

FutureDrive

Volume 1, Number 1

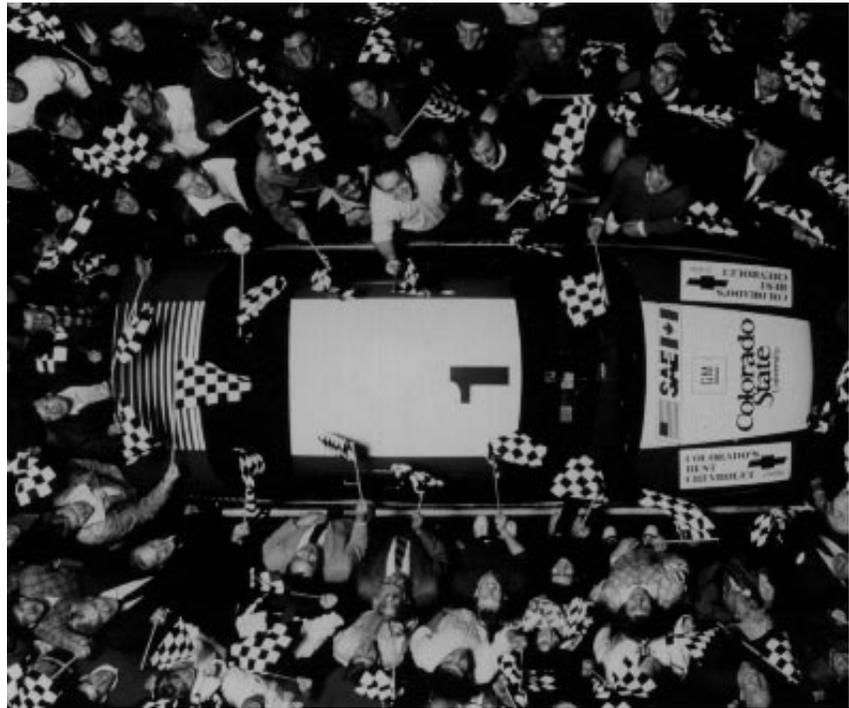
DOE/Industry Competitions Advancing Automotive Technology

Spring 1995

WELCOME TO FUTUREDRIVE

Tour the Future in Today's Advanced Vehicles

Will your vision of the future drive the designs of tomorrow's cars and trucks? That's the objective of thousands of participants in the Automotive Technology Competition series sponsored by the U.S. Department of Energy (DOE) in partnership with industry. *FutureDrive*, our new quarterly publication about the entire range of the series, will provide a glimpse of the future shape of automotive technology. These competitions enable engineering, science, and business students to create advanced, environmentally responsible vehicles and technologies in a low-risk, low-cost, high-payoff setting.



In 1995, 10 DOE-sponsored competitions will take place, involving electric, hybrid-electric, solar, and alternative-fueled vehicles. Basic electric vehicle conversions to ground-breaking technologies will be showcased. With *FutureDrive*, we'll keep you up to date on each competition's plans, events, and results. We'll note how the competitions impact education and research and development. We'll also show how they open doors for people and help bring advanced transportation technology into today's marketplace. For instance, a multi-fuel injector for alternative-fueled vehicles, initially developed in a DOE-sponsored competition, is now being manufactured for use in Chrysler's propane vans.

If you'd like to contribute your time or resources to an upcoming competition, there are plenty of ways you can help. Perhaps your company would like to sponsor

an event. Or maybe you could work with a participating school or judge an event. The articles inside provide contacts for each event; feel free to call them to volunteer or ask for more information.

Involvement in the competitions is always gratifying, since they produce exciting, technologically advanced vehicles. Still yet another reward we reap from them are the lasting friendships we forge. So, if you've participated in a past competition, we'd like to hear from you again. Let us know what you're doing now so we can share the news with other competition enthusiasts. Keep in touch. Through *FutureDrive*, you know we will.

Bob Larsen
Director, Competition Activities
Argonne National Laboratory

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FUTUREDRIVE
 Volume 1, Number 1, Spring 1995

Purpose

To inform past, present, and potential sponsors, participants, organizers, volunteers, and others interested in DOE-sponsored vehicle competitions about the plans for and results from the competitions.

We welcome submissions but reserve the right to edit them. Information in *FutureDrive* may be reproduced for publication with acknowledgment to *FutureDrive*, Argonne National Laboratory. Address correspondence, subscription requests, and changes of address to:

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Argonne National Laboratory
U.S. Department of Energy

DOE Competitions Allow Students to Transform Tomorrow's Vision into Today's Reality



Since 1987, more than 8,000 students from top science and engineering programs in more than 150 North American high schools, colleges, and universities have participated in the U.S. Department of Energy's (DOE) vehicle competitions. And now, with increasingly strong support from the automotive industry and from within DOE itself, we expect these numbers to grow rapidly. A new competition, *FutureCar*, may be added to our already full list of events. Why? Because the competitions give the nation's brightest engineering, science, and business students the opportunity to design and build automobiles. The result? New concepts. New technologies. New designs. Increased public knowledge and acceptance of alternative-fueled vehicles. All add up to a very tangible representation of the creativity, vision, and energy needed to launch the fuel-efficient, environmentally friendly vehicles of the future.

Through *FutureDrive*, DOE's new quarterly publication, we hope to give you a deeper understanding of the depth and breadth of activities involved in each and every event. We hope to paint a picture of the energy and excitement generated by each competition. *FutureDrive* will recognize the many accomplishments of competition participants as well as the support from and participation by hundreds of professionals from the government and automotive-related industries. *FutureDrive* will also highlight the numerous benefits that accrue from the competitions, including:

◆ **Advancing Technologies for Today's Market.**

A number of student-developed technological innovations or refinements have already been incorporated by auto manufacturers and suppliers into their commercially available product lines. Each new competition fosters the unique insights and creativity of the students and brings cutting-edge automotive engineering and design concepts to the road.

◆ **Enhancing Student Capabilities through Real-World Experience.**

Applying engineering principles learned in school to solve real-world problems, the school teams design and build vehicles that meet stringent competition requirements. Many talented competition graduates have become part of the newest generation of employees at DOE and its network of national R&D laboratories. Others are bringing their experience to employment within the auto industry itself. Undoubtedly, this new generation of automotive engineers will influence the direction of future transportation decisions in a positive and powerful manner.

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 truly committed to working together for the future of our nation's educational system, the environment, and the U.S. economy.

Shelley Launey
 Manager of Vehicle Competitions
 DOE Office of Transportation
 Technologies

EDS Makes Science Education Exciting

Electronic Data Systems (EDS), a world leader in the application of information technology, is providing aerodynamic analysis, consulting, and photo-realistic images to more than 30 teams involved in Sunrayce 95. The project is being supported by EDS's Campus Relations and the Advanced Technology Business Unit. By utilizing the service, students are exposed to the modern age of electronic communications. Internet, telephones, and voice mail are used to efficiently communicate requirements, data, results, and information between EDS and the design teams. For the 31 schools that are participating, EDS analyzed 90 different car configurations with varying onset conditions for a total of 253 analysis runs. (In comparison, 41 runs were completed for 16 schools prior to Sunrayce 93.)

"Our involvement with these events gives students and the general public a chance to see EDS technology and what we do, and they walk away realizing how much we have to offer," says Coleen McKenna, EDS Campus Relations Manager. "It also makes our technology easier to understand,

because people can see it and see how it relates to what's happening out on the road."

Sunrayce 95 provides a unique vantage point for this year's spectators. Through the "eyes" of technology, race enthusiasts will be able to view the 1,100-mile, solar-powered vehicle race from start to finish. EDS, Delco Electronics, and Hughes Network Systems are teaming up to track and


"The company's goal of making science education exciting aligns with EDS's efforts to encourage students to pursue careers in math, science, and engineering fields."

communicate the current position of each solar vehicle throughout the race. By combining Global Positioning System satellite technology with cellular technology and communication services, the Location Communication System (LCS) will provide up-to-the-minute race information. Kiosks will display each solar vehicle's location on an on-line map for spectator viewing at public sites and media outlets along the race route.

During the race, EDS will use a customized timing and scoring system, the EDS Sunrayce Scoring Information System (SSIS). The system—a database application developed to work in Microsoft Windows—will provide continuous feedback on what is happening throughout each day of the race. SSIS was first used during Sunrayce 93 and has been modified for several other student engineering events. These include the 1994 HEV Challenge, Formula SAE, Canadian Solar Challenge, and World Solar Challenge.

The SSIS will be linked to the LCS to provide an official elapsed time for each school, a starting position posting with each school's name, and start time each morning. The system will also print reports showing the name of each school, official elapsed time, daily penalties and standing, and overall standing.

"EDS has a strong corporate commitment to education," notes Dolores Bertossi, EDS Campus Relations Representative. "The company's goal of making science education exciting aligns with EDS's efforts to encourage students to pursue careers in math, science, and engineering fields." Founded in 1962 and headquartered in Plano, Texas, EDS has more than 76,000 employees committed to applying computer and communications technologies to improve business performance for a highly diversified customer base.

Dolores Bertossi
EDS Campus Relations
Representative



“AfterShock” HEV Sets Mileage Record, Reduces Emissions

AfterShock, an award-winning, hybrid-electric vehicle (HEV), set a mileage record on an October 20, 1994, test drive through central California. During the 440-mile trip from Los Angeles to Sacramento, AfterShock required only a single battery charge and 5.7 gallons of gasoline, while averaging 77 mpg. University of California, Davis (UC Davis) engineering students created the vehicle.

the U.S. Department of Energy through Argonne National Laboratory, the National Renewable Energy Laboratory, Saturn Corp., the Society of Automotive Engineers, and Natural Resources of Canada.

In the Ground-Up class, each team of students designed and built a completely new vehicle from scratch, combining an electric


“We wanted to design and fabricate a world-class HEV that would set benchmarks in electrical performance, gasoline fuel economy, and emissions.”


 propulsion system with a combustion engine—powered by alternative fuels or reformulated gasoline—to produce an HEV.



AfterShock’s test drive gained nationwide recognition through media coverage on TV stations in numerous California cities, Minneapolis, Seattle, Denver, Milwaukee, Cleveland, Pittsburgh, and West Palm Beach, as well as on the CBS “Up to the Minute” national network broadcast. The *Washington Times* in D.C. and local California newspapers also publicized the event. On October 21, AfterShock was displayed at a Clean City dedication at the California state capitol in Sacramento with U.S. Department of Energy Secretary Hazel O’Leary in attendance.

“We wanted to design and fabricate a world-class HEV that would set benchmarks in electrical performance, gasoline fuel economy, and emissions,” remarks Greg Reimers, the UC Davis HEV Program Coordinator and a graduate engineering student.

AfterShock took first-place honors in the Ground-Up class of the 1994 Hybrid Electric Vehicle (HEV) Challenge. The competition was held June 14-20 at Lawrence Technological University in Southfield, Michigan. More than 35 vehicles from North America competed in the HEV Challenge, making this intercollegiate competition the largest gathering of HEV technology ever. The event was sponsored by

AfterShock Specifications

Curb Weight	2,250 pounds	Top Speed	105 mph
Wheelbase	93 inches	ZEV Range:	
Length	160 inches	Freeway	80 miles @ 60 mph
Width	70 inches	City	125 miles @ 30 mph
Height	50 inches	HEV Range	750 miles @ 60 mph
0-60 mph (ZEV)	14 seconds	Fuel Economy:	
0-60 mph (HEV)	13 seconds	Gasoline	80 mpg @ 60 mph

SAE Competitions Spark the Imagination

The 1995 Formula SAE competition will be held at the Pontiac Silverdome in Michigan on May 18-21. This competition challenges engineering students to conceive, design, fabricate, and compete with small, formula-style racing cars. There is plenty of opportunity for creativity, knowledge, and imagination to come to the fore, with only small, safety-based restrictions on car frame and engine size. The cars are judged in three different categories: static inspection and engineering design, solo performance trials, and high-performance track endurance.

During all performance events, teams may choose to run their cars with gasoline or M-85 (a mixture of 85% methanol and 15% hydrocarbons). For this competition, the DOE, through Argonne National Laboratory, sponsors several awards totalling \$7,000, which are presented to the top M-85 finishers. In addition, DOE sponsors awards for Best M-85 Fuel Economy, for Best M-85 Design/Conversion, and for Outstanding Teamwork.

Another DOE-sponsored competition, West Coast Supermileage, will take place June 10-11 in Sacramento, California. Categories include the ISO-octane fuel class, in which teams design and construct a vehicle powered by a Briggs & Stratton engine, and the Alcohol fuel class, in which the vehicle can be powered by any internal combustion engine. DOE provides another award for the Alcohol fuel class.



To become involved in the 1995 Formula SAE or West Coast Supermileage competitions as a participant, judge, or volunteer, or to obtain more information, contact Lynn Puskar at SAE headquarters (412) 776-4841, ext. 224.

Race into the Future with Electric Vehicle Technology Competitions

Four major on-track electric vehicle (EV) events will take place during March, April, May, and July, 1995. Electric Vehicle Technology Competitions, Inc. (EVTC), is coordinating the events.

The 1995 APS Electrics (formerly the APS Electric 500) will be held March 3-5 in Phoenix, Arizona. The APS Electrics, the "granddaddy" of all electric vehicle competitions for university, high school, and elementary school students, focuses on electric vehicles, the environment, and alternative transportation. The broad spectrum of vehicles, coupled with flexible charging capabilities, offers students the chance to implement infrastructure and vehicle design "experiments" in the "laboratory" environment available at the event. Competition sponsors include the U.S. Department of Energy through Argonne National Laboratory, Arizona Public Service, Edison Electric Institute, Advanced DC Motors, and Asea Brown Boveri.

At the Toyota Grand Prix of Long Beach, scheduled for April 14-16 in

Long Beach, California, EVTC will conduct an electric vehicle exposition. The expo will increase public awareness of electric vehicles and DOE vehicle competitions for as many as 100,000 people throughout the weekend.

Hosted by Virginia Power, the Richmond EV Grand Prix for university and high school students will be held May 5-6 in Richmond, Virginia. East Coast high school students will compete at the event; top teams will be invited to participate in next year's APS Electrics.

The Cleveland Electric Formula Classic will take place July 21-22 in Cleveland, Ohio. Last year, drive systems from Centerior Energy, Hughes, AC Delco, Westinghouse, General Electric, Solectria, Motorola, and DOE were present.

If you'd like more information or want to volunteer for an event, contact Donald Karner, Electric Vehicle Technology Competitions, L.C., P.O. Box 11088, Glendale, AZ 85318. Phone: (602) 978-1373; Fax: (602) 978-8310.



Recap from 1994 Automotive Technology Competitions

In 1994, over 280 teams from high schools, colleges, universities, and the private sector entered vehicles in seven major competitions. Participants came from North America and abroad to compete. The teams designed and built electric, hybrid-electric, solar, natural gas, and other alternative-fueled vehicles. Following are short descriptions of each event and the top winners in each competition and category.

**APS Electric 500
Electric, Hybrid-Electric,
and Solar-Electric Vehicles
March 17-18
Phoenix, AZ**

The APS Electric 500 provided a forum for interchange among high school students focused on electric vehicles, the environment, and alternative transportation.

- ◆ 1st Shadow Mountain H.S.
Porsche 914
Phoenix, AZ
- ◆ 2nd Port Townsend H.S.
Mazda RX7
Port Townsend, WA
- ◆ 3rd Snowflake H.S.
Honda Civic
Snowflake, AZ

**World Clean Air Road Rally
to Disneyland
Alternative-Transportation
Vehicles
April 8-11
Disneyland, CA**

Patterned after road rallies, the Rally traveled through 25 Southern California cities, showcasing electric, hybrid-electric, natural gas, propane, ethanol, and solar-

powered vehicles. Its purpose was two-fold: first, to show that these vehicles are capable of fulfilling daily transportation needs; and second, to test the vehicles under the challenging driving conditions they face in the California market. Participants included high school and university students as well as utility and business representatives.

Electric Commuter Class

- ◆ 1st University of California,
Davis
Geo Prizm
Davis, CA
- ◆ 2nd John Dunning/Delco Remy
Geo Metro
Monrovia, CA
- ◆ 3rd Jesse James/Sunbelt
Battery Co.
Karmann Ghia
Tempe, AZ

Alternative Fuels Class

- ◆ 1st Long Beach
Gas Department
CNG Ford Explorer
Long Beach, CA
- ◆ 2nd Long Beach
Gas Department
CNG Rideshare Van
Long Beach, CA
- ◆ 3rd City of Long Beach
CNG Police Car
Long Beach, CA

**EV Grand Prix
Electric Vehicles
April 28-30
Richmond, VA**

The U.S. Department of Energy and electric utilities partnered to establish this high school program for electric vehicles, as a model

for other, similar competitions throughout the United States. The EV Grand Prix was open to schools within a 200-mile radius of Richmond, Virginia, and drew together students in curricula ranging from advanced placement physics to automobile shop classes.

- ◆ 1st Northampton County
H.S.-East
Ford Escort
Jackson, NC
- ◆ 2nd Raleigh County
Vocational Tech Center
Geo Metro
Beckley, WV
- ◆ 3rd Hermitage
Technical Center
Dodge Colt
Richmond, VA

**Clean Air Grand Prix
Electric Vehicles
May 13-15
Atlanta, GA**

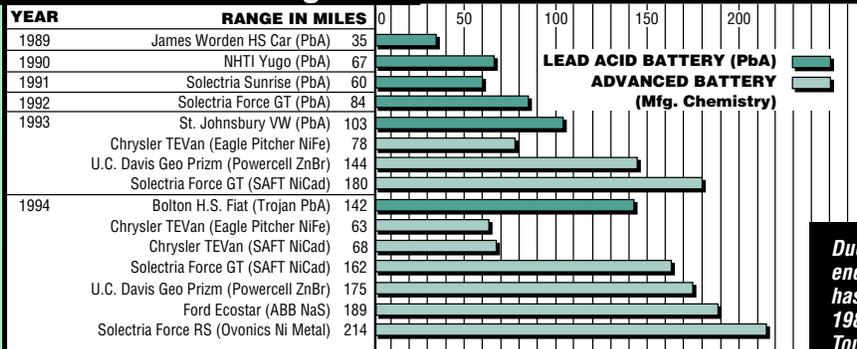
Sixteen universities and colleges converted gasoline-powered vehicles to electric power. The U.S. Department of Energy donated kilowatt-hour meters to the teams.

- ◆ 1st University of
Central Florida
Mercury Lynx
Orlando, FL
- ◆ 2nd Daytona Beach
Community College
Chevy Chevette
Daytona Beach, FL
- ◆ 3rd DeVry Technical Institute
VW Rabbit
Decatur, GA

**Formula SAE
Small, Open-Wheeled
Racing Cars
May 20-22
Pontiac Silverdome, MI**

The Formula SAE Competition gave engineering students the opportunity to conceive, design, fabricate, and compete with small, formula-style racing cars. During about one year, the teams designed

Electric Vehicle Range



Due to better overall efficiency and advanced energy storage systems, electric vehicle range has increased from 35 miles to 214 miles between 1989-1994. Cars that competed in the American Tour de Sol are shown.

Recap from 1994 Automotive Technology Competitions

and built more than 60 cars, which were compared and judged at the competition.

M-85

- ◆ 1st University of Texas at Arlington
Arlington, TX
- ◆ 2nd University of Akron #80
Akron, OH
- ◆ 3rd University of Akron #81
Akron, OH

Best M-85 Fuel Economy

- ◆ University of Akron #81
Akron, OH

Best M-85 Design/Conversion

- ◆ University of Texas at Arlington
Arlington, TX

Argonne National Laboratory Outstanding Teamwork Award

- ◆ University of Puerto Rico,
Mayaguez
Mayaguez, PR

American Tour de Sol Electric, Hybrid-Electric, and Solar-Electric Vehicles May 22-28 New York, NY to Philadelphia, PA

The road rally format, with stops in nine different communities during the seven-day event, was designed to exhibit electric and solar vehicles that have near-term potential for meeting U.S. transportation needs. Anyone with an electric, hybrid-electric vehicle, or a solar racing car who wished to promote electric transportation to the public was eligible to enter the event.

COMMUTER ELECTRIC VEHICLE CATEGORIES

Production

- ◆ 1st PA Electric Transportation Council
Ford Ecostar
Greensburg, PA
- ◆ 2nd Ford Motor Co.
Ford Ecostar
Dearborn, MI
- ◆ 3rd Solectria Corp.
ForceGT-Geo Metro
Boston, MA

American Commuter

- ◆ 1st Solectria Corp.
ForceRS-Geo Metro
Boston, MA
- ◆ 2nd University of California,
Davis
Geo Prizm
Davis, CA
- ◆ 3rd Bolton H.S.
Fiat X1/9
Bolton, CT

Tour de Sol Commuter

- ◆ 1st MIT Solar EV Club
Custom
Cambridge, MA
- ◆ 2nd NHTI Solar Car Team
Custom
Concord, NH
- ◆ 3rd SETS Racing Team
Custom
Enosburg Falls, VT

SOLAR RACING CATEGORY

Tour de Sol Racing

- ◆ 1st Salisbury School
Custom
Salisbury, CT
- ◆ 2nd Dartmouth University
Custom
Hanover, NH
- ◆ 3rd University of Pennsylvania
Custom
Philadelphia, PA

Cross-Continental Racing

- ◆ 1st Drexel University
Custom
Philadelphia, PA
- ◆ 2nd Mankato State
Custom
Mankato, MN
- ◆ 3rd Rochester Institute of Technology
Custom
Rochester, NY

OPEN CATEGORY

- ◆ 1st Schiller Power Group
Motorcycle
Bensheim-Zell, Germany
- ◆ 2nd Team New England
Three-Wheeled
Cambridge, MA
- ◆ 3rd Team Forest
Motorcycle
Sunderland, MA

Hybrid Electric Vehicle Challenge Hybrid-Electric Vehicles June 14-20 Southfield, MI

The HEV Challenge involved 40 teams from colleges and universities around the world. Besides providing future engineers with exceptional educational opportunities, it resulted in a wealth of technical data that complement and enhance the automotive industry's research and development efforts.

SATURN CONVERSION

- ◆ 1st University of Maryland
College Park, MD
- ◆ 2nd (Tie for 2nd Place)
University of
West Ontario
London, Ontario, Canada
and
GMI
Flint, MI

FORD ESCORT CONVERSION

- ◆ 1st Weber State University
Ogden, UT
- ◆ 2nd University of Illinois,
Urbana
Urbana, IL
- ◆ 3rd (Tie for 3rd Place)
University of Alberta
Edmonton, Alberta, Canada
and
University of Wisconsin
Madison, WI

GROUND-UP

- ◆ 1st University of California,
Davis
Davis, CA
- ◆ 2nd California Polytechnic
State University, Pomona
Pomona, CA
- ◆ 3rd Lawrence Technological
University
Southfield, MI

American Tour de Sol: Electric, Solar Vehicles Ready to Roll

With clean air vehicle mandates only three years away, expect to see plenty of electric, hybrid-electric, and solar-electric vehicles participating in the seventh annual American Tour de Sol (ATdS). The national road rally championship will run from Waterbury, Connecticut, to Portland, Maine, on May 20-27, with six stops along the way.

The eight-day event includes two days of technical testing, five days on the road, numerous displays, and an auto-cross event for practical cars. It is being sponsored by the U.S. Department of Energy through Argonne National Laboratory, the Greater Portland Council of Governments, the Waterbury Region Convention and Visitors Bureau, Connecticut Department of Transportation, Maine Department of Economic and Community Development, New England Electric System, and Northeast Utilities, among others. The Northeast Sustainable Energy Association (NESEA) of Greenfield, Massachusetts, is coordinating the ATdS.



The competition vehicles will be built by original equipment and electric-vehicle manufacturers, individuals, and students from North America and abroad. In 1994, 75% of the 50 vehicles participating were practical electric cars and motorcycles, with eight already available in the marketplace.

New categories, scoring, and prizes will enhance the 1995 competition. Five vehicle categories—Production Category, American Commuter, Solar Racing Category, Mass Transit, and Open Category—encourage innovation and creativity for the development and use of practical, pollution-free vehicles. The new scoring system will enable entrants to accumulate “Tour Miles” and will make efficiency and driving range the key to winning. Prizes will be awarded in all five categories.

Want to Get Involved in the American Tour de Sol?



The Northeast Sustainable Energy Association (NESEA) is seeking corporations, not-for-profits, and individuals who would like to work on 1995 ATdS pre-event educational activities as well as assist with logistics and sponsor dollars. Northeast Utilities plans to host a teacher training workshop on EVs in Connecticut. Numerous other organizations have offered to host Jr. Solar Sprint events, including Northeast Utilities, Quaddy Amusement Park, Green Mountain Power, Bonnyvale Environmental Education Center, and the Maine Solar Blast.

In 1996, NESEA is seeking support for a New York City, NY, to Washington, D.C., event.

To get involved in either the 1995 or 1996 event, contact NESEA, 50 Miles St., Greenfield, MA 01301. Phone: (413) 774-6051; Fax: (413) 774-6053.

To assure adequate charging for vehicle batteries, 1995 entries will be restricted to 50 vehicles, selected according to published criteria on a first-come, first-served basis. The registration fee is \$500 from March 2 through May 1. With a \$40 pre-registration fee, registrants receive a 50-page ATdS *Rules, Regulations & Resources* book and Northeast Sustainable Energy Association membership. Entry forms may be obtained from NESEA, 50 Miles St., Greenfield, MA 01301. Phone: (413) 774-6051.

Hybrid Electric Vehicle Challenge Set for June

The 1995 HEV Challenge is set for June 5-13 at the Chrysler Technology Center in Auburn Hills, Michigan. Now in its third year, the Challenge is being sponsored by the U.S. Department of Energy through Argonne National Laboratory, the National Renewable Energy Laboratory, Chrysler Corp., and Natural Resources of Canada. Top engineering colleges and universities across North America compete in the event, which is one of the most technically challenging engineering competitions.

Two of last year's vehicle classes—the Ford Escort Conversion Class and the Saturn Conversion Class—will return to the 1995 Challenge. The Ground-Up Class, the third class in the 1994 HEV Challenge, will now compete in the DOECARR/DASH competition in Los Angeles (see article on p. 10). A newcomer to this year's event is the Neon Conversion Class, based on the 1995 Chrysler Neon platform. The 12 Neon teams, together with the other teams, will bring this year's grand total to 35 schools competing in June.

The format of the Challenge has been changed to include testing the heating, ventilating and air-conditioning system for the Neon teams and adding the Consumer Acceptability Test for all teams. Also new in 1995: The Neon teams will use compressed natural gas instead of liquid-based fuels. The following events will continue to be held in this year's competition: Emissions Testing, Energy Economy, Acceleration, Range, Engineering Design, Vehicle Dynamic Event, and Technical Paper.

The 1995 HEV Challenge is shaping up to be one of the best competitions to date. For additional information, contact Nicole LeBlanc, Argonne National Laboratory, 9700 South Cass Ave., Bldg. 362/C264A, Argonne, IL 60439. Phone: (708) 252-6594; Fax: (708) 252-3443.



The 1995 HEV Challenge is shaping up to be one of the best competitions to date.



DOECARR and DOEDASH Showcase Alternative-Fueled, Hybrid-Electric Vehicles

The 1995 DOE Clean Air Road Rally, DOECARR, will take place in the Los Angeles area March 30-April 1. This year, participation will be by invitation only to keep the size of the field manageable and to provide the best possible support to competitors. DOECARR will include a cross-section of alternative-fueled vehicles (electric and hybrid-electric, natural gas, methanol, and ethanol) and broad representation from manufacturers, government agencies, utilities, educational institutions, and private sector companies.

For corporations that prefer not to compete but that would still like to showcase their vehicles, there will be a "display class," which will be the first to leave the starting line each day. The U.S. Department of Energy through Argonne National Laboratory, the South Coast Air Quality Management District, Circuit City, and California State University, Long Beach, are sponsoring the DOECARR. Advanced Energy Competitions is organizing the competition.



In an exciting, new development, the Ground-Up class of Hybrid-Electric Vehicles from the 1994 HEV Challenge, built by college students, will join the Rally on the last two days to travel across the Los Angeles basin. This new competition has been named the DOE Advanced Student Hybrid (DASH) Challenge. The cars will participate in several events to evaluate their emissions, energy efficiency, performance, and consumer acceptance. The California Air Resources Board has offered in-kind sponsorship.

For more information about the DOECARR, contact Advanced Energy Competitions. Phone: (602) 774-8474. Regarding the DOEDASH, contact Spencer Quong. Phone: (708) 252-6489.



South Mountain High School Students Advance Electric Vehicles

Electric vehicles spark considerable interest in the Valley of the Sun and across the state of Arizona. During the past four years, approximately 40 area high schools have developed Electric Vehicle Programs. Students convert gasoline-powered cars and pickup trucks to electrically powered vehicles.

I have had the privilege of working with the Electric Vehicle Research and Racing Team at South Mountain High School in Phoenix, Arizona, as its advisor over the past three years. During this time, the team has converted a Chevy Citation and a Postal Jeep from gasoline-fueled to battery-operated. More than 30 students have been involved to date. During the course of its work, the team applies key concepts learned in the school's physics course. Students need to have mastered mechanics and electricity to be able to discuss,

for example, the number, voltage, and weight of batteries that will power the vehicles. Our team also addresses such challenges as how to distribute weight in the vehicle, what types of drivelines to use, and how to cool and heat various components to enhance the vehicle's performance.

The team has competed in the APS Electric 500 (now named the APS Electrics) for the past two years. This race is sponsored by Arizona Public Service, a local utility. We have also competed in several local road rallies, one of which we hosted. Last year, we ventured to California with three other Arizona high schools to participate in the DOE Clean Air Road Rally.

This year is being devoted to scientific research and the improvement of existing vehicles, as well as the construction of go-karts that will be used for research.

These endeavors are sponsored by the Department of Energy and local businesses through partnerships with the schools. Participants include battery companies, General Electric Co., Goodyear Tires, Salt River Project, Arizona Public Service, Arizona Machine and Fabrication, and Motorola. Each has invested both material resources and personnel to promote this unique learning opportunity.

The South Mountain Team is grateful to our sponsors for believing in us to the tune of thousands of dollars accompanied by safety meetings, publicity seminars, and the personal interest of employees. We are proud to be part of this quest for "clean air transportation" and hope our contribution will become an integral part of a better future.

Chelle Myram
South Mountain High School
Team Advisor



Focuses on "Three Es" for Solar Cars

Sunrayce 95, being held June 20-29, emphasizes

- ▶ **Education,**
- ▶ **Energy, and the**
- ▶ **Environment**

as its theme. With 65 registered entries, the competition will be the largest solar car race ever held in North America. The organizers opened up the field to 40 teams—30 "seeded" and 10 "challenger" positions.

Sponsors include the U.S. Department of Energy through the National Renewable Energy Laboratory (NREL), General Motors Corp., Electronic Data Systems, AC Delco Systems, Chevrolet Motor Division, Delco Electronics, Hughes Network Systems, and Midwest Research Institute. NREL is organizing the event.

The format, regulations, and route of this year's Sunrayce have been improved. Safety regulations are more stringent, and teams are required to thoroughly document driver safety in their structural reports. Also, the traditional South-to-North route was changed to an East-to-West (Indianapolis, Indiana, to Denver, Colorado) route.

As the pace for Sunrayce 95 escalates, several teams will unveil their cars at press conferences early this spring. One team already displayed its car at the Detroit Auto Show. Most teams plan to complete their cars at least a month before the race to allow for road testing and last-minute refinement.

Sunrayce 95 Headquarters developed a World Wide Web server during the summer and fall of 1994. The Sunrayce 95 Home Page has on-line listings of regulations,

newsletters, product suppliers, and other items of interest for teams and the general public. Internet "surfers" can get more information about the electronic services by sending e-mail to sunrayce@nrel.gov or by browsing the Sunrayce 95 Home Page at <http://www.nrel.gov/sunrayce>.



If you are interested in volunteering your time, contact Sunrayce 95 Headquarters.
Phone: (303) 384-6735;
Fax: (303) 384-6490.

1995 Vehicle Competitions Challenge the Best and the Brightest

March/April

March 3-5

APS Electrics
Phoenix, Arizona

◆ *Contact:*
Donald Karner
Phone: (602) 978-1373

March 27-April 1

DOE Clean Air Road Rally (CARR)/
DOE Advanced Student
Hybrid (DASH) Challenge
Los Angeles area

◆ *Contacts:*
DOECARR
Advanced Energy Competitions
Phone: (602) 774-8474

DOEDASH
Spencer Quong
Phone: (708) 252-6489

April 14-16

Toyota Grand Prix of Long Beach
Long Beach, California

◆ *Contact:*
Donald Karner
Phone: (602) 978-1373

May

May 5-6

Richmond EV Grand Prix
Richmond, Virginia

◆ *Contact:*
Donald Karner
Phone: (602) 978-1373

May 18-21

Formula SAE
Pontiac Silverdome, Michigan

◆ *Contact:*
Lynn Puskar
Phone: (412) 776-4841,
ext. 224

May 20-27

American Tour de Sol
Waterbury, Connecticut,
to Portland, Maine

◆ *Contact:*
Northeast Sustainable
Energy Association
Phone: (413) 774-6051

June

June 5-13

Hybrid Electric Vehicle Challenge
Auburn Hills, Michigan

◆ *Contact:*
Nicole LeBlanc
Phone: (708) 252-6594

June 10-11

West Coast Supermileage
Sacramento, California

◆ *Contact:*
Lynn Puskar
Phone: (412) 776-4841,
ext. 224

June 20-29

Sunrayce 95
Indianapolis, Indiana,
to Denver, Colorado

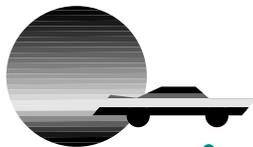
◆ *Contact:*
Sunrayce Headquarters
Phone: (303) 384-6735

July

July 21-22

Cleveland Electric Formula Classic
Cleveland, Ohio

◆ *Contact:*
Donald Karner
Phone: (602) 978-1373



FutureDrive

**DOE/Industry Competitions
Advancing Automotive Technology**

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