Development and Validation at GM. From 2006-2008, Bly was Director of Global Hybrid Integration and Controls, overseeing the teams responsible for developing and producing GM’s multiple hybrid vehicles and contributing to integration work on the Volt. Bly’s team of engineers made sure all of the components — from the engine, transmission, brakes, and batteries to the controllers and software — came together seamlessly. Bly joined GM as a student intern in 1986, and was hired as part of GM’s Powertrain Engineering staff after graduating from Georgia Tech with a Bachelor of Science in Mechanical Engineering in 1990. In 2003, he received a Master of Science in Engineering from Rensselaer Polytechnic Institute. Bly was the former co-executive GM lead for EcoCAR: The NeXt Challenge.

Steven Boyd See Executive Steering Committee

Patrick Davis See Executive Steering Committee



Don Hillebrand, as the Director of Argonne's Energy Systems Division, is responsible for leading a team of engineers and scientists who are developing innovative sustainable technologies designed to use energy and resources more efficiently, minimize our nation's dependence on imported energy, and enhance our national security. Previously, Don worked for DaimlerChrysler Research labs in Stuttgart, Germany, as the manager of Research and Technology Policy. Don also worked for two years in the White House Office of Science and Technology Policy as a Senior Policy Advisor for Transportation to the Executive Office of the President. Previously, Don spent 20 years as a product engineer with Chrysler Motors, working on a range of advanced technology programs. Dr. Hillebrand was elected the 2013 President of the Society of Automotive Engineers; he is also a Fellow of the Engineering Society of Detroit (ESD).

Elise Keddie is Manager of the Zero Emission Vehicle Implementation Section at the California Air Resources Board (ARB). Her group is responsible for, among other things, California's zero emissions vehicle regulation, which requires vehicle manufacturers to produce advanced technology vehicles. Before she joined California ARB in 2001, Elise held a research position at the University of California, Davis. She has a Bachelor of Science degree from the University of California, Davis, and a Ph.D. from the University of Alabama at Birmingham.

Dan Nicholson has had the position of Executive Director for Global Powertrain Drivability, Calibration and Verification at GM since April 2011. He is responsible for running the day-to-day operations of the global engineering team that calibrates all the GM powertrains, ensuring they provide customer-pleasing drive quality and comply with tailpipe emissions standards and on-board diagnostics. Previously, Mr. Nicholson was the Vice President of Global Quality and the head of Powertrain Product Engineering Europe. He began his career with GM as a co-op student in the Buick Motor Division in 1982. With his extensive background in product engineering, he progressed through a series of

leadership positions, including Engineering Group Manager, Director of Controller Integration, and Director of Engine Development, Calibration and Validation. In 2004, he was named Chief Engineer and Program Manager for V8 Engines and became responsible for the Corvette Z06's LS7 engine and implementing active fuel management technology for small block engines. Mr. Nicholson has a Bachelor of Science in Mechanical Engineering from General Motors Institute (now Kettering University), a Master of Science in Mechanical Engineering from Texas A&M University, and an MBA from Stanford University.

Controller HIL Evaluation

David Anderson is a technology development manager for the U.S. Department of Energy (DOE) Vehicle Technologies Program. As a member of the Vehicle and Systems Simulation and Testing Team, he is responsible for managing DOE's vehicle modeling and simulation efforts, as well as vehicle component and systems evaluation activities. He previously worked as a design engineer in the semiconductor industry. David has conducted research in the advanced automotive battery industry and has experience in motor sports at both the amateur and professional levels.

Brian Benoy See Executive Steering Committee

Lawrence Hallman is the Director of Electronic Controls and Software for Powertrain, Chassis and Hybrid Vehicles at General Motors (GM). He joined GM in 1988 as a Test and Development Engineer for the GM Truck Group. Just prior to his current position, he had numerous assignments in the GM Electrical Engineering organization, working on chassis electronics, powertrain electrical integration, and body electronics.

Project Initiation Approval Presentation

Santhosh Jogi has been the Director of Engineering for dSPACE Inc., responsible for technical operations in the company's North American market, since 2007. Santhosh joined dSPACE in 1997 as a technical support engineer and progressed into management. Today he oversees product support, training, and application engineering services. Over the past 15 years, he has gained expertise in applying tools and the development methodology for embedded controls software, specifically in the area of model-based design, which involves algorithm prototyping, automatic code generation, and verification and validation through HIL simulation.

Vivek Modugal is the Director of Sales for dSPACE Inc., responsible for sales operations in the company's North American market since 2003. Vivek joined dSPACE in 1993 as a technical support engineer and spent his first 10 years in the Engineering Department carrying out various roles, including the support, execution, and management of software development projects. Throughout his tenure with the company, he has gained expertise in applying model-based development tools for control software development and validation.

Gen Sasaki, as a senior consultant for MathWorks, focuses on verification and validation, code generation, model-based design, and high-integrity systems. Gen developed powertrain control algorithms and software at Delphi for more than 10 years. After this, he was the managing director of a consulting services company that helped customers implement model-based design. Gen has a Bachelor of Science in Mechanical Engineering from Cornell University and a Master of Science in Mechanical Engineering from the University of Wisconsin–Madison.

Maribeth Yabes manages a team of engineers involved in plant model and HIL integration, algorithm development engineers, and verification and validation engineers at GM. Maribeth joined GM in 1990 as an Associate Engineer in Powertrain Engineering. Before she began her current position, she had numerous assignments working on product engineering and electronic controls and software.

Tim Campbell is a Program Engineering Manager in the Midsize Vehicles Group at General Motors (GM). He is responsible for leading the product and process integration activities for a future vehicle program and for providing a single engineering voice to the program team. Tim started his career with GM in 1977 when he was a student at GM Institute (now Kettering University), and has held several vehicle development positions working on the Camaro and Corvette. Most recently, he was Program Engineering Manager on the Buick LaCrosse and the new Chevrolet Malibu Eco. In the past, Tim was very involved in University Relations Teams and the FIRST Robotics competition.

Craig Childers See Final Technical Report

Niklas Ekstrom See Executive Steering Committee

Sheri Hickok is Vehicle Chief Engineer for the Buick LaCrosse, Buick Regal, and Cadillac XTS. She began her career with GM in 1995 as a co-op student for the Midsize Car Division. Since then, Sheri served as a Chassis Systems and Integration Engineer in Noise and Vibration and Vehicle Dynamics and as an I-Engineering Group Manager in Chassis in the Alpha Program. She also held the positions of Executive Technical Assistant to the Vice President of Global Engineering and Director of Global Noise and Vibration Center. She led the 2006–2007 “A World in Motion” (AWIM) Program for GM. Sheri has a Bachelor of Science in Mechanical Engineering from Kettering University, a Master of Science in Engineering from Purdue University, and an MBA from the University of Michigan, Ross School of Business.

Larry Johnson is the Director of the Transportation Technology Research and Development Center at Argonne National Laboratory. He has more than 30 years of transportation research experience and is the author or co-author of more than 70 publications and conference presentations on transportation topics.

Mike O’Kronley See A123 Mentors



Edwin Owens is Supervisor of Hybrid Electric Systems and Materials Technology in the Office of Vehicle Technologies at the U.S. Department of Energy (DOE). In this position, he oversees research and development that focus on improving the capabilities and reducing the cost of hybrid electric vehicles. Prior to joining DOE, Mr. Owens worked in technology development at Southwest Research Institute, a major not-for-profit automotive research center, and at Cummins Engine Company, a manufacturer of diesel engines. He has a Bachelor of Science in Mechanical Engineering from Southern Methodist University.

Ann M. Schlenker joined Argonne National Laboratory in 2009 as Manager of the Vehicle Systems Section for the Center for Transportation Research. Ms. Schlenker's applied research work focuses on reducing the transportation sector's reliance on imported energy. Her responsibilities include evaluating the energy and environmental impacts of advanced technologies and new transportation fuels. She manages the testing of vehicle, component, and engine control strategies for advanced technology vehicles, encompassing hybrid electric vehicles, plug-in hybrid electric vehicles, electric vehicles, and fuel cell vehicles. Ms. Schlenker is also responsible for flexible modeling and simulation tool development, with a goal of helping to help manage the number of possible advanced powertrain configurations. Before coming to Argonne, she had spent more than 30 years with Chrysler Engineering in Product Development.

Phil Shaw is Chief Engineer at AVL Powertrain Engineering, where he is responsible for powertrain integration and vehicle programs. Previously he was with Ford Motor Company for more than 12 years working in powertrain development. He has a Master of Science in Automotive Systems Engineering from Loughborough University and a Bachelor of Science in Manufacturing Engineering from Leeds Metropolitan University.

Bob Storc is Senior Manager – Advanced Development for Magna E-Car Systems. He has 10 years of experience working with automotive suppliers, including specialty car and component suppliers, and special skills in creating automobiles and packaging them for ground-up vehicle design. Bob has more than 36 years of experience with GM, where his work has covered Wankel engines; all-wheel drive vehicles; vehicle development; vehicle interior trim, body, fasteners, and chassis; vehicle packaging; vehicle integration; and new product creation and strategies. Bob has 10 patents, including the one for the Midgate™.

Don Vossler is a Fellow and Vice President at Siemens PLM Software, where he leads strategic planning, portfolio management, and software development activities with a goal of finding product life-cycle management solutions within the mechanical design and systems engineering disciplines. Prior to joining Siemens (formerly UGS) in 1982, he worked for 10 years as an automotive engineer at General Motors Corporation. He began as an electrical system design engineer, test car driver, and structures engineer. Later as part of the GM Advanced Engineering staff, he was involved in developing the GM corporate graphics system.



Controls Presentation

Dave Anderson See HIL Evaluation

Tom Ender is the Engineering Group Manager for the Chassis Controls and Onboard Diagnostics (OBD) Team. His responsibilities have included compressed natural gas/liquefied petroleum gas alternative fuel systems; electronic fuel pressure regulations and diagnostics; heating, ventilation, and air-conditioning (HVAC) climate control; hybrid vehicle system diagnostics; pressurized fuel system control; electric vehicle drive control; diagnostics for stability control; and electric trailer brake systems. Tom joined GM in 1997 as part of the Alternative Fuels Team. From 2003 to 2007, he served as the Challenge X Team Mentor for his alma mater, the University of Waterloo.

Scott Furry is a Senior Consultant for MathWorks, whose main areas of focus are model-based design, rapid prototyping and HIL, and controls/physical system modeling. Before joining MathWorks in 2005, he worked in control systems engineering for General Motors and Bosch over a 16 year period. His work involved powertrain controls design, rapid prototyping, HIL, calibration, and plant modeling.

Donna Haiderer is the Chief Engineer and Program Manager for Global Engine Controls at General Motors. Donna joined GM in 1983 as a Software Development Engineer for small block engines and GM Motorsport. Prior to her current position, she had numerous assignments associated with engine quality, design, and development, including Assistant Chief Engineer for the Northstar Engines.

Greg Hubbard is the Senior Manager for Global Electrification Controls at General Motors (GM). Greg began work in alternative propulsion at Rose-Hulman Institute of Technology when he competed in SunRayce '93. Then he attended Massachusetts Institute of Technology, where he did research on hybrid and electric propulsion system modeling and controls. Greg has served as a leader of people and, with more than 40 patents, he has contributed his expertise to the embedded controls for GM's Allison transmission and all of GM's recent production eAssist, hybrid, and electric propulsion systems.

Vivek Jaikamal is currently an Engineering Manager at ETAS Inc., in Ann Arbor, Michigan. His team is responsible for delivering high-end engineering services and developing the product strategy for ETAS's software engineering tools in the Americas. Vivek has more than 20 years of experience in the automotive industry in the areas of embedded software development, model-based design, process consulting, business development, and product marketing.

Santhosh Jogi See HIL Evaluation

Alex Koch joined the FleetCarma team in 2010. Initially he supported the CrossChasm Consulting Division, focusing on the use of powertrain controls, simulation, and model-based design in a wide variety of vehicle applications and industries. Currently he focuses on data collection, signal decoding, and vehicle modeling in support of FleetCarma vehicle selection and vehicle monitoring systems. Alex holds a Bachelor of Science in Mechanical Engineering from the University of Waterloo. He was involved with two AVTCs, Challenge X and EcoCAR: The NeXt Challenge, from 2007 to 2010.

Jim Kolhoff is the global Chief Engineer for front-wheel drive hybrid drive units at General Motors. His organization is responsible for the drive unit hardware for front-wheel drive hybrids and extended-range electric vehicles, including the Chevrolet Volt. Jim was previously Director of Transmission Controls and Director of Software Engineering for GM Powertrain. He has more than 25 years of experience in automotive powertrain engineering.

Vivek Modugal See HIL Evaluation



Dave Reuter is very passionate about hybrid electric vehicles (HEVs) and has been involved with the development of HEV technologies since 1993. Presently Dave is a Technical Specialist for Energy Systems at AVL Powertrain Engineering. Previous positions included Chief Engineer of Hybrid Electric Powertrains at IAV, Inc.; Electrical and Electronics Engineering Manager at Adaptive Propulsion Systems; Program Planning and Project Manager with Kia and HATCI; and Power Systems Engineer at Science Applications International Corporation. Mr. Reuter has a Bachelor of Science in Mechanical Engineering from Michigan Tech and a Bachelor of Science in Electrical Engineering from Purdue University. He also has a Master of Science in Electrical Engineering from the University of Michigan. He has volunteered as the technical advisor and writer for HybridCars.com.

Aymeric Rousseau is the Manager of the Vehicle Modeling and Simulation Section at Argonne National Laboratory. He received his engineering diploma at the Industrial System Engineering School in La Rochelle, France, in 1997. After working for PSA Peugeot Citroen in the hybrid electric vehicle research department, he joined Argonne in 1999, where he is now responsible for the development of Autonomie. He received an R&D100 Award in 2004 and a Vehicle Technologies Program R&D Award in 2010. He has authored more than 40 technical papers in the area of advanced vehicle technologies.

Mechanical Presentation

Ed Argalas is an engineering specialist in vehicle dynamics for the Advanced Development Group at General Motors North America Vehicle Dynamics Center, Milford Proving Ground, Michigan. Since joining the vehicle development staff in 2000, Ed has developed production anti-lock braking system, traction control system, and electronic control (ABS/TCS/ESC) technologies for GM truck products. He also led the development of advanced active damping systems across architectures, and he was responsible for tuning the chassis control system on the Chevrolet Equinox fuel cell electric vehicle. Currently he is leading a project in advanced vehicle steering technologies.

Richard Bush is currently responsible for Global Business Development for NX Design at Siemens PLM Software, a business unit of the Siemens Industry Automation Division and a leading global provider of product life-cycle management (PLM) software and services. It has 6.7 million licensed seats and 63,000 customers worldwide. Mr. Bush has nearly 30 years of experience in computer-aided design, manufacturing, and engineering (CAD/CAM/CAE) applications, beginning with his career at British Aerospace (Kingston), where he specialized in engineering analysis of both metal and advanced composite aircraft structures. In 2004, Richard Joined UGS (now Siemens PLM Software) and was responsible for CAE product marketing around the world.

Henning Lohse-Busch is the lead engineer at the Advanced Powertrain Research Facility at Argonne National Laboratory. His job includes technology benchmark testing of hybrid vehicles, plug-in hybrid vehicles, battery electric vehicles, and alternative fuel vehicles, from prototype to production level. Henning earned a Ph.D. in the field of advanced technology vehicles from the Mechanical Engineering Department at Virginia Tech. He is also a graduate of the U.S. Department of Energy AVTCs and, since 2004, has served as a key organizer and an event captain for the emissions and energy consumption events.

Justin Kern is a senior calibration engineer at Bosch. He has worked at Bosch for eight years as a technical expert and project leader using Motronic engine control software. Before he joined Bosch, Justin was employed at Argonne National Laboratory, where he worked with hybrid electric vehicles and served as a technical coordinator of the AVTC programs.

Niveditha Krishnamoorthy received her Ph.D. in Chemical Engineering from the University of Utah, Salt Lake City. Niveditha works at CD-adapco as a Senior Application Support Engineer, where she is involved in supporting its products StarCCM+, DARs, and Battery Design Studio for a wide range of applications. She also has a strong background in combustion modeling.

Joe Palazzolo is Chief Engineer, eDrive Systems, at GKN Driveline, where he manages the mechanical design and development of new automotive gearboxes, torque transfer devices, and concepts and their integration into production applications. His prior professional experience included all-wheel systems design and development, power transfer unit and transfer case design, and torque management device development at Visteon Corporation, Warn Industries, and Ford Motor Company. Mr. Palazzolo is a recipient of the Society of Automotive Engineers (SAE) Forest R. McFarland Award for distinction in professional development and education, an SAE Master Instructor, and the award-winning author of High-Performance Differentials, Axles and Drivelines. He has designed, built, campaigned for, and supported various race cars and teams for both professional and amateur racing organizations, and he holds numerous patents for advancing mobility systems. He has a Bachelor of Science in Mechanical Engineering from Cleveland State University and a Master of Science in Automotive Engineering from Lawrence Technological University.

Gerard Powierski is a Senior Manager in Powertrain Integration at General Motors. He has worked at the Advanced Vehicle Development Center at GM since 2000, leading the integration of powertrains into our new vehicle architectures. Gerry joined GM in 1984 and has worked in analysis, crashworthiness, chassis, and powertrain at GM. Gerry has a Bachelor of Science in Mechanical Engineering from Wayne State University and a MBA from the University of Michigan.

Muneeb Shaik is a Senior Project Engineer at General Motors' Canadian Regional Engineering Centre. In this role, he supports CAE, validation, chassis structures, and alternative fuel efforts. Muneeb has expertise in modeling and simulation processes that measure durability, crashworthiness, and vehicle dynamics. He has also worked on procuring materials, vehicles, and setting up and conducting full vehicle barrier testing to meet Federal Motor Vehicle Safety Standards.

Larry Slone is an Engineering Specialist in the Advanced Components and Systems Division - OEM On Highway Transmission Group, at Caterpillar, Inc. He is currently the engineering project team leader supporting Caterpillar's collaboration with BAE Systems to develop parallel hybrid systems for heavy-duty on-highway trucks. He is an alumnus of DOE AVTCs from The Ohio State University, where he served as FutureTruck Team Leader and received a Master of Science in Mechanical Engineering.

Tushar Swamy works as a cell product engineer for A123 Systems. In his current role, he is responsible for designing and validating test procedures for battery product/process development and for the detection/root causes of failed cells. Before joining A123, Tushar led the Penn State EcoCAR Energy Storage Systems Group in 2009 and 2010; this role gave him the valuable experience working with automotive batteries that ultimately allowed him to secure his position at A123 Systems.

Tim Tomlinson is Engineering Manager, Snap-On Specialty Tools. He graduated from Western Michigan University in 1992 and has been in engineering/engineering management since that time.

Mick Winship is Executive Director of Engineering at AVL Powertrain Engineering, Inc. Previously, he was Director of Engineering and Business Unit Director of Engine and Transmissions Engineering. Before working at AVL, Mr. Winship was Director of Simulation and Analysis at Ricardo and Manager Design and Analysis at FederalMogul. He holds a Bachelor of Engineering in Combined Engineering from Coventry University.

John Zalewski is Global Product Manager eDrives at Magna Powertrain, and has served as Director of Business Development and Drivetrain System Architect since 2004. Previously, Mr. Zalewski was Executive Engineer for New Product Design at New Venture Gear. He holds a Bachelor of Science in Mechanical Engineering from Clarkson University and holds a Certificate from the Executive Leadership Program at Cornell University.

Electrical Presentation

Kevin Anderson is the Systems and Applications Manager for Freescale's analog mixed signal and power automotive products. He has been involved in automotive systems architecture and in developing requirements for silicon-based automotive solutions for more than 20 years. He currently heads a laboratory that is investigating advanced hardware and software architectures for electric and hybrid electric vehicles. He is a member of the Institute of Electrical and Electronics Engineers and Society of Automotive Engineers, holds two patents, and has authored numerous conference and technical papers.

Sean Bartolucci has responsibilities that include developing and integrating the requirements for high-voltage inverters, DC-DC converters, and chargers. Sean joined General Motors in 2007 as part of the Hybrid Power Electronics Team, where he completed several assignments before becoming Engineering Group Manager in 2010.

Kirk Englert, who is Director, Battery Pack Engineering, started at A123 Systems in September 2008 as an early member of the new Automotive Group. He was responsible for electric and plug-in hybrid electric vehicle pack systems engineering and was part of the core team that was instrumental in the awarding of the Fisker Karma and GM Spark battery pack programs. Prior to joining A123 Systems, Kirk spent eight years with Ford Motor Company, where he launched the industry's first integrated trailer brake controller, launched the first application of trailer sway control on Ford vehicles (including the 2009 F150), and supported roll stability control on multiple programs.

Bruce Falls is the Director of the AVL California Technology Center, which focuses on applying and testing technologies for vehicle electrification. Mr. Falls has nearly 30 years of experience in automotive engineering, mostly in powertrain development and vehicle systems integration. He has

concentrated on the areas of base engine development, electronic controls, including software and calibration, emissions development, and alternative fuel applications. After graduating from the University of Texas with a Bachelor of Science in Mechanical Engineering in 1983, Mr. Falls began his career at the General Motors Technology Center in Warren, Michigan, working for Chevrolet Engineering. He was involved in developing advanced emissions control hardware and strategies that led him to accept the position of Calibration Release Engineer at Milford Proving Grounds. He also worked for McLaren USA on prototype powertrains and racing applications.

Kerry Grand is a Senior Consulting Engineer for MathWorks. His main areas of focus are production code generation, large-scale control modeling, and physical system modeling for power electronic customers. Before joining MathWorks in 2006, Kerry designed and developed electronic motor control algorithms for Ford Motor Company and Ballard Power Systems over an eight-year period, which resulted in 12 related patents.

Tim Grewe is the Chief Engineer for Global Rear-Wheel Drive Electrified Systems at GM. Tim is responsible for design release and integration for hybrid and plug in hybrid systems for GM. He has released numerous hybrid systems for various vehicles ranging from a 60 foot transit bus to passenger cars. Tim has a Master of Science in Electrical Engineering from Syracuse University and a Bachelor of Science in Electrical Engineering from Rensselaer Polytechnic Institute.

Rich Nesbitt has been at Bosch for six years working as a Technical Program Manager TPM, a calibrator, and a technical expert in electronic stability control. Prior to joining Bosch, Rich was employed at General Motors (GM) where he worked with electronic stability control on the GM full-size truck lines and with active all-wheel-drive controls.



Keith Tousignant is Lead Engineer, Validation–Electrical Systems at Magna E-Car Systems. He began his career with the Chrysler Group in the Electromagnetic Compatibility (EMC) Core Group, where he was responsible for testing vehicles for conformance and troubleshooting vehicle-level EMC issues. He moved to the Diagnostic Group at General Dynamics Land Systems, where he wrote manuals on troubleshooting for M1 Abrams main battle tanks, and then came to Magna E-Car in both a systems engineering role and lead validation role. Mr. Tousignant worked on vehicle electrical architecture; supported ongoing software development, failure modes and effects analysis (FMEA) development, and software validation projects; joined a build launch team; and fleet troubleshooting. He has a Bachelor of Science in Electrical Engineering from Oakland University.

Bill Wallace, who became Director of Global Battery Systems for General Motors (GM) in May 2010, oversees the company's design and development of energy battery systems, including the Chevrolet Volt's battery and electric vehicle service equipment. He also leads advanced technology development for battery product engineering. Previously, Wallace was the Engineering Group Manager for designing and developing the Volt's Li-ion battery system. He came to GM in 1990, and he focused on chassis and thermal systems until he came to the battery group. He has held product engineering positions in Flint and Warren, Michigan, as well as in Rüsselsheim, Germany, when he worked for Adam Opel AG. In his career, Wallace has launched 14 major programs across eight platforms, including GM's global midsize architecture. He has a Bachelor of Science in Mechanical Engineering from the University of Illinois and a Master of Science in Aerospace Engineering from the University of California, Los Angeles.

Ron Young provides system guidance and EMC services to programs involving hybrid, electric, and fuel cell activity programs. He is presently in charge of the advanced engineering work for power electronics at the Advanced Technical Center.

Business Presentation

Connie Bezanson See Executive Steering Committee

Bill Boswell is the Senior Director of Partner Strategy for Siemens PLM Software, a business unit of the Siemens Industry Automation Division. Mr. Boswell directs worldwide marketing and the go-to-market strategy for Siemens PLM Software consulting and systems integration partners, software and technology partners, and GO PLM™ global academic partners. Before working in this position, he was responsible for worldwide marketing and the go-to-market strategy for Siemens PLM Software's Teamcenter software product line. Mr. Boswell has nearly 30 years of experience in software, systems engineering, product management, and marketing across multiple industries. He earned his Bachelor of Science in Computer Science and Business from Juniata College in Huntingdon, Pennsylvania.

Carol Johnson is the Program Engineering Manager for GM's Cadillac ELR extended-range electric vehicle program. She has been a leader in hybrid vehicle development since 2001. Carol previously worked as a Program Engineering Manager for crossover vehicle hybrid and plug-in hybrid programs and as an Electrical Engineering Group Manager for the parallel hybrid truck. She has a Bachelor and a Master of Science in Electrical Engineering and has worked in GM's Electrical organization since 1985 on various assignments.

Kevin Kott has been president of dSPACE Inc., the North American headquarters for dSPACE, in Wixom, Michigan, since 2001. dSPACE is the world's leading supplier of tools for developing and testing "mechatronic" control systems. Kevin has more than 30 years of experience in automotive product development, engineering, testing services, and scientific instrumentation. He started as a project engineer at EG&G, Automotive Research, in San Antonio, Texas, and progressed to management and executive responsibilities in vehicle and emissions testing laboratories, engine dynamometer testing, proving grounds operations, and structural-test laboratory operations. He was President of Structural Kinematics in Troy, Michigan, in the late 1980s

and President of EG&G's Instruments for Research and Applied Science in Oak Ridge, Tennessee, in the mid 1990s. He also served as President of EG&G's Consolidated Automotive Operations, providing worldwide engineering and automotive testing services in the late 1990s.

Andy Mastronardi joined Freescale Semiconductor in September 1999 as the Global Director of the Freescale University Programs. For the past 13 years he has assisted universities, colleges, and high schools in their efforts to prepare students for today's workplace. Prior to Freescale, Andy spent 26 years in the education industry, beginning as a high school and college instructor and later moving into educational book publishing. Andy has an Associate of Arts and Science degree, a Bachelor of Arts in Applied Sciences and Mathematics, and a Master of Science in Applied Sciences and Mathematics from Paul Smith's College, the State University of New York at Potsdam, and Long Island University.

Lynda Palombo See Executive Steering Committee

Ken Ratkovich has extensive experience in the manufacturing and supplier production of large automotive vehicles that covers all areas of product and manufacturing engineering, total program management, and corporate financial management. His background involves a lengthy career at General Motors (GM) as a Finance Manager and a Program Manager for some of GM's largest new vehicle programs. After Ken retired from GM, he became Assistant Chief Engineer for the Chevrolet SSR at ASC Corporation. In his current position at Magna International, he does strategic planning to help find opportunities for business growth, and he applies his expertise to financial analysis, budget development, supplier due diligence, acquisition due diligence, project management, and engineering feasibility analysis for the broad range of new project opportunities for Magna. He has a MBA from the University of Maryland and a Bachelor of Science in Industrial Engineering from GM Institute, now Kettering University.

Cindy Svestka is the Engineering Group Manager for GM Powertrain's North American Cranking Systems and Electronic Sensors Group. Since Cindy joined GM in 2000, she has designed and developed ethanol fuel systems for full-size trucks. In that capacity, she has overseen the energy and drive quality performance of the Chevrolet HHR; met the fuel economy and vehicle performance targets for the four-wheel-drive, two-mode hybrid program; and served as the executive technical assistant for Powertrain's vehicle integration. Throughout her time at GM, Cindy has been engaged as a Technical Lead for EcoCAR, Challenge X, FutureTruck, and the Ethanol Vehicle Challenge. Prior to joining GM, Cindy worked for Argonne National Laboratory on the AVTC Program and was a student team leader in the Propane Vehicle Challenge.

Outreach Presentation

Alicia Alvin has been the marketing manager for dSPACE Inc., the North American headquarters for dSPACE, in Wixom, Michigan, since 2006. She has more than 20 years of experience in marketing communications. Alicia has worked extensively in the automotive, quality, and environmental industry sectors.

Dave Barthmuss is Group Manager, Policy and Product, for General Motors Western Region Communications team. Dave has served in various communications functions at GM for nearly 20 years, covering several product, marketing, sales, and issues management positions before assuming his current role. Prior to his career at GM, he held senior-level positions at one of the world's largest public relations agencies, worked for Michigan State Legislature, and was a newspaper reporter. Dave earned a Bachelor of Arts in Journalism and Political Science from Michigan State University. He is currently a board member for the Southern California Leadership Network and California Connections.

Connie Bezanson See Executive Steering Committee

Jacqui Kern is a Senior Recruiter for AVL Americas Inc., which offers combined solutions involving powertrain engineering, simulation software and testing, and instrumentation systems. Jacqui was previously a Recruiting Program Manager for IBM. She has a Bachelor of Science in Business Administration–Marketing from Kutztown University of Pennsylvania.

Maureen Maher joined MathWorks in 2001 and currently manages the Education Marketing Communications Team. Maureen’s team is responsible for programs that support MathWorks business in academia worldwide: sponsoring student competitions and curriculum development, offering fellowships, forming relationships with engineering education societies, and the company’s extensive book program. Before joining MathWorks, Maureen held executive positions at CEO Express, an internet portal service, and at SilverPlatter Information, Inc., a global electronic publisher serving academic and medical libraries. Maureen has a Bachelor of Arts in Communications from the University of New Hampshire and completed the Program for Management Development at Harvard Business School.

Andy Mastronardi See Business Presentation

Lynda Palombo See Executive Steering Committee

National Science Foundation Outstanding Faculty Advisor Awards

Connie Bezanson See Executive Steering Committee

Kristen De La Rosa See Executive Steering Committee

Steve Gurski See Executive Steering Committee

Lynda Palombo See Executive Steering Committee

Don Senich is the Senior Advisor for Academic Programs in the Industrial Innovation and Partnership Division in the National Science Foundation. He is responsible for implementing \$52 million in academic and industrial collaborative research in the Engineering Directorate and is the procurement interface with the Small Business Administration’s Office of Government Contracting.

Freescale Innovation Award

John Cotner is a member of the field engineering team of Freescale Semiconductor. John has held a variety of positions with the automotive electronics industry for the past 23 years, including eight years on hybrid vehicle control and powertrain electronics at Freescale. John received degrees in electrical engineering from the University of Michigan and holds four patents

Renato Frias, who joined Freescale in 2007, is a Field Applications Engineer who provides technical support for companies designing automotive multimedia systems with i.MX processors. Renato started his carrier in the embedded systems space 10 years ago, designing industrial and commercial applications for Motorola semiconductors. He also worked in the telecom market (cellular networks) at Alcatel-Lucent. He has a Bachelor of Science in Electrical Engineering from the Polytechnic School of the University of Sao Paulo.



Andrew Poliak, Director of Automotive Business Development for QNX Software Systems, is responsible for building, developing, and maintaining relationships in the automotive value chain. Automakers, tier one automotive suppliers, and automotive industry analysts all recognize Mr. Poliak as an automotive thought leader. He is a founding member of multiple consortia, including COMET, SH-Navi, now with ng Connect to bring LTE wireless broadband to the automobile, speaks frequently at automotive telematics events, and advises analysts on trends and issues in the automotive market. He holds patents for a framework that consolidates access to multimedia devices, and for social in-vehicle navigation via images encoded with location data. Recently, he helped define and launch the QNX CAR Application Platform, which significantly reduces the upfront engineering needed to develop connected in-vehicle systems. Mr. Poliak holds a Bachelor of Arts in Business with an emphasis in Information Systems from the University of Washington.

Mark Walters is currently the Engineering Group Manager for Global Platform Calibration Development, Verification and Release at General Motors (GM). He joined GM in 2000, and since then has held positions in the Assembly Verification Group; Heating, Ventilation, and Air-Conditioning (HVAC) Validation Group; Global Electrical Center; Software Innovation Team; and Body Control Module Release Group. In Mark's last role, he was Group Manager of the Body Control Software and Calibration Group, where he oversaw the global release of the body control module on various vehicles including the Opel Insignia, Chevy Cruze, Chevy Volt, Camaro, and Buick LaCrosse.

dSPACE Embedded Success Award

Santhosh Jogi See HIL Presentation

Vivek Modugal See HIL Presentation

A123 Systems Energy Storage System Design Award

Tony Knakal See A123 Mentors

Joe Salani See A123 Mentors

MathWorks Modeling Award

Tom Egel, a Principal Consulting Engineer from the Novi, Michigan, office, spends most of his time working with customers in the automotive industry who are interested in using physical modeling and simulation tools. Tom has a Bachelor of Science in Electrical Engineering from Washington University in St. Louis and a Bachelor of Arts in Physics from St. Louis University. Tom's past experiences include work as an electrical design engineer at Texas Instruments, as an applications engineer at Analogy, Inc. (Saber), and most recently as a technical marketing engineer at Mentor Graphics. Prior to joining MathWorks in July 2005, Tom spent more than 12 years developing, supporting, and selling physical modeling tools in the automotive and transportation industry.

Kent Helfrich See Executive Steering Committee

Wit Nursilo is a Senior Application Engineer based in the MathWorks office in Novi, Michigan. He supports physical modeling applications for customers in the automotive and other industries. Including his time at Delphi Corporation and MathWorks, Wit has more than 10 years of industry experience in hydraulics and pneumatics component and system modeling. He has both a Bachelor and Master of Science in Mechanical Engineering from Tokai University, Japan, and he received his Ph.D. in Mechanical Engineering with a focus on hydraulics transmission line dynamics from the University of Texas at Arlington.

Gen Sasaki See HIL Presentation



Paul Smith is the Director of Consulting Services for MathWorks. He has been with the company for about 12 years in various engineering positions dealing with customers. Paul had previously worked for 13 years for a major automotive company developing power train control and diagnostic strategies. Prior to that he served as a Naval Nuclear Engineer on the U.S. Navy submarine force. Paul holds a Bachelor of Science in Electrical Engineering from Michigan Technological University and a Master of Science in Electrical, Communications and Cyber Systems from Wayne State University.

Best Collaboration with a Clean Cities Coalition Award

Dave Gardy is Chairman and Chief Executive Officer of TV Worldwide. After graduation from the U.S. Merchant Marine Academy in 1980 with a commission as an officer in the U.S. Naval Reserve, he joined Advanced Marine Enterprises, initiating the first use of video for ship design and conversion. From 1985 through 1999, he founded two successful, nationally renowned media businesses: Gardy McGrath International and TV on the WEB, both of which were acquired by Ampex Corporation in 1999. After founding TV Worldwide in 1999, he became a recognized pioneer in streaming video applications, building the first network of Internet TV channels, leading to the selection of TV Worldwide to be on the list of the industry's "Hottest Streaming Companies." He has been honored as one of the 25 Most Influential People in Streaming Media. He is President of the International Webcasting Association and serves on the Vietnam Veterans Memorial Fund's Corporate Council.

Andrew Hudgins is a Project Leader at the National Renewable Energy Laboratory, where he supports the Department of Energy's Clean Cities and Federal Fleet Programs. He is leading the efforts of the Clean Cities National Parks Initiative, Clean Cities TV, and Alternative Fuel Stations Database. Previously he was the Alamo Area Clean Cities Coordinator in San Antonio, Texas. Andrew has a Bachelor of Science in Environmental Science from Capital University and a Master of Science in Environmental Policy from the University of Denver.

Marcy Rood Werpy is a Principal Transportation Environmental Analyst at Argonne National Laboratory's Center for Transportation Research, where she manages a team of analysts who support the U.S. Department of Energy's Clean Cities Program in the areas of idle reduction, renewable natural gas, plug-in electric, propane, and natural gas vehicles. Marcy supports the Clean Cities University Workforce Development Program and international activities related to alternative fuels. Previously she was a Program Manager in the Clean Cities Program. She has a Bachelor of Arts in Political Science and Economics from Ashland University and a Master of Arts in Public Administration from Ohio State University.

David Scrivener is an Emmy Award-winning automotive journalist who has been on the staff of the PBS TV series MotorWeek for 22 years. He now works there as a senior producer, head writer, and as high-performance vehicle test driver. David specializes in the topics of automotive maintenance, advanced technologies, and alternative fuels, and he has researched, written, and produced hundreds of feature segments and vehicle reviews in these subject areas.

Women in the Winner's Circle Foundation Award

Pamela Fletcher is the Global Chief Engineer for Electrified Propulsion Systems at General Motors (GM). She is responsible for the extended-range electric vehicle propulsion system in the Chevrolet Volt as well as other future hybrid, plug-in hybrid, and extended-range electric vehicle drive systems. Pamela has been working in the electrification space for more than seven years. Her earlier career responsibilities included engine development and chassis and powertrain integration, and she was a Chief Engineer for mid-sized utility vehicles. Pamela has both a Bachelor and Master of Science in Mechanical Engineering. She also graduated from the Executive Development Program at the Kellogg School of Management at Northwestern University. She is an active member of the Board of Advisors for the College of Engineering at the University of North Carolina in Charlotte.

JoAnn Milliken has more than 15 years of experience in the research and development of energy technologies, having led DOE programs in the areas of batteries and fuel cells; hydrogen production, storage, and delivery; and wind, solar, and geothermal technologies. Prior to joining DOE in 1994, she was a research chemist at the U.S. Naval Research Laboratory and a program manager at the Office of Naval Research, where she conducted and managed mission-related materials research. JoAnn earned a Bachelor of Arts in Chemistry from LaSalle University and a Ph.D. in Chemistry from the University of Pennsylvania under Nobel Laureate Professor Alan MacDiarmid. She also worked on carbon materials as a post-doctoral fellow under Professor Jack Fischer at the University of Pennsylvania. Currently, JoAnn is Acting Director of Strategic Programs in DOE's Office of Energy Efficiency and Renewable Energy, where she oversees activities related to strategic planning and analysis, innovation and deployment, and other cross-cutting areas.

Lyn St. James is the founder of the Women in the Winner's Circle Foundation, a nonprofit organization that focuses on worldwide activities and programs that educate, develop, promote diversity, and advocate for women drivers, particularly those who aspire to become race car drivers. As a former professional IndyCar driver, Lyn was one of the few women to successfully qualify for the Indianapolis 500 and the first woman to win the Indianapolis 500 Rookie of the Year award. During her celebrated driving career, she held 31 international and national closed-circuit speed records and won various races, such as the 24 Hours of Daytona. Lyn also currently serves as a motivational speaker.



Ruth Shuman joined the National Science Foundation in August 2009. She currently serves as the Program Director for the Biology and Chemical Technologies (BC) Cluster in the Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) Programs and recently was named Cluster Leader. In addition, she has organized an outreach effort that targets women grantees and has provided a forum to discuss issues important to the success of their businesses. Before she had this position, she was the founder, president, and CEO of a successful venture-backed life science company, Gentra Systems, Inc., that developed, manufactured, and sold products for genetic testing and research to clinical and research laboratories worldwide. Following Gentra's acquisition, she held various consulting and advisory positions with startup companies, and she was CEO-in-Residence for Life Science with the University of Minnesota's Venture Center, evaluating the business potential of technologies developed at the university. Ruth began her career as a faculty member at North Carolina State University and was a pioneer in developing gene transfer and genetic engineering technology. She has a Ph.D. from the University of Minnesota in Genetics and Cell Biology. Ruth is also an avid auto racing fan and has a long-held interest in automobile technology.

LaVern Sula is the Director of General Motors (GM) Vehicle Cybersecurity. She began her career at GM in 1983 as a co-op student. In 1988, she earned a Bachelor of Science in Mechanical Engineering from the New York Institute of Technology and was hired by GM as a Quality Control Engineer and Supervisor. In her 27 years with GM, she has worked in a number of technical and managerial assignments that span manufacturing and vehicle engineering. They included work with variation simulation modeling and validation engineering, and a role as Business Information Manager and Executive Technical Assistant to the Vice President of Global Engineering. In 2004, she became an executive in GM's Electrical organization, and she has managed GM Engineering Centers in both Canada and India. LaVern won the Women of Color in Technology Award for New Media Leadership. She enjoys judging for FIRST Robotics and EcoCAR competitions.

Cindy Svestka See Business Presentation

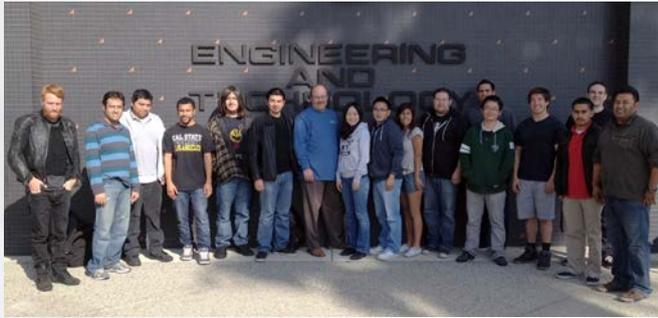


DATE	TIME	ECOCAR 2 EVENT	LOCATION
Thursday, May 17	12:00 PM – 10:00 PM 3:00 PM – 6:00 PM	Teams Travel to Competition Registration	Hotel, Renaissance Hollywood Mezzanine Level, Registration Desk
Friday, May 18	7:30 AM – 5:30 PM 8:00 AM – 9:00 AM 9:00 AM – 5:00 PM 9:00 AM – 5:30 PM 6:00 PM – 9:30 PM	Registration Team Leader Meeting Trade Show Set-Up HIL Set-Up Outreach Practice Session Welcome Night	Mezzanine Level, Registration Desk Mt. Olympus Hollywood Ballroom Hollywood Ballroom Los Feliz Level 3, Hollywood & Highlands
Saturday, May 19	7:30 AM – 8:20 AM 8:20 AM – 9:00 AM 9:00 AM – 10:30 AM 10:30 AM – 10:45 AM 10:45 AM – 12:15 PM 12:15 PM – 1:15 PM 1:15 PM – 3:30 PM 3:30 PM – 3:45 PM 3:45 PM – 5:15 PM 5:30 PM	Registration Judge's Briefings HIL Mt. Olympus Trade Show Outreach Presentations HIL Evaluation Trade Show Presentation Outreach Presentation Break – Trade Show Open Presentations Cont'd Lunch Presentations HIL Evaluation Trade Show Presentation Outreach Presentation Break – Trade Show Open Presentations Cont'd Teams On Your Own	Mezzanine Level, Registration Desk Laurel Los Feliz Hollywood Ballroom Hollywood Ballroom Los Feliz Hollywood Ballroom Poolside Hollywood Ballroom Hollywood Ballroom Los Feliz
Sunday, May 20	7:30 AM – 8:00 AM 8:00 AM – 5:00 PM 8:30 AM – 10:00 AM 10:00 AM – 10:15 AM 10:15 AM – 11:45 AM 11:45 AM – 12:45 PM 12:45 PM – 2:15 PM 2:15 PM – 3:15 PM 3:30 PM – 5:30 PM 4:30 PM – 5:30 PM 6:30 PM – 9:30 PM 6:30 PM	Team Leader Meeting Practice Sessions Mechanical Presentation Electrical Presentation Controls Presentation PIA Presentation Business Presentation Presentations HIL Evaluation Trade Show Presentation Outreach Presentation Break – Trade Show Open Presentations Cont'd Lunch Presentations Cont'd Judge's Debrief Sponsor Displays Set-Up RMT/SMT Briefing Faculty Dinner Teams On Your Own	Mt. Olympus Silver Lake Echo Park Mt. Olympus Franklin Hills Whitley Heights Hollywood Ballroom Hollywood Ballroom Los Feliz Hollywood Ballroom Poolside Hollywood Ballroom Nichols Panorama Suite, Rm. 2001, Ren. Hollywood



DATE	TIME	ECOCAR 2 EVENT	LOCATION	
Monday, May 21	4:00 AM – 10:00 AM	Radio Media Tour	Suite TBD	
	8:00 AM – 8:40 AM	Judge's Briefings Mechanical Electrical Controls Program Initiation Approval Business	Silver Lake Echo Park Mt. Olympus Franklin Hills Los Feliz	
	8:40 AM – 10:00 AM	Presentations Mechanical Electrical Controls Program Initiation Approval Business Freescale Sponsored Award MathWorks Sponsored Award	Silver Lake Echo Park Mt. Olympus Franklin Hills Los Feliz Whitley Heights Nichols	
	10:00 AM – 10:20 AM	Break/Trade Show Open	Hollywood Ballroom	
	10:20 AM – 11:40 AM	Presentations Cont'd		
	11:40 AM – 12:40 PM	Lunch/Trade Show Open (12:10 PM - 12:40 PM)	Poolside	
	1:00 PM – 2:40 PM	Presentations Cont'd		
	2:40 PM – 3:00 PM	Break – Trade Show Open	Hollywood Ballroom	
	3:00 PM – 5:00 PM	Presentations Cont'd		
	5:30 PM – 8:00 PM	Sponsor Social Reception & Trade Show	Hollywood Ballroom	
7:00 PM	Teams On Your Own			
Tuesday, May 22	4:00 AM – 10:00 AM	Satellite Media Tour	Outside, Renaissance Hollywood	
	7:30 AM – 8:00 AM	Team Leader Meeting	Mt. Olympus	
	8:00 AM – 9:20 AM	Presentations Mechanical Electrical Controls PIA Franklin Hills Business Freescale Sponsored Award MathWorks Sponsored Award	Silver Lake Echo Park Mt. Olympus Los Feliz Whitley Heights Nichols	
	9:20 AM – 9:40 AM	Break – Trade Show Open		
	9:40 AM – 11:40 AM	Presentations Cont'd		
	11:40 AM – 12:40 PM	Judges Debrief		
	12:30 PM - 1:00 PM	Red Carpet Arrival	Madame Tussaud's, Hollywood	
	1:00 PM – 3:00 PM	Outreach Awards Luncheon	Madame Tussaud's, Hollywood	
	3:00 PM	Teams On Your Own		
	Wednesday, May 23	9:00 AM – 10:00 AM	Engineer Careers Panel	Doheny, Beachwood, Runyon
9:00 AM – 4:00 PM		Sponsored Award Presentation Women in Engineering	Whitley Heights	
10:00 AM – 12:00 PM		EcoCAR 2 Media Day	Hollywood Ballroom	
12:00 PM – 1:00 PM		Lunch	Poolside	
1:00 PM - 1:30 PM		Group Photo	Grand Staircase, Hollywood & Highland	
1:30 PM - 2:00 PM		Key Ceremony	Renaissance Hollywood	
2:00 PM – 5:00 PM		Trade Show/HIL Take Down and Shipping	Hollywood Ballroom	
6:30 PM – 10:00 PM		Awards Ceremony	Grand Ballroom, Renaissance Hollywood	
Thursday, May 24		ALL DAY	Teams Head Back to Universities	





California State University, Los Angeles

Faculty Advisors: Dr. David Blekhman and Dr. Kamran Karimlou

Team Leader: Chris Reid

Outreach Coordinator: Hector Jimenez

Team Description

CSULA's interdisciplinary EcoCAR 2 team consists of four departments that together carry out all the engineering, business, and outreach efforts. The three engineering departments — controls, electrical, and mechanical — are responsible for the vehicle's design and development. The business/outreach department is responsible for planning and implementing the marketing, communication, finance, and outreach efforts. The CSULA team is managed by the team leader, the department leads, and two faculty advisors. The team departments are well integrated, with redundancy measures implemented to ensure the transfer and sustainability of knowledge and information.

Vehicle Design

The CSULA EcoCAR 2 Team is designing a parallel through-the-road (PTTR) plug-in hybrid electric vehicle (PHEV). This architecture is based on an internal combustion engine powering the front wheels and an electric motor driving the rear wheels. The vehicle will have a 2.4 L flex fuel engine that can be powered by an alternative fuel containing up to 85% ethanol, the goal being to reduce pollutant emissions and greenhouse gas generation. Powered by an A123 Systems battery pack, the Magna E-Drive electric motor will drive the rear wheels. The vehicle can be completely powered by the engine or the electric motor. It will allow the driver to run in fully electric mode for up to 40 miles, which adequately meets the daily driving needs of most U.S. drivers. For longer trips, the 2.4 L engine will provide power to propel the vehicle and recharge the batteries. For everyday commuting, the battery pack can be recharged at home or in any other location equipped with a charging station. Other traditional hybrid technologies will also be implemented on the vehicle, including regenerative braking, electric air-conditioning, and graphic user interface (GUI) "infotainment."



Colorado State University

Faculty Advisors: Dr. Thomas Bradley and Dr. Jason Quinn

Team Leaders: Benjamin Geller and Matthew Fox

Outreach Coordinators: Mary Timby and Leslie Howerton

Team Description

Colorado State University's Vehicle Innovation Team (CSU VIT) consists of two faculty advisors, four graduate students, and 33 undergraduates who are dedicated to developing and building innovative, green automotive technologies. Together, these diverse team members have decades of experience in automotive and energy research and bring to the project their expertise in a variety of areas, including manufacturing, systems engineering, mechanical engineering, electrical and computer engineering, and design. The team works out of CSU's Motorsports Engineering Research Center, which supports students in the fields of vehicle dynamics, vehicle structures and materials, vehicle aerodynamics, hybrid powertrain system design, and vehicle-level control.

Vehicle Design

The CSU VIT has designed and is building a fuel cell plug-in hybrid electric vehicle (FCPHEV). This fully functioning, front-wheel-drive electric vehicle will be powered by a Unique Mobility 145 kW electric motor and a 18.9 kWh lithium-ion battery from A123 Systems. With these components, the vehicle will have up to 55 miles of all electric range for commutes and short trips. For longer trips, a small, high-efficiency, hydrogen fuel cell will supply additional energy to achieve a total driving range of more than 200 miles.

Although the selected architecture does present a myriad of design challenges, its advantages are significant. Compared to other PHEV technologies, the FCPHEV's high efficiency, low well-to-wheel emissions, and negligible use of petroleum make it superior. Compared to pure electric vehicles, the hydrogen system not only provides additional driving range but also enables fast refueling while maintaining zero tailpipe emissions. This unique combination of advantages embodies the CSU team's vision for the future of transportation: a vehicle with high efficiency, low emissions, and full functionality.



Embry-Riddle Aeronautical University

Faculty Advisor: Marc Compere

Team Leader: Brian Harries

Outreach Coordinator: Cassie Jameson

Team Description

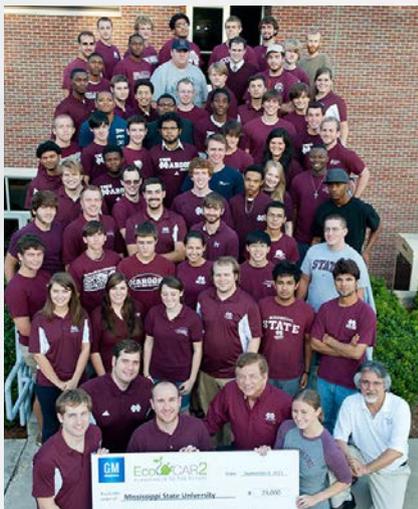
The team from Embry-Riddle Aeronautical University in Daytona Beach, Florida, calls itself the EcoEagles. This diverse, multidisciplinary team includes engineering, communications, and business majors, and it involves graduate and undergraduate students in mechanical, electrical, computer, and aerospace engineering to help design its EcoCAR 2 vehicle. The

engineering students work closely with the outreach group, which is made up of business and communication students. The outreach group focuses on youth education and on promoting community, influencer, and consumer awareness about clean energy initiatives and advanced vehicle technologies. The EcoEagles draw on their high standards of excellence and accumulated expertise in the aerospace industry to solve challenging real-world problems in advanced vehicle development. With strong support from the university, community, and students, the team is poised for success in the EcoCAR 2 competition.

Vehicle Design

For the EcoCAR 2 competition, the EcoEagles have designed a front-wheel-drive series plug-in hybrid electric vehicle (PHEV). The series PHEV will run on both grid electricity and B20 biodiesel fuel. The vehicle will be capable of being driven as an electric vehicle for more than 40 miles by utilizing AM-Racing, Remy electric motors and an A123 Systems lithium-ion battery pack. The EcoEagles are using a GM 1.7 L diesel engine and a Remy generator to sustain the battery. The small GM diesel engine was chosen because of its high efficiency and the low environmental impact associated with B20 biodiesel. The EcoEagles' goals for their series PHEV are to minimize energy consumption, maintain a high level of consumer acceptability, and never compromise driver safety.





Mississippi State University

Faculty Advisor: Dr. Marshall Molen

Team Leader: Matthew Doude

Outreach Coordinator: Kimberly Torries

Team Description

Mississippi State University (MSU) first became involved in advanced vehicle technology competitions (AVTCs) during the four-year Challenge X competition in 2004, followed by EcoCAR: The NeXt Challenge. With EcoCAR 2, the team is now in its eighth year of AVTCs. The MSU EcoCAR 2 team has 84 members who are pursuing degrees in 16 major study areas. The team is led by a graduate student in mechanical engineering, Matthew Doude, and by graduate student group leaders, all of whom have significant experience in AVTCs. Currently, the MSU team is composed of six sub groups: mechanical, electrical, controls, business, outreach, and emissions. The team's leadership is provided by graduate students Matthew Doude, John Moore, Josh Hoop, Lee Pratt, and Kimberly Torries, and the Faculty Advisor is Dr. Marshall Molen.

Vehicle Design

The MSU team has designed their 2013 Chevrolet Malibu to be a series-parallel plug-in hybrid electric vehicle (PHEV). The vehicle will be fueled by ethanol, or E85, and electricity. It will use energy taken from the electric grid through plug-in charging to propel it for the first 60 miles. Its electric powertrain consists of a lithium-ion battery donated by A123 Systems, and a UQM 145 kW permanent-magnet DC traction motor. Once the battery is depleted, the vehicle's turbocharged GM 1.4 L engine will power the wheels, providing extended range. Both the electric traction motor and the engine will transmit their power to the wheels through a six-speed automatic transmission. This architecture will allow an all-electric range, which is crucial in reducing oil dependency, and offer very high efficiency once the battery is depleted and the car is running on liquid fuel.



North Carolina State University

Faculty Advisor: Dr. Eric Klang

Team Leaders: Jonathan Lohr and Phu Ho

Outreach Coordination: Meredith Towery

Team Description

North Carolina State University (NCSU) has been a competitor in advanced vehicle technology competitions (AVTCs) for four years, starting in 2008 with EcoCAR: The NeXt Challenge. Currently the NCSU team has about 25 students, but it is continuing to grow. The team is split

into several subgroups, including mechanical and computer-assisted design, electrical, controls, energy storage system design, and outreach and business.

Vehicle Design

NCSU is designing a series plug-in hybrid electric vehicle (PHEV). This means that the primary source of energy for the GM donated Chevrolet Malibu will be from a battery pack that is able to be charged from the electric grid. This power will be transmitted to the road through a rear-mounted electric motor. After about 45 miles, when the battery pack becomes low, an on-board biodiesel engine will turn on, powering a generator that will take over running the electric motor, which will charge the battery with an extra electrical current.



The Ohio State University

Faculty Advisors: Dr. Giorgio Rizzoni and Dr. Shawn Midlam-Mohler

Team Leader: Katherine Bovee

Co-Outreach Coordinators: Sarah Jadwin and Tyler Joswick

Team Description

The team from Ohio State University is composed of 35 undergraduate and

graduate students who have majors in various fields from photography to mechanical engineering. The three main segments of the team are engineering, outreach, and business. The engineering segment consists of mechanical, electrical, and controls subgroups and is responsible for vehicle design, construction, and testing. The business segment is responsible for fundraising and managing the team budget. The outreach segment is responsible for educational and marketing activities. The three segments work together on a daily basis to develop and promote the Ohio State EcoCAR 2 vehicle.

Vehicle Design

Ohio State University's vehicle architecture is a series-parallel PHEV. It features an 18.9 kWh battery pack that is used with a 118 kW peak electric machine on the rear axle to provide power to the rear wheels through a single-speed gearbox. The vehicle's front powertrain utilizes a 1.8 L, high compression ratio engine recalibrated to run on E85 fuel and a 118 kW peak electric machine to provide power to the front wheels through a six-speed automated manual transmission. The vehicle is capable of operating in charge-depleting, charge-sustaining series, and charge-sustaining parallel modes.



Pennsylvania State University

Faculty Advisors: Dr. Daniel Haworth, Dr. Jeffrey Mayer, and Gary Neal

Co-Team Leaders: Luke Shepley and Eduardo Barrientos

Outreach Coordinator: Allison Lilly

Team Description

Since 1988, students, faculty, and volunteers at Penn State have participated in AVTCs to designing and

building fuel-efficient and production-grade vehicles. Now with 50 undergraduate students; veteran volunteers from past competitions; faculty advisors Dr. Daniel Haworth, Dr. Jeffrey Mayer, and Gary Neal; co-team leaders Luke Shepley and Eduardo Barrientos; and outreach coordinator Allison Lilly, Penn State's team is aiming to train the next generation of automotive and energy professionals. The team is split into four subgroups: mechanical, controls, electrical, and outreach/business. The outreach/business group is dedicated to educating the local State College and surrounding youth and community about the importance of hybrids and fuel-efficient vehicles.

Vehicle Design

The Penn State University Advanced Vehicle Team (PSU AVT) has designed a series plug-in hybrid electric vehicle (PHEV) fueled with E85. The converted 2013 Chevrolet Malibu will utilize a front-wheel-drive system powered by a Magna E Drive motor with a 90 kW electric drive unit to supply the propulsion for the converted 2013 Chevrolet Malibu. For the auxiliary power unit, the PSU AVT will use a naturally aspirated Weber MPE 750 engine fueled with E85, coupled to a UQM PowerPhase 75 generator to supply DC power to the high-voltage bus. A123 Systems donated the lithium-ion-phosphate batteries that will form the basis for the energy storage system.





overseen by graduate students, work together to design and implement the chosen vehicle architecture. In addition to these technical groups is a committee of graduate and undergraduate students from different disciplines that manages outreach and business activities, such as media and community outreach and fundraising.

Vehicle Design

The Purdue EcoMakers selected the parallel-through-the-road (PTTR) plug-in hybrid electric vehicle (PHEV) as their final EcoCAR 2 architecture. The vehicle can be plugged into a standard wall outlet to charge a high-energy-capacity A123 Systems battery, and it can run in electric-only mode. With a 45 kW Magna E-Drive motor, the vehicle will be propelled solely by the electric rear drivetrain. The 1.7 L diesel engine, which operates the front drive train, will help power the vehicle if the acceleration demand is higher than what the electric motor can provide. Once the battery charge is depleted, the front drivetrain will take over, and the vehicle will be powered solely by the B20-capable diesel engine. The rear drive train will continue to function for regenerative braking and to supplement the engine for brief periods when the acceleration demand is high.



Purdue University

Faculty Advisor: Vahid Motevalli

Team Leader: Haley Moore

Outreach Coordinator: Dylan Schmitter

Team Description

The EcoMakers are a diverse team of undergraduate and graduate students, faculty advisors, and university mentors who cross various disciplines at Purdue University. The team is composed of three technical subgroups: controls, powertrain integration, and energy storage systems. These groups, made up of undergraduate engineering and technology students and

Rose-Hulman Institute of Technology

Faculty Advisors: Dr. Zac Chambers and Dr. Marc Herniter

Co-Team Leaders: Patrick Hudson and Jon Nibert

Outreach Coordinator: Kaci Lientz

Team Description

The Rose-Hulman EcoCAR 2 team consists predominantly of undergraduate students from multiple disciplines who are focusing on powertrain development in advanced vehicles. Although the team has a strong mix of mechanical and

electrical engineering students, it actively welcomes students who have majors in all disciplines to become involved with the EcoCAR project. In addition, the Rose-Hulman team works with Indiana State University to give students in business, marketing, and communications an opportunity to participate in the EcoCAR 2 program. The team, which has participated in U.S. Department of Energy Advanced Vehicle Technology Competitions (AVTCs) since 2005, including Challenge X and EcoCAR: The NeXt Challenge, uses powertrain electrification to decrease the amounts of both the petroleum that is consumed and the emissions that are generated by production vehicles, while ensuring that they maintain or exceed consumer satisfaction levels with regard to their performance, utility, and safety. The faculty advisors are Dr. Zac Chambers, Associate Professor of Mechanical Engineering, and Dr. Marc Herniter, Professor of ECE.

Vehicle Design

The Rose-Hulman EcoCAR 2 team is developing an E85-fueled split-parallel plug-in hybrid electric vehicle (PHEV) architecture. This architecture will use a GM BAS motor connected to the E85-fueled GM LE9 engine's accessory belt, which will be able to charge the A123 Systems lithium-ion battery, start the engine, and provide additional power for acceleration. A separate Remy HVH250 motor will provide additional power and regenerative braking capabilities through the rear wheels.



University of Tennessee, Knoxville

Faculty Advisors: David Irick and David Smith

Co-Team Leaders: Ryan Howell and Mitchel Routh

Outreach Coordinator: Victoria Kisluk

Team Description

Team Tennessee is composed of four graduate and 16 undergraduate students. The engineering team has four subgroups: mechanical design engineering led by Ryan Howell,

thermal engineering led by Travis Childress, controls engineering led by Mitchel Routh, and electrical engineering led by Michael Pickelsimer. There is also an outreach team led by Victoria Kisluk, and business team led by Emily Wise.

Vehicle Design

Team Tennessee's EcoCAR 2 vehicle is a series-parallel plug-in hybrid electric vehicle (PHEV), consisting of a 2.4 L LE9 fueled with E85 coupled to a UQM SR218H generator. The rear drive consists of a Remy HVH 250-115A motor mated to a BorgWarner eGearDrive. The energy storage system consists of seven 7X15s2p modules from A123 Systems, providing a nominal 340 volts with 40 Ah capacity. The vehicle will have a 55 kilometer charge-depleting range, after which the vehicle may be operated as either a series or parallel hybrid.



University of Victoria

Faculty Advisors: Dr. Zoumin Dong and Dr. Curan Crawford

Team Leader: Stefan Kaban

Outreach Coordinator: Nicholas Basansky

Team Description

The University of Victoria (UVic) on the beautiful west coast of Canada, is revving up for EcoCAR 2. A relative newcomer to AVTCs, UVic was introduced to them through EcoCAR: The NeXt Challenge and has quickly built a reputation for first-class work, especially in modeling and simulation. The

team is structured into two main groups: technical and outreach/business. The technical group is divided into four subgroups: mechanical/computer-assisted design (CAD), electrical/energy storage system (ESS), controls and modeling, and "infotainment." The outreach group is divided into three subgroups: outreach/media/events, business/accounting, and sponsorship. Every fall semester, UVic's Mechanical Engineering Department offers an elective, "Fundamentals of Hybrid Vehicles," that covers hybrid vehicle technologies and design tools. Students complete several projects that are derived from ongoing EcoCAR team work. The department also offers two design project classes that have been linked to EcoCAR: "Engineering Design Project" and "Green Vehicle Design Project." The outreach/business group is pushing to expand the university's involvement by actively recruiting faculty members from the business and other departments to participate in nontechnical activities.



Vehicle Architecture

The team is competing with a series-parallel plug-in hybrid electric vehicle (PHEV) architecture. A high-capacity battery pack will be built, using lithium-ion modules donated by A123 Systems, to store energy from the grid. A Magna E Drive system mounted in the back of the vehicle will conduct this energy to the rear wheels and provide them with motive power. This unit combines a 100 kW electric motor with a differential, an inverter, and all cooling and related systems into a single unit, thus reducing the amount of system integration work required. To propel the vehicle when a lot of power is demanded and to extend the vehicle's range, a GM 2.4 L E85 engine, with a TM4 37 kW electric motor coupled to it, will be mounted in the front of the car. Using this vehicle architecture provides a full spectrum of propulsion options to address any driving situation, from electric-only operation, to mild hybrid belt-alternator-starter (BAS)+ functionality, to series hybrid operation. The control strategy will incorporate both off-line and real-time optimization and optimal control, derived from ongoing research at UVic, to maximize the vehicle's efficiency.



University of Washington

Faculty Advisors: Dr. Brian Fabien and Dr. Per Reinhall

Team Co-Leaders: Trevor Fayer and Trevor Crain

Outreach Coordinator: Tyler Rose

Team Description

The University of Washington (UW) team is highly interdisciplinary, with undergraduate and graduate students having engineering, business, and art backgrounds. Because this is the first time UW is participating in an AVTC, the team is building an EcoCAR-dedicated facility — UW Advanced Vehicle Works — from the ground up. The team's goal is to

create a laboratory for ongoing alternative fuel research beyond that required for the scope of the competition. With the university's background in environmental science and transportation technology, the team is confident in its ability to excel in this competition.

Vehicle Design

The UW engineers are developing a parallel through-the-road (PTTR) plug-in hybrid architecture (PHEV). The team used a variety of tools and methods to select this final architecture, which the members determined to be the one that encompasses the best combination of efficiency and feasibility. A GM 1.7 L diesel engine in the front of the vehicle will power the car. Biodiesel will be the source of fuel for the internal combustion engine. A Remy electric traction motor will be fitted and drive the rear wheels. Batteries from A123 Systems placed in the rear trunk space will provide power to the motor.



University of Waterloo

Faculty Advisors: Dr. Roydon A. Fraser, Dr. Michael Fowler, and Dr. Steven L. Waslander

Team Leaders: Gurhari P. Singh, Josh Lo, Michael Karpinski-Leydier, Eric Evenchick, Mark Cremasco, and Trevor Sabiston

Outreach Coordinator: Mark Goody

Team Description

The University of Waterloo Alternative Fuels Team (UWAF) is composed of graduate and undergraduate students from the University of Waterloo and Wilfrid Laurier University. UWAF's primary mandate is to conduct research on and design advanced vehicle technologies and implement them in existing production vehicles to reduce fuel consumption, well-to-wheel greenhouse gas emissions, and criteria tailpipe emissions, while maintaining or exceeding vehicle performance, safety, and consumer acceptability. In addition to conducting technical research and development, UWAF actively educates the public about alternative fuels and hybrid vehicle technologies via public outreach events and social media.

Vehicle Design

After completing an exhaustive design process, the team selected an E85 series plug-in hybrid electric vehicle (PHEV) architecture for EcoCAR 2. An 18.9 kWh battery from A123 Systems will power two TM4 motors, which together are capable of delivering more than 260 horsepower to the wheels. The vehicle will have an all-electric range of 60 km and can be recharged by using a standard wall outlet. If the battery is not charged or is depleted, a 2.4 L GM-donated engine will come on line, providing power via an electric generator, to extend the vehicle's range. The team selected these vehicle specifications on the basis of real-world driving habits and consumer feedback. By designing a vehicle based on driver needs, UWAF hopes to push green vehicle technology into the mainstream automotive market.





Virginia Tech

Faculty Advisor: Doug Nelson

Team Leader: Jesse Alley

Outreach Coordinators: Rommelyn Conde, Virginia Hyer, Sarah Kilbourne, and Kaitlyn Wilkes

Team Description

Virginia Tech has had a Hybrid Electric Vehicle Team (HEVT) participating in AVTCs since 1995, starting with the HEV Challenge. This HEVT is composed of senior engineering students and underclassmen volunteers

from various engineering disciplines. It is divided into five subteams: controls, electrical, mechanical, outreach, and business. The subteams work together to design and implement the vehicle architecture chosen in Year 1 of EcoCAR 2. Team members are also responsible for outreach, business, and financial deliverables. The team functions as a senior design project under Virginia Tech's mechanical engineering curriculum, and electrical and computer engineering students get independent study credit for their participation. Team membership provides all students with an opportunity to conduct research and development and to build actual hybrid vehicles. HEVT outreach efforts at Virginia Tech have been expanding by soliciting support and recruiting from the school's Public Relations Student Society of America.

Vehicle Design

For the EcoCAR 2 competition, HEVT chose to design and build a series-parallel plug-in hybrid electric vehicle (PHEV). This type of vehicle uses two different energy sources — an engine and two electric motors — to operate efficiently, maintain low petroleum energy consumption, and have a low impact on the environment. With this vehicle, the HEVT will be able to plug in and recharge the onboard battery pack with grid electricity, allowing the car to operate in all-electric mode. Since the vehicle attains only about 45 miles on a single charge, the HEVT is adding a GM 2.4 L flex fuel engine that uses E85 ethanol to extend its range. This engine will start automatically when the battery charge runs low, so the vehicle can operate solely on fuel energy until the next time the battery is recharged from the grid and all-electric mode can resume. By using these two energy sources to produce the series-parallel PHEV configuration, the HEVT achieves efficient power transfer to the wheels as the engine and electric motors are combined at different times.

ECOCAR2

TEAMS TEAM



Wayne State University

Faculty Advisor: Dr. Jerry Ku

Team Leaders: Idan Regev (Project Manager) and Kevin Snyder (Chief Engineer)

Outreach Coordinator: Jeffery Rednour

Team Description

The members of Wayne State University's Hybrid Warriors team are proud to represent Detroit and Michigan in the EcoCAR 2 competition and hope to excel in all the engineering, business, and outreach events. In the first year of the competition, the

team members developed their collective knowledge and experience and worked together to design a series-parallel plug-in hybrid electric vehicle (PHEV). The team now wants to give back to the community and educate others about hybrid electric vehicles, encouraging them to follow its motto: Aim Higher — Aim Hybrid. The members are inspired by these words of John F. Kennedy: "We choose to go to the moon ... and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept ... and one which we intend to win."

Vehicle Design

The Hybrid Warriors are designing a parallel-through-the-road PHEV. The vehicle, with its all-wheel-drive capability, is based on a 2013 Chevrolet Malibu. It has more than 30 miles of electric-only range from its electric rear-wheel drive, powered by two Remy motors and Rinehart inverters and an A123 Systems 19 kWh high-voltage battery. The double motor configuration allows for more efficient use of the motors while ensuring high performance even in electric-only mode. When the battery is depleted, the vehicle will engage its front-wheel drive, powered by a GM 2.4 L E85 low emissions engine and six speed automatic transmission. In this mode, the electric drive will help with low-speed accelerations, while the battery charge level will be sustained by using normal and forced regenerative braking. The vehicle will have electric power steering and high-voltage air conditioning to reduce accessory load losses.

TEAMS TEAMS TEAMS
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Headline Sponsors



General Motors – For more than 15 years, General Motors (GM) has joined the U.S. Department of Energy (DOE) to sponsor several successful student engineering competition programs. Most recently, GM and DOE have teamed up as the headline sponsors of EcoCAR 2: Plugging In to the Future, the latest Advanced Vehicle Technology Competition program.

The three-year competition, modeled after the GM global vehicle development process, brings students into the real world of vehicle development and helps prepare them to make contributions to the engineering profession and the automotive industry more quickly.

Each participating university team is re-engineering a vehicle donated by GM, with three basic goals: reduce energy consumption, decrease emissions, and maintain the performance and utility features of the stock vehicle. For this competition, the teams are also required to emulate the vehicle categories from the California Air Resources Board zero emissions vehicle (ZEV) requirements. They are encouraged to explore a variety of technology solutions, including electric, hybrid, plug-in hybrid, and fuel cell technologies.

GM will donate vehicles to each of the university teams at the end of the first year of the competition. GM also provided each university team with seed money in Year 1. It donates the use of its engineering, testing, and proving ground facilities for student workshops and competitions. Finally, GM provides highly controlled access to its intellectual property as well as engineering staff support and mentoring — including a program manager, team mentors, and event judges—and communications support for the competition series.

General Motors Co. (NYSE: GM, TSX: GMM) and its partners produce vehicles in 30 countries, and the company has leadership positions in the world's largest and fastest-growing automotive markets. GM's brands include Chevrolet and Cadillac, as well as Baojun, Buick, GMC, Holden, Isuzu, Jiefang, Opel, Vauxhall, and Wuling. More information on the company and its subsidiaries, including OnStar, a global leader in vehicle safety, security, and information services, can be found at <http://www.gm.com>.



U.S. DEPARTMENT OF
ENERGY

U.S. Department of Energy Office of Energy Efficiency and Renewable Energy (EERE) provides overall competition management, team evaluation, and technical and logistical support for EcoCAR 2 through Argonne National Laboratory.

DOE launched its student vehicle competition program in 1989 to demonstrate and test technologies developed in its laboratories. By combining the next generation of technical innovators with emerging advanced transportation technologies, the EcoCAR competition helps ensure a sustainable, environmentally responsible transportation future. DOE's EERE and its network of national laboratories maintain an aggressive research and development program in advanced vehicle technologies, which covers energy storage, electric motors and machines, hybrid systems, fuel cells, advanced materials, alternative fuels, and heat engines. DOE continues to develop new technologies to improve vehicle efficiency and lessen the nation's dependence on foreign oil. Through its student vehicle competition program, close to 20,000 students have received hands-on engineering experience. Many of them have moved on to take jobs in the automotive industry, bringing with them an understanding of and enthusiasm for advanced vehicle technologies. For more information, visit www.eere.energy.gov/vehiclesandfuels.

Diamond Sponsors



Natural Resources
Canada

Natural Resources Canada and the Government of Canada has been a longtime supporter of the U.S. Department of Energy's Advanced Vehicle Technology Competition program, providing technical and program support for more than 21 competitions over 18 years. EcoCAR 2 underscores the Government of Canada's

commitment to addressing greenhouse gas reductions and supporting sustainable energy policies and advanced automotive technologies. Support to EcoCAR is provided by Natural Resources Canada and Transport Canada.

Natural Resources Canada provides knowledge and expertise and offers programs and activities to support the sustainable development and use of Canada's natural resources and the global competitiveness of its resource and related sectors. This includes energy activities that encompass policy development, market development programs, and international activities in energy efficiency, renewables, transportation technologies, alternative fuels, and conventional fuels. Transport Canada is responsible for transportation policies and programs. It ensures that air, marine, road, and rail transportation are safe, secure, efficient, and environmentally responsible. For more information, visit <http://www.nrcan.gc.ca/>.



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Visit www.mathworks.com for more information.



California Air Resources Board (ARB) – California's state legislature established the ARB in 1967 to protect public health, the economy, and the state's ecological resources by reducing air pollution. With the passage of Assembly Bill (AB) 32, the

agency must now also develop and implement strategies to reduce greenhouse gas emissions. Since its formation, the ARB has successfully worked with the public, environmental groups, businesses, and local and federal agencies to cooperatively reach clean air goals. While many problems persist, California now enjoys its cleanest air in more than 50 years. See www.arb.ca.gov for more information.





U.S. Department of Energy

Clean Cities is part of the Vehicle Technologies Program in the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. Clean Cities strives to advance the nation's energy, environmental, and economic security by supporting local decisions to reduce U.S. dependence on imported petroleum. Clean Cities has a network of about 90 volunteer coalitions that develop public/private partnerships to promote alternative fuels and advanced vehicle technologies, such as electric drive vehicles, and other petroleum reduction practices, such as idle reduction technologies and fuel economy initiatives. The Clean Cities program is funding the EcoCAR 2 outreach coordinators fellowship. This presents a great opportunity for students to participate in EcoCAR 2 marketing efforts and support their local Clean Cities coalitions. See <http://www.eere.energy.gov/cleancities/> for more information.

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dSPACE, Inc. is a market innovator and leading producer of engineering tools for embedded controller development. dSPACE provides integrated systems for prototyping control algorithms, automatic production code generation, controller testing, controller calibration, and engineering support services. It views the EcoCAR competition as an opportunity to empower student engineers to quickly develop innovative solutions to address the challenges of reduced vehicle emissions, increased vehicle performance, and driver satisfaction. Its robust and comprehensive environment for developing electronic control units is designed to dramatically reduce development time and costs, while providing increased flexibility for continuous process modifications. Today, more than 20,000 dSPACE systems are in use worldwide, serving customers in the automotive, aerospace, commercial and off-highway vehicle, agricultural, educational, engineering, robotics, and noise and vibration industries. Visit www.dspaceinc.com for more information.



A123 Systems, Inc. (NASDAQ: AONE) develops and manufactures advanced Nanophosphate[®] lithium iron phosphate batteries and energy storage systems for the transportation, electric grid, and commercial markets. The company was founded in 2001, based on novel nanoscale technology initially developed at the Massachusetts Institute of Technology. It currently employs more than 2,400 people globally.

A123's high-performance Nanophosphate lithium iron phosphate battery technology delivers high power and energy density combined with excellent safety performance and extensive life cycling in a lighter-weight, compact package. A123's growing list of blue-chip customers in the automotive market includes leading passenger car makers (including GM, BMW, Fisker Automotive, and SAIC, the largest automaker in China) as well as companies focused on the truck/bus market (including Smith Electric Vehicles, Daimler, ALTe, VIA Motors, Navistar, and BAE Systems).



Freescale (NYSE: FSL) is a global leader in embedded processing solutions, providing industry leading products that are advancing automotive, consumer, industrial, and networking markets. From microprocessors and microcontrollers to sensors, analog integrated circuits, and connectivity – our technologies are the foundation for the innovations that make our world greener, safer, healthier, and more connected. Some key applications and end-markets include automotive safety, hybrid and all-electric vehicles, next-generation wireless infrastructure, smart energy management, portable medical devices, consumer appliances, and smart mobile devices. The company is based in Austin, Texas, and has design, research and development, manufacturing, and sales operations around the world. Visit www.freescale.com for more information.



AVL Powertrain Engineering is the world's largest privately owned and independent company for the development of gasoline, diesel, and alternative fuel powertrain systems, as well as fuel cell and hybrid technologies. For more than 60 years, AVL has been active in the development of engines and powertrains having low fuel consumption. AVL Powertrain Engineering activities embrace all functions, from concept definition to production development. Supported by comprehensive in-house research, AVL's engineering specialists design and develop engines for both stationary and mobile applications, transmissions, and complete powertrain systems.

The company offers combined solutions that involve powertrain engineering, simulation software, and testing and instrumentation systems. AVL guarantees close cooperation with customers through its affiliates and local offices worldwide. AVL's North American headquarters is located in the Detroit suburb of Plymouth, Michigan. By supporting EcoCAR, AVL is proving its commitment to the future of the automotive industry with the ongoing, hands-on education of tomorrow's engineers and leaders. For more information, visit www.avl.com.



National Science Foundation (NSF) is a longtime supporter of the U.S. Department of Energy's Advanced Vehicle Technology Competitions. In addition to providing financial support to EcoCAR 2, the NSF also provides awards to faculty members who have made significant contributions to the goals of the EcoCAR 2 program and to engineering education. NSF is an independent federal agency that supports fundamental research and education across all fields of science and engineering. Its annual budget was approximately \$6.5 billion in fiscal year 2009. NSF funding reaches all 50 states through grants and cooperative agreements to nearly 2,000 universities and institutions. Every year, the NSF receives about 55,600 competitive requests for funding and makes about 13,000 new funding awards. The NSF also awards more than \$425 million in professional and service contracts yearly. The website www.nsf.gov has more information.

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ETAS provides a comprehensive portfolio of open tools for vehicle electronic control units (ECUs), which are used extensively by automotive and heavy-duty diesel manufacturers and adjacent segments of the embedded industry. ETAS's business activities focus on increasing customer process efficiency and process quality. ETAS products can be easily integrated into existing customer processes, including any required integration into and with third-party products. ETAS has complete solutions for control systems development, i.e. modeling/integration, hardware in the loop (HIL), rapid prototyping, and measurement/calibration, are used throughout the globe. INCA, ETAS's calibration and measurement software, is the industry standard and is used by more than 15,000 engineers worldwide. More than 50 million vehicles around the globe run on software validated by ETAS's HIL testing system, LABCAR. The ETAS portfolio also includes engineering services, training, and premium customer support.

ETAS is an active participant in standards consortiums, such as ASAM, OSEK, Nexus, AUTOSAR, AESAS, FlexRay, LIN, and JasPar. There are 650 ETAS personnel representing the company in markets throughout the world, including Germany, the United States, Japan, Korea, the People's Republic of China, India, France, the United Kingdom, Sweden, Italy, Brazil, and the Russian Federation. For more information, visit www.etas.com.





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Magna Powertrain is one of the most diversified automotive suppliers in the world. Magna Powertrain designs, develops, and manufactures technologically advanced automotive systems, assemblies, modules, and components. Magna Powertrain also engineers and assembles complete vehicles, primarily for manufacturers of cars and light trucks. As an organization that values teamwork, innovation, and the entrepreneurial spirit, it is proud to sponsor the EcoCAR competition and the talented engineering students who participate. For more information, see www.magnapowertrain.com



The Bosch Group is a leading global supplier of technology and services. In the United States, Canada, and Mexico, the Bosch Group manufactures and markets automotive products (both original equipment and aftermarket), along with many other items: industrial drives and control technologies, power tools, security and communication systems, packaging technology, thermo-technology, household appliances, solar energy, healthcare telemedicine, and software innovations. Since establishing a regional presence in 1906, Bosch employs more than 22,500 associates in more than 100 locations, with sales of \$9.8 billion in fiscal year 2011, according to preliminary figures. For more information, visit www.boschusa.com.



FleetCarma developed by CrossChasm Technologies, combines data-logging and modeling to determine the total cost of plug-in vehicle ownership. In addition, FleetCarma's system determines if a vehicle is range-capable based on your particular usage and driving style. After you purchase, FleetCarma provides in-performance monitoring for plug-in (PHEV/EREV/EV) vehicles. FleetCarma was recently listed as one of Deloitte's Green15, a list of 15 leading clean technology companies. Recognition on Green15 was based not only on the FleetCarma system but also on the model-based design and control systems work that CrossChasm does for original equipment manufacturers (OEMs) and Tier 1 suppliers of OEMs. See www.fleetcarma.com for more information.



Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product life-cycle management (PLM) software and services, with 7 million licensed seats and more than 71,000 customers worldwide. Headquartered in

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Vector CANtech, Inc., located in Novi, Michigan, was established in 1997 as a wholly owned North American subsidiary of Vector Informatik, GmbH. Vector is a leading manufacturer of software tools, embedded software components, and services to automotive original equipment manufacturers and their suppliers, as well as to various other

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Vector is proud to be a sponsor of EcoCAR and other programs that benefit universities and future engineers. For more than 10 years, Vector has been committed to providing students and faculty members access to its premium in-vehicle networking tools: CANoe, CANalyzer, and CANape. To learn more about Vector, visit www.vector.com.





GKN Driveline has 22,000 employees in more than 57 facilities in more than 23 countries. A pioneer and a systems leader in advanced electric and hybrid drivelines, GKN Driveline continues to deliver driveline systems and provide solutions to the world's automotive manufacturers. Within the eDrive Systems product segment, GKN Driveline designs, develops, and manufactures an impressive range of solutions, from eAxles, for hybrid, electric, all-wheel-drive, and compact systems for low power drive) to compact, lightweight "eTransmissions" (compact, lightweight transmissions for purely electric vehicles). In addition to employing a standardized family approach, GKN Driveline works closely with vehicle manufacturer teams to innovate eDrive systems for the future. With a focus on efficiency, performance, and dynamics, GKN Driveline targets its technologies toward continuous improvement and innovation in applying alternative power sources and sustainable energy in systems that deliver outstanding performance. As an EcoCAR 2 Bronze Sponsor, GKN Driveline is providing eTransmissions and technical support to three university teams as well as general financial support to the EcoCAR 2 Program. The website www.gkndriveline.com has more information.



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Research In Motion (RIM), parent company of **QNX**, is a manufacturer and marketer of innovative wireless solutions for the worldwide mobile communications market. Through the development of integrated hardware, software and services that support multiple wireless network standards, RIM provides platforms and solutions for seamless access to time-sensitive information including email, phone, SMS messaging, Internet and intranet-based applications. RIM technology also enables a broad array of third party developers and manufacturers to enhance their products and services with wireless connectivity. RIM's portfolio of award-winning products, services and embedded technologies are used by thousands of organizations around the world and include the BlackBerry wireless platform, the RIM Wireless Handheld™ product line, software development tools, radio-modems and software/hardware licensing agreements. Founded in 1984 and based in Waterloo, Ontario, RIM operates offices in North America, Europe and Asia Pacific. RIM is listed on the Nasdaq Stock Market (Nasdaq: RIMM) and the Toronto Stock Exchange (TSX: RIM). For more information, visit www.rim.com or www.blackberry.com.



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Woodward is an electronic system integrator and a leader in the application of code generation onto the production controllers. Woodward supplies the MotoHawk® model-based software development tools used by many EcoCAR teams. Woodward's MotoHawk Control Solutions product line supplies electronic systems, tools, and controller hardware to the industrial, power generation, automotive, marine, recreational, aviation, and other

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The Delphi Foundation is an independent charitable foundation established in 1999. Delphi Foundation's target areas are educational opportunities and support systems aimed at helping young people reach their full potential. Underscoring Delphi's commitment to corporate citizenship, the Delphi Foundation focuses support on education, particularly in the areas of science and

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Women in the Winner's Circle (WIWC) Foundation was founded in 1994 by former Indy race car driver Lyn St. James. It is a 501(c)(3) organization that focuses on worldwide activities and programs designed to educate, develop, promote diversity, and advocate for women drivers, particularly those who aspire to become race car drivers. WIWC is dedicated to making a difference and reaching a point in time when finding opportunities and achieving diversity are no longer of concern; they are taken for granted.

The foundation's mission is to provide the leadership, vision, resources, and financial support to help create an environment in which women are welcome to participate and increase their experience in the automotive and the competitive motor sports fields.

The WIWC Foundation is proud to sponsor an award to honor women engineering students who demonstrate outstanding technical excellence and accomplishments in EcoCAR 2. The award is intended to encourage more women to study engineering and pursue a career in automotive engineering after graduation. For more information, visit <http://lynstjames.com/foundation/>.





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ADVANCED VEHICLE TECHNOLOGY COMPETITIONS

This competition year marks the 24th year that the U.S. Department of Energy has sponsored Advanced Vehicle Technology Competitions (AVTCs) through Argonne National Laboratory. Over the past two decades, more than 45 competitions have been held, with the participation of more than 85 universities and the involvement of more than 15,000 students. The AVTC program is providing the automotive industry with thousands of engineering graduates who have gotten real-world experience to help them prepare for the transportation and energy-related challenges of the 21st century.



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