



QUICK FACTS AND BACKGROUND

ECOCAR: THE NEXT CHALLENGE

EcoCAR: The NeXt Challenge is a three-year collegiate student engineering competition that focuses on vehicle integration of advanced propulsion technologies. The competition challenges 17 universities across North America to reduce the environmental impact of vehicles by minimizing the vehicle's fuel consumption, petroleum use and emissions, while maintaining its utility, safety and performance.

Students will design and build advanced propulsion solutions that are based on categories from the California Air Resources Board (CARB) zero emissions vehicle (ZEV) regulations. Students are encouraged to explore a variety of solutions including electric, hybrid, plug-in hybrid and fuel cells. In addition, they will incorporate lightweight materials, improve aerodynamics and utilize alternative fuels such as ethanol, biodiesel and hydrogen.

Using a real-world engineering process modeled after GM's Global Vehicle Development Process (GVDP), teams will integrate their advanced technology solutions into a 2009 Saturn Vue crossover vehicle. The GVDP is the modeling simulation process currently used to develop all GM vehicles. This real-world approach gives students valuable hands-on experience in engineering practices and resource allocation. The EcoCAR competition is unique for its focus on modeling and simulation, as well as subsystem development and testing, rather than just hardware modifications.

EcoCAR: The NeXt Challenge was established by the United States Department of Energy (DOE) and General Motors (GM) and is being managed by Argonne National Laboratory. More information is available at www.ecoCARchallenge.org and photos can be viewed at <http://archive.ecocarphoto.com/c/ecocarphoto>.

PARTICIPANTS

The 17 university teams participating in the EcoCAR competition are:

- Embry-Riddle Aeronautical University (Daytona Beach, FL)
- Georgia Tech (Atlanta, GA)
- Howard University (Washington, DC)
- Michigan Technological University (Houghton, MI)
- Mississippi State University (Starkville, MS)
- Missouri University of Science and Technology (Rolla, MO)
- North Carolina State University (Raleigh, NC)
- Ohio State University (Columbus, OH)
- Pennsylvania State University (University Park, PA)
- Rose-Hulman Institute of Technology (Terre Haute, IN)
- Texas Tech University (Lubbock, TX)
- University of Ontario Institute of Technology (Oshawa, Ontario, Canada)
- University of Victoria (Victoria, British Columbia, Canada)
- University of Waterloo (Waterloo, Ontario, Canada)
- University of Wisconsin-Madison (Madison, WI)
- Virginia Tech (Blacksburg, VA)
- West Virginia University (Morgantown, WV)

COMPETITION DETAILS

Year One

In the first year of EcoCAR, student teams receive \$10,000 to begin developing their vehicle designs through the use of GM's GVDP. Year One is an essential foundation for establishing a successful vehicle by emphasizing the use of math-based design tools—such as Argonne's Powertrain Systems Analysis Toolkit (PSAT) 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. Vehicles are evaluated using a well-to-wheels approach, which highlights all the issues involved in energy efficiency and emissions including the fuel source, the propulsion system and the vehicle's real-world utility and consumer appeal. 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 will earn a key to a new 2009 Saturn Vue 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 the technology each team selects.

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

- 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 criteria and WTW greenhouse gas (GHG) and criteria emissions; and
- 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 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, more than 30 industry sponsors provide participating teams with leading-edge math simulation software, automotive propulsion systems, programs and mentoring support to the students. EcoCAR sponsors include:

- Government of Canada
- California Environmental Protection Agency
- Air Resources Board
- A123 Systems
- dSpace, Inc.
- The MathWorks
- National Instruments
- Freescale Semiconductor
- AVL Powertrain Engineering, Inc.
- National Science Foundation
- Woodward
- Vector CANtech, Inc.
- Robert Bosch, LLC
- Sensors, Inc.
- Snap-On, Inc.
- Magna International/Magna Powertrain
- Renewable Fuels Association
- Siemens PLM Software
- Delphi Foundation
- EcoMotors
- Women in the Winner's Circle Foundation

By sponsoring advanced vehicle engineering competitions like EcoCAR, GM, the Department of Energy and other industry sponsors are helping to develop the next generation of scientists and engineers. *EcoCAR* follows the previous successful student engineering competition, "*Challenge X: Crossover to Sustainable Mobility*," also sponsored by GM and the U.S. Department of Energy.

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