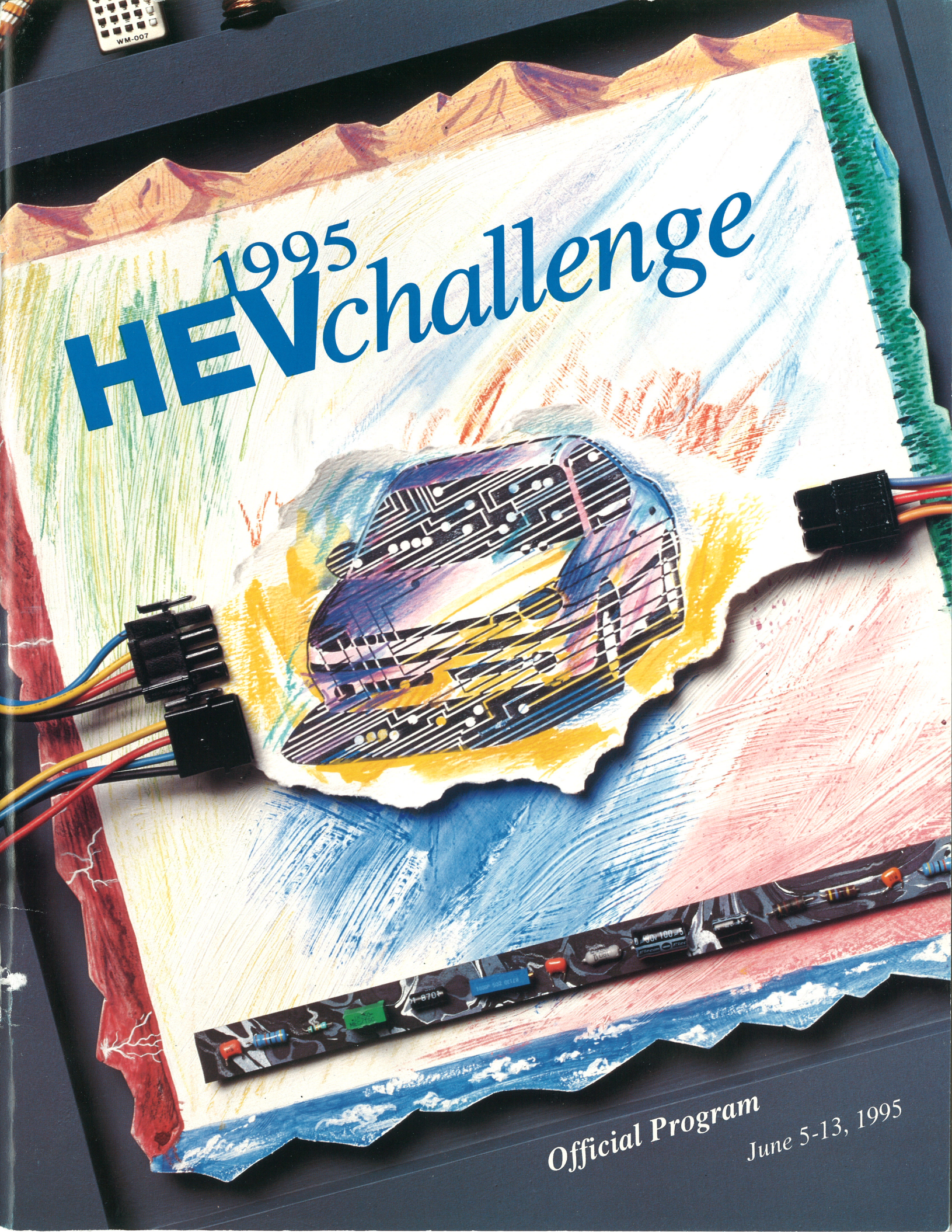
1995 HEV challenge

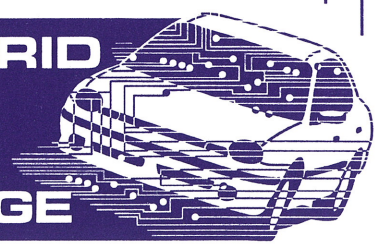


Official Program

June 5-13, 1995

June 5-13, 1995

1995 HYBRID ELECTRIC VEHICLE CHALLENGE



CHRYSLER CORPORATION

Natural Resources Canada

SAE INTERNATIONAL

United States Department of Energy

Chrysler Sponsors Hybrid Challenge

The Hybrid Electric Vehicle Challenge, sponsored in part by Chrysler Corporation, is an intercollegiate competition created by the U.S. Department of Energy (DOE) and the Society of Automotive Engineers (SAE). During the Challenge, students demonstrate new hybrid-electric technology on cars which have been converted from conventional gasoline power to a "hybrid" of electricity and other energy sources such as compressed natural gas, methanol, ethanol or reformulated gasoline.

"The HEV Challenge generates interest in hybrid-electric vehicles and students' creative skills help drive breakthroughs in hybrid electric power," said Ken Mack, Chrysler's executive engineer for advanced research programs.

"The Challenge also strengthens Chrysler's relationship with government agencies and laboratories, along with some of the top technical universities in the nation."

An HEV combines an electric propulsion system with a combustion engine – powered by alternative fuels or reformulated gasoline – to produce a hybrid vehicle that's capable of up to twice the fuel economy of contemporary vehicles while significantly reducing harmful tailpipe emissions.

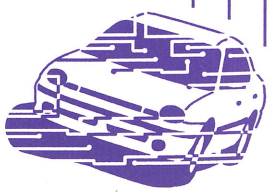
For the 1995 HEV Challenge, Chrysler Corporation is donating 12 Neon subcompacts to selected college teams. The Neons will be converted to compressed-natural-gas-hybrid-electric vehicles for the competition. Because the competition stresses the need to meet consumer expectations, the Neons must also have working heating and air conditioning units.

"Chrysler has made a significant investment in natural-gas-vehicle technology over the last several years, so it seemed 'natural' for us to select it as the fuel for this year's Challenge," said Mack.

Each team receiving a Neon was selected on the basis of its engineering proposal by Chrysler and other Challenge sponsors including the DOE, National Renewable Energy Labs, SAE and Argonne National Laboratory. An additional 23 college teams will work on evolutionary designs of their Ford or Saturn HEVs which they converted for previous HEV Challenge competitions.

Three classes of cars are included in the 1995 Challenge: Neon Conversion Class, Escort Conversion Class, and Saturn Conversion Class.

(more)



All of the entries will be scored on: fuel economy and emissions, driving range, handling and performance and engineering drivability. Awards will be give for: Best Vehicle Appearance, Excellence in Safety, Best Technical Report, Most Efficient HEV, Best Engineering Design, Best Air-Conditioning and Heating Performance (Neon only), and Best Overall Performance.

The panel of judges will include engineers from the three U.S. automakers, the DOE and the two participating national laboratories. Winning teams in each category will receive prizes of up to $6,000.

Each team submits a technical report as part of the competition, detailing the technological developments in their vehicle. The automakers evaluate those technologies for use in future hybrid-electric vehicles.

"The HEV Challenge is a wonderful way for us to evaluate the different approaches to hybrid technology," said Bob Larsen, head of alternative fuels research for Argonne National Laboratory.

"We (the sponsors) are looking at smart approaches to solving problems and we are finding very unique, patentable ideas every year. These students are illuminating the path of technology and setting performance benchmarks along the way."

Department of Energy
Washington, DC 20585

Welcome HEV Participants!

I am pleased to see that the same teams (with very few exceptions) which started two years ago with their Escorts and last year with their Saturns, have returned again with even higher performing vehicles. And we are fortunate to have a new class of Neons competing with us this year also. Three complete teams have made this year's competition especially challenging.

With the excitement of the third Hybrid Electric Vehicle (HEV) Challenge upon us, it's time to take stock and see how far we've come:

- We are beginning to see a place for hybrids among the vehicle mix of the future. This place has been won, in part, because of the records made by HEV Challengers and the attention which you have brought to hybrid technology.

- We are becoming more and more aware of the range of vehicle strategies which are possible with hybrids, many of these explored and demonstrated by student teams.

- And finally, we have all been able to cheer at the achievements of students committed to pushing the envelope of automotive technology.

Chrysler has been a perfect HEV Challenge host and co-sponsor. Although I regret that HEV is drawing to a close, I look forward to new partnerships with Chrysler and our other automotive partners. We have several new events which we are planning for next year which we hope will continue to make student vehicle competitions as exciting and challenging as they have been in the past. And with your continued participation, I know they will be.

I wish you all success (and luck, too) during the week's events and look forward to following your achievements in the future.

~~Sincerely~~,

Richard L. Moore for

Thomas J. Gross
Deputy Assistant Secretary
Office of Transportation Technologies

Printed with soy ink on recycled paper

Vehicle Competitions Accelerate Development of Alternative-Fuel Technologies

WASHINGTON, D.C., June 1995 – For many Americans, the combination of students and cars might conjure up unpleasant thoughts, but the U.S. Department of Energy (DOE) sees things from a different perspective. For DOE, this combination is one key to unlocking the future of alternative-fuel technologies.

This year, DOE will sponsor 10 student vehicle competitions across the country. Designed to help accelerate the development of environmentally responsible vehicles, these competitions involve electric, hybrid-electric, solar and alternative-fueled vehicles.

Since 1987, more than 8,000 students from science and engineering programs in more than 150 North American high schools, colleges and universities have participated in DOE-organized vehicle competitions.

"With increasingly strong support from the automotive industry, we expect these numbers to continue to produce tangible results," said Shelley Launey, manager of vehicle competitions, DOE Office of Transportation Technologies.

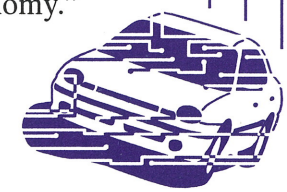
"We believe that these competitions are a great way to give some of the brightest science, engineering and business students an opportunity to apply what they've learned to the design of new vehicles and vehicle systems," she said.

"What is more important, vehicle competitions provide industry with an opportunity to research and develop new technologies in a low-risk, low-cost, high-payoff setting," said Bob Larsen, director of competition activities for DOE's Argonne National Laboratory, located near Chicago.

According to Larsen, a number of student-developed technological innovations or refinements have already been incorporated by auto manufacturers and suppliers into commercially available product lines.

The competitions also provide the students with real-world experience for graduation. Many participants have taken their talents to the automotive industry, while others have become the newest generation of employees at DOE and its network of national research laboratories.

"DOE is extremely proud of its student vehicle competitions," said Launey. "They demonstrate what can be accomplished when government and industry are committed to working together for the future of our nation's educational system, the environment and the U.S. economy."



McLellan Salutes Students Participating In International Hybrid Electric Vehicle (HEV) Challenge

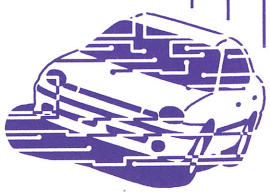
OTTAWA – The 1995 HEV Challenge is being sponsored by the Canada Centre for Mineral and Energy Technology (CANMET), a research and development arm of Natural Resources Canada (NRCan).

"NRCan's support for the HEV Challenge reflects the importance this government places on sustainable development," the Honourable A. Anne McLellan, Minister of Natural Resources Canada, stated. "Alternative transportation fuels contribute to urban air quality standards and to progress on our climate change commitments. Furthermore, environmental technology makes good business sense."

This year's Challenge promises to be one of the most rigorous and rewarding competitions of its kind.

The five Canadian universities involved are the University of British Colombia, the University of Alberta, the University of Western Ontario, Concordia University and the University of Quebec. Minister McLellan noted Canada's strong representation in this event, adding, "I am proud of how well Canadian schools have done in previous competitions, in which at least one of our universities has consistently placed in the top four since we started supporting them in 1989."

CANMET will be providing $50,000 to the Electric Vehicle Association of Canada to support the Challenge, with an additional $30,000 (US) contribution to the American Society of Automotive Engineers. From these funds, contributions of $10,000 will be given to each of the five Canadian teams to support their participation in the Challenge. Funding was provided for in the February 1994 federal budget and is therefore built into the existing federal framework. This initiative is an example of how the Government of Canada is prioritizing its spending so that it can better serve Canadians by making efficient use of their tax dollars.



News from SAE INTERNATIONAL®

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FOR IMMEDIATE RELEASE

For more information contact:
Barbara J. Pontello
(412) 772-7182

HYBRID ELECTRIC VEHICLES - WHAT'S HAPPENING?

Warrendale, PA -- While discussion about the viability, practicality, and necessity of hybrid electric vehicles continues to heat up, dozens of universities from the U.S. and Canada will be doing more than talking.

SAE is proud to sponsor the 1995 Hybrid Electric Vehicle (HEV) Challenge--a collegiate engineering competition designed to familiarize students with future technologies and help drive the development of hybrid electric vehicles. With more than 20 years' experience in collegiate design competitions, SAE brings to its sponsorship the resources of its 65,000 members in 85 countries. In addition, the SAE Board of Directors has selected the environment as a critical strategic issue and sponsorship of the HEV Challenge supports both the study of this issue and potential contributions to improving the environment.

"This is an outstanding experience for tomorrow's vehicle designers and manufacturers. I'm confident this event will produce engineers who are better able to meet the future demands of the global automotive industry," said Bob Sechler, Manager of SAE's Educational Relations Division.

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SAE95.5.036

Primary Sponsors:

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U.S. Department of Energy
Natural Resources Canada
Society of Automotive Engineers

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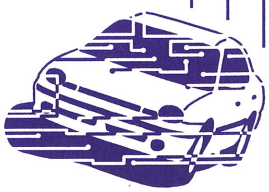


Background

Hybrid-electric vehicles (HEVs)combine an electric propulsion system with another source of power, typically a combustion engine using alternative fuels (ethanol, methanol or compressed natural gas) or reformulated gasoline. They are designed to improve significantly the fuel economy of traditional vehicles, reduce harmful tailpipe emissions, and maintain conventional vehicle performance.

Government and industry are developing a number of new technologies to provide clean and efficient transportation – for both personal and commercial use – for the future. HEVs are one technology.

How HEVs work

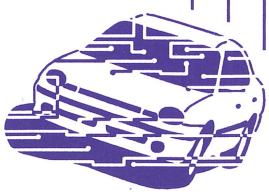
The two main types of HEVs are series and parallel systems. In a series HEV an engine creates mechanical power to drive a generator. The energy can be used to propel the vehicle using an electric motor, or it can be sent to the batteries for storage. The parallel hybrid can drive the wheels with mechanical power from the engine and from the electric motor.

In a series hybrid the HEV is driven as an electric vehicle. When the batteries are depleted, the engine provides extended range as in conventional vehicles. Parallel hybrids combine a small engine and an electric motor for greatly improved fuel economy. The electric motor provides peak power needed for acceleration.

An HEV is different from conventional cars

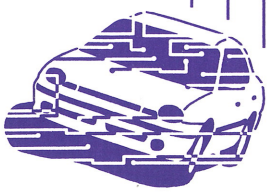
The electric drive and energy storage systems enable most HEVs to recapture some of the energy that would be lost when braking in a conventional vehicle, and the recovered energy is stored for later use. In addition, the battery supplements the HEV engine's generator to meet peak power demands including acceleration, so the engine can be smaller than in conventional vehicles yet deliver equivalent performance. Benefits come from managing the power between the engine and the electric motor to satisfy the "road load" demands such as aerodynamic drag, tire rolling resistance and accessory loads.

- New in 1995, 12 student teams have converted 1995 Neons to hybrid-electric vehicles. In "engine-on" or HEV mode the cars will run on compressed natural gas (CNG).
- Minimum electric range: 5 miles
- Unlike the other classes, the Neons must have working heating and air conditioning systems, which demonstrates the need to meet consumer demands.
- Participating teams: **Concordia University**
  Texas A&M University
  Texas Tech University
  University of British Colombia
  University of Connecticut
  University of Florida
  University of Illinois at Chicago
  University of Michigan at Ann Arbor
  University of Tennessee
  University of Texas, El Paso
  Virginia Polytechnic Institute & State University
  Western Washington University



- Nine student teams have converted 1992 Ford Escort Wagons into hybrid-electric vehicles. In the "engine-on" or HEV mode the cars will run on reformulated gasoline, methanol or ethanol.
- Minimum electric range: 25 miles
- The Ford Escort Conversion Class is the original 1993 hybrid class.
- Participating teams: **California State University, Northridge**
  Colorado School of Mines
  Pennsylvania State University
  United States Naval Academy
  University of Alberta
  University of California, Irvine
  University of Wisconsin, Madison
  Wayne State University
  West Virginia University

- Eleven student teams have converted 1992 Saturn SL2 Sedans to hybrid-electric vehicles. In the "engine-on" or HEV mode the cars will run on methanol or ethanol.
- Minimum electric range: 5 miles
- Participating teams: **Alfred University**
  California State University, Chico
  California State University, Fresno
  Cedarville College
  Ecole de Technologie Superieure
  GMI Engineering & Management Institute
  Illinois Institute of Technology
  University of Maryland
  University of Texas at Austin
  University of Western Ontario
  Wentworth Technological University



Alfred University

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Advanced DC/DC

Controller Manufacturer: Curtis

Battery Manufacturer/Type: SAFT NIFE/NiCad

Engine: Nissan/1597cc

Fuel: M85

The Competitors

California State University - Chico

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Series

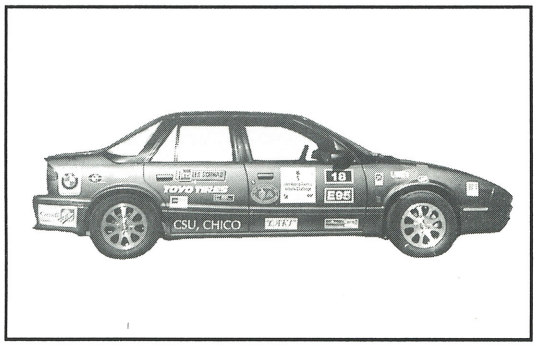
Electric Motor Manufacturer/Type: AC Propulsion/AC Induction

Controller Manufacturer: AC Propulsion

Battery Manufacturer/Type: Ovonic/NiMH

Engine: Kohler/749cc

Fuel: E95



California State University - Fresno

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Parallel

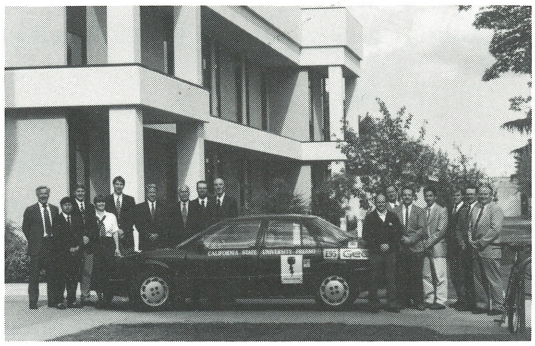
Electric Motor Manufacturer/Type: Unique Mobility/DC Brushless

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Exide/Lead-Acid

Engine: Suzuki/1.3(l)

Fuel: E95



The Competitors

California State University - Northridge

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Series Hybrid

Electric Motor Manufacturer/Type: 2 Unique Mobility, DC Brushless Motors

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Teledyne Gill, Lead Acid Batteries

Engine: Kawasaki/617cc

Fuel: RFG

Cedarville College

Class/Vehicle: 1992 Saturn SL2

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Unique Mobility/Permanent Magnet Brushless DC

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Exide/Napa/Lead-Acid

Engine: Honda/1500cc

Fuel: M85

Colorado School of Mines

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Series

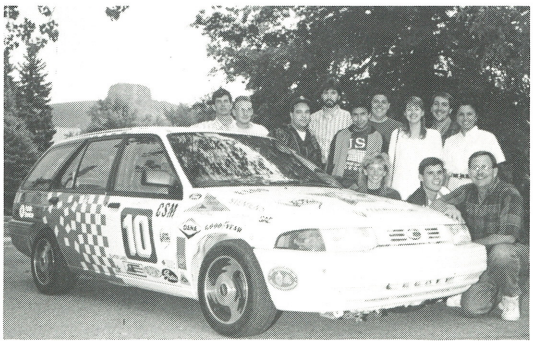
Electric Motor Manufacturer/Type: Unique Mobility/Brushless DC Permanent Magnet

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: SAFT/Ni-CAD

Engine: Kawasaki/600cc

Fuel: E95



Concordia University

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Advanced DC/DC Series

Controller Manufacturer: Curtis PMC

Battery Manufacturer/Type: East Penn Manufg. Co./Lead Acid

Engine: BMW/740cc

Fuel: CNG

Ecole de Technologie Superieure

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Simi-split Parallel

Electric Motor Manufacturer/Type: Baldor/AC Brushless (Permanent Magnet)

Controller Manufacturer: Sweodrive

Battery Manufacturer/Type: Marathon/Ni-Cad

Engine: Subaru/1189cc

Fuel: M85

GMI Engineering and Management

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Magnetek/AC Induction

Controller Manufacturer: Magna Tek

Battery Manufacturer/Type: Hawker Energy/Lead-Acid

Engine: Kawasaki/625cc

Fuel: E95

The Competitors

Illinois Institute of Technology

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Parallel

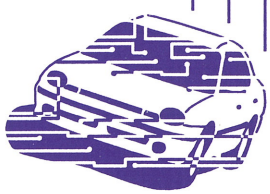
Electric Motor Manufacturer/Type: GE/DC shunt

Controller Manufacturer: GE

Battery Manufacturer/Type: EXIDE/Lead-Acid

Engine: Suzuki/993cc

Fuel: E95



Pennsylvania State University

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Solectria/AC Induction (two, one per wheel)

Controller Manufacturer: Solectria

Battery Manufacturer/Type: Horizon/Lead-Acid

Engine: Kawasaki/620cc

Fuel: RFG

The Competitors

Texas A&M University

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Advanced DC Motors/DC Series/Shunt

Controller Manufacturer: Curtis Instrument

Battery Manufacturer/Type: Electrosource/ Lead-Acid fabric

Engine: Honda/498cc

Fuel: CNG

Texas Tech University

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Unique Mobility/DC Brushless

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Power Sonic/12V

Engine: Chrysler/2.0L

Fuel: CNG

The Competitors

U.S. Naval Academy

Class/Vehicle: 1992 Ford Escort Wagon

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: GE/DC Series wound

Controller Manufacturer: GE

Battery Manufacturer/Type: ELECTROSOURCE/ Sealed Lead Acid

Engine: Kawasaki/617cc

Fuel: RFG/CNG

University of Alberta

Class/Vehicle: 1993 Ford Escort

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Uniq Mobility/Magnet

Controller Manufacturer: Uniq Mobility

Battery Manufacturer/Type: SAFT-NIFE/Ni-CAD

Engine: Suzuki/993cc

Fuel: RFG

The Competitors

University of British Columbia

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Controller Manufacturer: Custom Made

Battery Manufacturer/Type: Lead Acid

Engine: Chrysler/2000cc

Fuel: CNG

University of California - Irvine

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Electra-Bear/AC Induction

Controller Manufacturer: Emerson

Battery Manufacturer/Type: Trojan/Lead Acid 22NI

Engine: Geo Metro

Fuel: RFG

The Competitors

University of Connecticut

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: GE/DC

Controller Manufacturer: General Electric

Battery Manufacturer/Type: Eagle Picher/Lead Acid

Engine: Chrysler/2.0L

Fuel: CNG

University of Florida

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Unique Mobility/DC Brushless

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: SAFT/Ni-CAD

Engine: Kawasaki/617cc

Fuel: CNG

The Competitors

University of Illinois at Chicago

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Advanced DC/DC Series

Controller Manufacturer: Custom-UIC

Battery Manufacturer/Type: Exide/Lead Acid

Engine: Briggs & Straton-Diahatsu/850cc

Fuel: CNG

University of Maryland

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Parallel

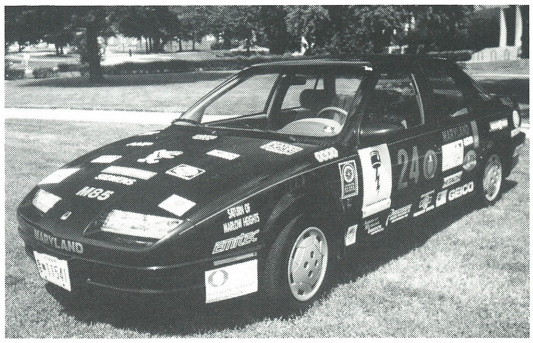
Electric Motor Manufacturer/Type: Unique Mobility/DC Brushless

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: SAFT-NIFE/Ni-Cad

Engine: Geo/Suzuki/993cc

Fuel: M85



University of Michigan - Ann Arbor

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Unique Mobility/DC brushless, Permanent magnet

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Johnson Controls/ Lead Acid

Engine: Kawasaki/620cc

Fuel: CNG

University of Tennessee, Knoxville

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

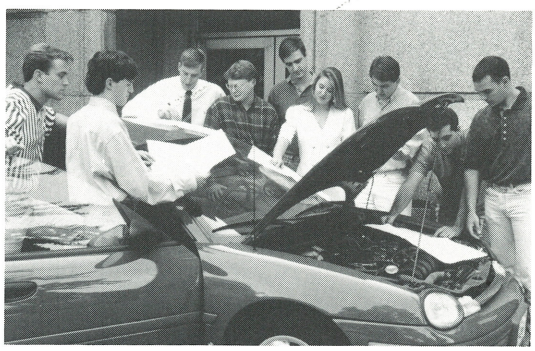
Electric Motor Manufacturer/Type: Unique Mobility/Brushless PM DC

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: Exide/Lead-Acid

Engine: Suzuki/Geo/1.0L

Fuel: CNG



The Competitors

University of Texas at Austin

Class/Vehicle: Saturn SL2

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Unique Mobility/DC Brushless Permanent Magnet

Controller Manufacturer: Unique Mobility

Battery Manufacturer/Type: GNB/Lead Acid

Engine: BMW/750cc

Fuel: M85

University of Texas at El Paso

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: AC Propulsion/AC Induction

Controller Manufacturer: AC Propulsion

Battery Manufacturer/Type: Trojan/Lead Acid

Engine: Geo/Suzuki/1000cc

Fuel: CNG

University of Western Ontario

Class/Vehicle: 1992 Saturn SL2

Powertrain Configuration: Parallel

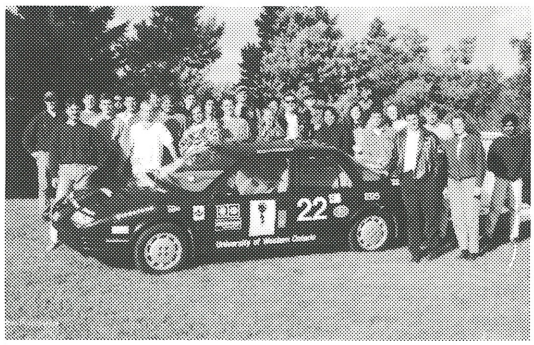
Electric Motor Manufacturer/Type: Solectria/DC Brushless PM

Controller Manufacturer: Solectria

Battery Manufacturer/Type: Hawker Energy/ Lead-Acid

Engine: Honda/1300cc

Fuel: E95



University of Wisconsin - Madison

Class/Vehicle: 1992 Ford Escort Wagon LX

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Lincoln Electric/AC Induction

Controller Manufacturer: Indramat

Battery Manufacturer/Type: Johnson Controls/ Lead Acid

Engine: Kohler/725cc

Fuel: RFG

The Competitors

Virginia Polytechnic Institute & State University

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: GE/AC Induction

Controller Manufacturer: GE

Battery Manufacturer/Type: Hawker Energy Corp./ Lead-Acid

Engine: Suzuki/1.0L

Fuel: CNG

Wayne State University

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Dual drive system (separate IC & Electrical drives)

Electric Motor Manufacturer/Type: GE/DC Separately excited

Controller Manufacturer: Wayne State

Battery Manufacturer/Type: Interstate/Pb-Acid

Engine: Ford/1.9L

Fuel: M85

Wentworth Institute of Technology

Class/Vehicle: 1991 Saturn SL2

Powertrain Configuration: Parallel

Electric Motor Manufacturer/Type: Solectria/AC Induction

Controller Manufacturer: Solectria

Battery Manufacturer/Type: Johnson Controls/ Lead Acid

Engine: Suzuki/993cc

Fuel: M85

West Virginia University

Class/Vehicle: 1992 Ford Escort

Powertrain Configuration: Series

Electric Motor Manufacturer/Type: Advanced DC/DC Series

Controller Manufacturer: WVU in house

Battery Manufacturer/Type: GMB PB Acid

Engine: Kawasaki/620cc

Fuel: RFG

The Competitors

Western Washington University

Class/Vehicle: 1995 Chrysler Neon

Powertrain Configuration: Parallel

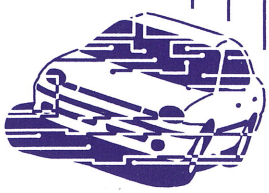
Electric Motor Manufacturer/Type: Unique/DC Brushless

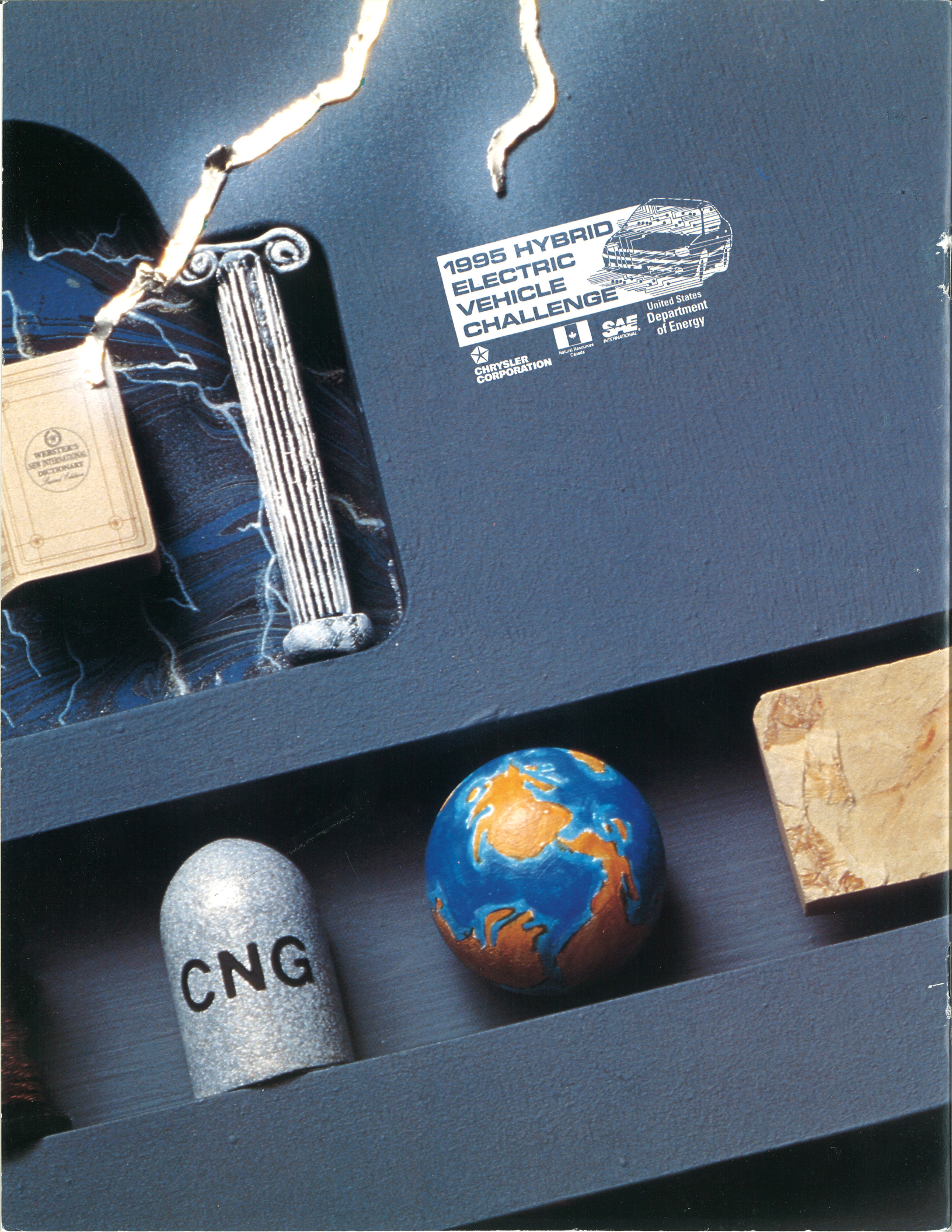
Controller Manufacturer: Unique

Battery Manufacturer/Type: SAFT/Ni-CAD

Engine: Chrysler/2.0L

Fuel: CNG




1995 HYBRID
ELECTRIC
VEHICLE
CHALLENGE
United States
Department
of Energy
SAE
INTERNATIONAL
Natural Resources
Canada
CHRYSLER
CORPORATION
CNG