



U.S. DEPARTMENT OF  
**ENERGY**



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## QUICK FACTS & BACKGROUND

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### ***ECOCAR 2: PLUGGING IN TO THE FUTURE***

*EcoCAR 2: Plugging In to the Future* is a three-year collegiate student engineering competition and the only program of its kind. Focused on vehicle integration of advanced propulsion technologies, EcoCAR 2 offers an unparalleled hands-on, real-world experience to educate the next generation of automotive engineers. The competition challenges 15 universities across North America to reduce the environmental impact of vehicles without compromising performance, safety and consumer acceptability.

Shaped by the greatest design changes in the history of the automotive industry, EcoCAR 2 requires students to explore a variety of powertrain architectures focusing on electric drive vehicle technology. Student designs will consider the well-to-wheel (WTW) impact of fuel use, and select renewable fuels. EcoCAR 2 teams will utilize a Chevrolet Malibu, donated by General Motors (GM), as the integration platform for their advanced vehicle design.

During the three-year program EcoCAR 2 teams will follow a real-world Vehicle Development Process (VDP) modeled after GM's VDP. The VDP serves as a roadmap for the engineering process of designing, building and refining their advanced technology vehicles. Following a VDP will give the teams an opportunity to improve their vehicles efficiency while retaining consumer acceptability, performance and safety.

EcoCAR 2's unique combination of cutting edge engineering practices, hands-on experience, exposure to world-class organizations and knowledge sharing in a competitive and team-oriented environment makes it the perfect preamble to future job success and a bastion for keeping the North American automotive industry competitive in the global marketplace.

*EcoCAR 2: Plugging In to the Future* was established by the United States Department of Energy (DOE) and GM and is being managed by Argonne National Laboratory. EcoCAR 2 follows the previous successful student engineering competitions, "EcoCAR: The NeXt Challenge" and "Challenge X: Crossover to Sustainable Mobility," also sponsored by GM and the DOE. More information is available at [www.ecocar2.org](http://www.ecocar2.org) and on the competition blog at [www.green-garage.org](http://www.green-garage.org).

### ***PARTICIPANTS***

The 15 university teams participating in the EcoCAR 2 competition are:

- California State University, Los Angeles (Los Angeles, CA)
- Colorado State University (Fort Collins, CO)
- Embry-Riddle Aeronautical University (Daytona Beach, FL)
- Mississippi State University (Starkville, MS)
- North Carolina State University (Raleigh, NC)

- The Ohio State University (Columbus, OH)
- Pennsylvania State University (University Park, PA)
- Purdue University (West Lafayette, IN)
- Rose-Hulman Institute of Technology (Terre Haute, IN)
- University of Tennessee, Knoxville (Knoxville, TN)
- University of Victoria (Victoria, British Columbia, Canada)
- University of Washington (Seattle, WA)
- University of Waterloo (Waterloo, Ontario, Canada)
- Virginia Tech (Blacksburg, VA)
- Wayne State University (Detroit, MI)

## **COMPETITION DETAILS**

### **Year One**

In the first year of EcoCAR 2, student teams will receive \$25,000 in seed money to begin developing their vehicle designs. Year One is an essential foundation for establishing a successful vehicle by emphasizing the use of math-based design tools—like Argonne’s Autonomie or similar vehicle models—and the development of software-in-the-loop (SIL) and hardware-in-the-loop (HIL) simulation techniques.

After researching, comparing and selecting advanced technologies that meet the competition and team goals, students will procure hardware to develop and test their powertrain and other subsystems. The emphasis is on optimizing a practical, realizable solution that will meet the goals of the competition. By broadening the technical focus of the competition to include more aspects of the entire vehicle development process, the university teams will have a greater opportunity to expand their learning and refine their vehicle solutions. Teams that successfully complete this first year of EcoCAR 2 will earn a key to a new Chevrolet Malibu and a place in the second phase of the competition.

### **Years Two and Three**

During the second and third years of the competition, students will build the vehicle and continue to refine, test, and improve vehicle operation. At the end of Years Two and Three, the re-engineered student vehicle prototypes will compete in a week-long competition of engineering tests. These tests are similar to the tests GM conducts to determine a prototype’s readiness for production. The Greenhouse gas, Regulated Emissions, and Energy in Transportation (GREET) model, developed at Argonne National Laboratory, will be used to assess a well to wheel analysis of the greenhouse gas impacts of each technology approach the teams select.

During the week-long competition, student teams will demonstrate the vehicles so when compared to the production gasoline vehicle they meet or exceed the following goals:

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

## **SPONSORS**

The U.S. Department of Energy and General Motors are the headline sponsors for the EcoCAR 2 competition. General Motors will provide production vehicles, vehicle components, seed money, technical mentoring and operational support. The U.S. Department of Energy and its research and development facility, Argonne National Laboratory, will provide competition management, team evaluation and technical and logistical support.

In addition, high-profile industry sponsors provide participating teams with leading-edge math simulation software, automotive propulsion systems, programs and mentoring support to the students.

EcoCAR 2 sponsors include:

- Natural Resources Canada
- MathWorks
- California Air Resources Board
- Clean Cities
- dSPACE, Inc.
- A123Systems, Inc.
- Freescale
- AVL Powertrain Engineering, Inc.
- ETAS
- Snap-On Tools
- Magna E-Car
- Magna Powertrain
- Robert Bosch, LLC
- Siemens PLM Software
- CD-Adapco
- Vector CANtech
- Woodward

By sponsoring advanced vehicle engineering competitions like EcoCAR 2, GM, the DOE and other industry sponsors are helping to develop the next generation of scientists and engineers.

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