

12



1997

# FutureCar challenge

Join in  
*Showcasing*  
Tomorrow's  
Advanced-Technology  
Vehicles...

**Today**



## Think It's Possible to Triple the Fuel Economy of Today's Mid-Sized Family Sedans — without Sacrificing Affordability, Performance, and Safety?

That's just one goal of the FutureCar Challenge, a two-year competition that challenges student teams from top universities in North America to design and build a mid-sized family sedan capable of achieving up to 80 mpg.



The FutureCar Challenge is sponsored jointly by the U.S. Department of Energy (DOE) and the United States Council for Automotive Research (USCAR) — a research venture of Chrysler Corp., Ford Motor Co., and General Motors Corp. The goals of the Challenge parallel those of the Partnership for a New Generation of Vehicles (PNGV), a cooperative research and development program between the federal government and USCAR. PNGV aims to significantly improve national competitiveness in manufacturing, implement commercially viable innovations from ongoing research on conventional vehicles, and develop vehicles that are up to three times more fuel efficient than today's sedans — without sacrificing consumer demands for performance, utility, safety, and affordability.

## What's Involved

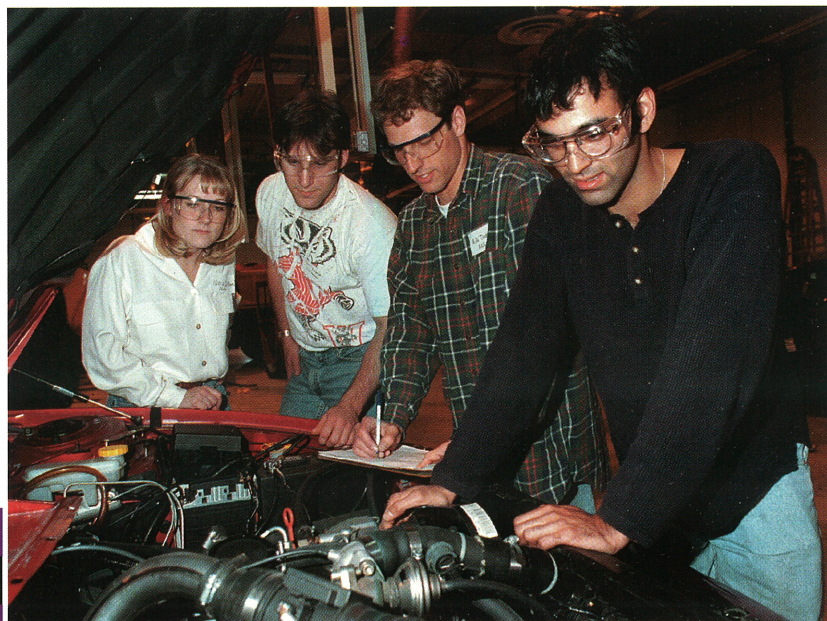
Innovative engineering...creativity...problem solving...setting and achieving goals — that's what the FutureCar Challenge is all about. Students blend raw materials and creative engineering to modify (convert) today's production vehicles to run on one of several "high-tech" alternative powertrains and fuels.

- The raw materials: a Chevrolet Lumina, Dodge Intrepid, or Ford Taurus as a conversion platform and \$10,000 in seed money from sponsors in 1996.
- Creative engineering: students choose a drivetrain and fuel combination with the greatest potential to move toward 80 mpg, including hybrid electric vehicle (HEV) technologies, advanced batteries, and direct-injection engines.
- The outcome: strategies for building energy-efficient vehicles that take into account potential manufacturability, affordability, safety, and performance.

## The 1996 FutureCar Challenge

The 1996 FutureCar Challenge took place June 17–24. During that week, Ford hosted design and performance events at its facilities in Dearborn, Michigan. The U.S. Environmental Protection Agency's (EPA's) National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Mich., conducted emissions and dynamometer testing. Industry and government engineers scored the vehicles on the basis of fuel efficiency, reliability, range, acceleration, handling, design, emissions, manufacturability, cost, and consumer acceptability.

Teams focused primarily on developing energy-efficient alternative powertrains. In just 10 months, students designed and implemented major engineering changes to their vehicles. Of the 12 vehicles, 10 were HEVs. HEVs draw power from two sources. The primary energy source (usually a heat engine) converts fuel into energy, and the second power source is an energy storage device (such as advanced batteries, flywheels, or ultracapacitors) that stores excess engine and braking energy. Other teams used different approaches: one used a 0.85-L air-boosted CNG-fueled engine, while another used a 1.9-L advanced direct-injection diesel engine. All of these approaches use a variety of fuels, like compressed natural gas (CNG), diesel fuel, biodiesel, ethanol (E85), liquefied petroleum gas (LPG), or reformulated gasoline (RFG).







The '96 Challenge demonstrated a collection of advanced approaches to high-fuel-efficiency vehicles. But there are still technical hurdles to overcome; PNGV has identified critical challenges to meet:

- Double the thermal efficiency of conventional mid-sized sedans. After 100 years of refinement, today's internal combustion engine uses only about 15% of the energy in a gallon of gasoline to move the vehicle. Major issues for alternative energy conversion devices include emissions, system packaging, weight, manufacturing, cost, and consumer acceptance.
- Develop compact energy-storage devices that charge/discharge power efficiently. Cost and weight reduction are major issues.
- Decrease vehicle weight by as much as 40% to improve fuel economy. Hurdles include weight, cost, manufacturability, and recycling.

## The Outcome of the '96 Challenge

The '96 competition was only the beginning.

- Excellent combined city/highway fuel economy — close to 45 mpg. Half of the vehicles demonstrated increased combined city/highway fuel economy, even though they weighed 12 to 1,236 lb more than stock counterparts.
- Sophisticated applications of technology — teams used advanced control strategies for hybrid vehicles, advanced powertrains incorporating new small engine technologies, and more powerful and efficient electric motors.

Everyone who participated was a winner. Teams that did exceptionally well after one year of competition were recognized with special awards, a few of which are listed at right.

## Team Awards

- First Place:** Virginia Tech  
**Second Place:** Ohio State University  
**Third Place:** Lawrence Technological University  
**Fourth Place:** University of Wisconsin-Madison  
**Fifth Place:** Concordia University  
**Sixth Place:** West Virginia University

## Event Awards

- Most Energy Efficient Vehicle:** Virginia Tech  
**Best Engineering Design:** Lawrence Technological University  
**Best Acceleration:** Ohio State University  
**Lowest Emissions:** Virginia Tech  
**Best Consumer Acceptability:** Concordia University  
**Best Application of Advanced Technologies:** Lawrence Technological University

## Special Awards

- Manufacturing and Cost Special Award:** University of Illinois at Chicago  
**Best Safety:** University of Maryland  
**Best Use of Alternative Fuels:** Virginia Tech

## Participating Teams Represent Universities across North America

Participating Team	Vehicle	Powertrain	Fuel Economy (MPGe)*	Acceleration Time (Seconds)
California State University at Northridge	Chevrolet Lumina	Parallel HEV	N/A	N/A
Concordia University	Dodge Intrepid	Parallel HEV	27.80	13.84
Lawrence Technological University	Ford Taurus	Parallel HEV	36.70	12.57
Michigan Technological University	Dodge Intrepid	Series HEV	24.30	13.29
Ohio State University	Chevrolet Lumina	DI Diesel	42.80	11.17
University of California at Davis	Ford Taurus	Parallel HEV	N/A	14.40
University of Illinois at Chicago	Ford Taurus	Stored-Air Supercharging	N/A	20.92
University of Maryland	Dodge Intrepid	Series HEV	N/A	12.63
University of Michigan	Ford Taurus	Parallel HEV	N/A	N/A
University of Wisconsin-Madison	Dodge Intrepid	Parallel HEV	30.60	12.52
Virginia Tech	Chevrolet Lumina	Series HEV	44.71	11.21
West Virginia University	Chevrolet Lumina	Series HEV	29.80	16.62

\* Mile per gallon equivalent (combined city/highway)



## What's Next?

Buckle-up and keep an eye out for the starting flag — the 1997 FutureCar Challenge is coming next June! Students are already gearing up for the '97 Challenge. General Motors will host the competition at its Technical Center in Warren, Mich. As in '96, the '97 Challenge will evaluate the vehicle in its entirety. In '97, teams will focus on gains in energy economy through advanced powertrains and other innovations, such as lightweight materials and improved aerodynamics. New events include HVAC testing, an over-the-road endurance event, and a gradeability test, which evaluates the power of the vehicle required to sustain a constant speed while on an incline.

## Who Benefits?

Everyone benefits from the competition. Students gain... *Intimate knowledge of advanced vehicle design and operation... Hands-on experience... Skills that lead to prime engineering jobs... Practical experience from working with a talented team of colleagues and mentors. Industry gains... Exposure to new ideas and technological innovations... The opportunity to evaluate advanced automotive technologies... Contact with students destined to become tomorrow's outstanding engineers... Favorable corporate visibility. The public sees... The results and benefits of a government, industry, and academia partnership... The potential vehicle technologies of tomorrow... That highly fuel-efficient vehicles can be fun, fast, and friendly.*

## Media Coverage — Great National Interest

The FutureCar Challenge makes news — more than 80 million people heard or read about the 1996 competition, including more than 55 million readers of magazines and newspapers and more than 25 million viewers or listeners to television and radio. The story was carried by such media as CNN, the *Washington Times*, *Chicago Tribune*, *Los Angeles Times*, and National Public Radio. Now that's coverage!



## Get Involved — Join the List of Sponsors and Supporters!

Want to be recognized for helping today's brightest, most talented students publicly demonstrate the potential of these advanced-technology vehicles? Contribute an award on behalf of your company... showcase your PNGV technology... watch as your tax-deductible contribution to the FutureCar Challenge helps take your company into the express lane, passing the competition. For more information about sponsorship, contact Shelley Launey at the U.S. Department of Energy.



FutureCar invites new sponsors to help make the 1997 competition a success. *Participating in this proven event is a great way to support a worthwhile, hands-on educational project.*

Join USCAR, DOE, and this distinguished group of sponsors and supporters who have committed to contributing money, time, and effort to make the 1997 FutureCar competition a success:

- Detroit Edison
- Goodyear Tire & Rubber Company
- National Science Foundation
- Natural Resources-Canada
- U.S. Environmental Protection Agency

Detroit  
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GOODYEAR



Natural Resources  
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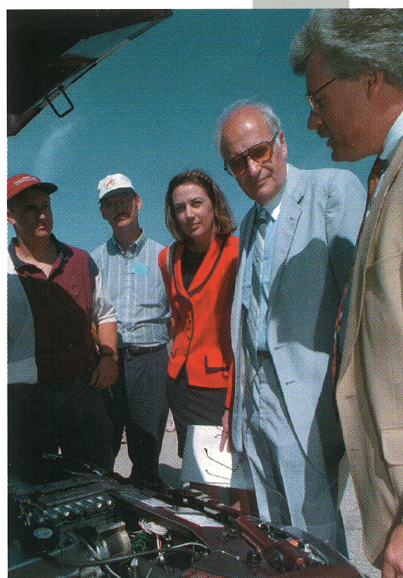




**"The FutureCar Challenge is more than a competition. It is a collaboration that brings together the brightest minds of government, industry, and academia in an effort to 'reinvent' the American automobile." — Al Gore, Vice President, United States**



**"This competition is not only a great way for students to get real world experience, but more importantly, to gain an understanding of the significant technical challenges facing the automotive industry in the future." — Mike Thomas, Executive Director, USCAR**



**"You don't know cars until you've built, broken, rebuilt, rebroken, rebuilt, and finally put them back together — just in time. Working with a large group of students, professors, and companies is an excellent real-life experience." — FutureCar team member, UIC**



**"DOE is extremely proud of its vehicle competitions. Through the years, they have become a highly visible public demonstration of what can be accomplished when government and industry are committed to working together to enhance engineering education, the environment, and the U.S. economy." — Tom Gross, DOE Office of Transportation Technologies**



**"Student engineering research competitions provide an unequalled educational experience for the future leaders of the auto industry and produce excellent, state-of-the-art vehicles that industry can use to measure their own approaches and ideas." — Dr. David Holloway, President-Elect, Society of Automotive Engineers**

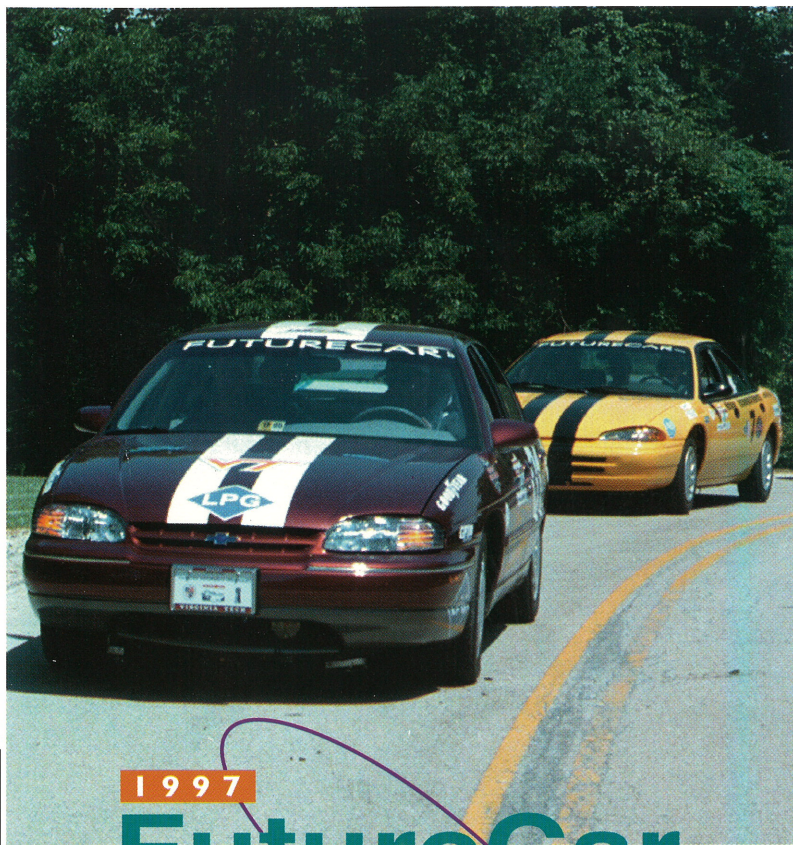
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**To Learn More,  
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