F.V.E.A.A. NEWSLETTER

Oct/Nov 1993

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NEXT MEETING

Nov 19th @ 7:30pm
College of Dupage
Student Resource Center
Room 1046
Use Lambert Rd. Entrance, Lot 7 at the Southeast corner of 22nd & Lambert
Nonmembers are always welcome!

MEMBERSHIP INFORMATION

Membership to the Fox Valley Electric Auto Association is open to the public. Anyone interested in electric vehicles or electric transportation are encouraged to join. The cost to join is $15 per year from November to November. If joining in the middle of the year the cost is $1.25 for every month remaining til November of that year. The cost for new members joining is $15.00.

Fox Valley Electric Auto Association
336 McKee Street
Batavia, IL 60510

First Class

ADDRESS CORRECTION REQUESTED

John Emde

6542 Fairmount Avenue
Downers Grove, IL 60516
USA

Presez

I attended an SAE meeting at Argonne National Laboratory last month where the University of Illinois' award winning hybrid-electric Ford Escort wagon was demonstrated.

The professor in charge of the project was an engineer who obviously was not ready to accept the "rocking chair" that our government and industry provides for its most experiencd and knowledgeable senior citizens. Our Congress is so inept that it can't even pass Representatives Dennis Hastert's non-controversial Senior Citizen's Right-to-Work Act.

The professor told me that all components required to convert the Ford Escort to Hybrid-Electric operation were off-the-shelf items. The A.C. motor, inverter, charger were all commercially available including the heat pump used for electrically heating and cooling the car.

The battery pack was packaged in such a way that it did not intrude on the passenger compartment. There was an admission however, that carrying four passengers would exceed the gross vehicle weight of the vehicle.

I also talked to the electrical and mechanical engineering graduate students who co-led the student group involved in this project. If these student s typify the caliber of students going through our universities, the future is indeed very bright.

There is no question that "Going Electric" is merely producing and marketing the product on an international basis. The technology is available now and will only improve with each production run.

Ken Woods

MINUTES OF SEPTEMBER 17, 1993 FVEAA MEETING

The meeting at the College of DuPage was called to order by President Woods at 7:31 PM. There were 17 members and 9 guests present. Dr Rod Bohlmann from Valpraiso University (VALPO) brought with him 5 students involved in their EV project.

A considerable discussion took place about the August meeting minutes, as published in the newsletter. Vice President Clark noted a number of changes required. He also objected to Secretary's text, interperting them as a personal attack on him. A motion was adopted to table approval of the minutes until written corrections are submitted to the Scretary.

Treasurer Corel reported $ 2106.62 in the Savings and $ 954.39 in the checking account. There are bills outstanding. Vice President Clark asked if the name badge bill was paid with the tax deducted. Treasurer Corel reported the bill has not been paid. His report was unaminously accepted.

Guest Bohlmann was invited to describle the VALPO conversion of an Escort to provide a test platform for development of a battery state-of-charge device.

President Woods reported on the FVEAA Summer Event held August 31 at the College of DuPage. There were 6 vehicles on display: Members Delmonico, Kranovitch, Mitchell, and Vana had their cars at the event. In addition, the Workman electric truck adapted from UK milk trucks and used for recycling pick up purposes in Hinsdale was arranged by Member Clark, and the Ahern Fiat was displayed.

President Woods reported on FVEAA participation in Naperville's Last Fling on September 5th. The Naperville Antique Auto Club invited the FVEAA to display electric vehicles along with the about 250 antique cars ususally shown at the event. We were assigned a choice position adjacent to the entry gate. Four EVs were displayed, Member Shafer's Mazda and Vana's Audi were there along with a 1993 Ford Ranger from Janesville, WI and the Workman recycling truck. The EV display was well received.

President Woods reported that Commonwealth Edison (CECO) has offered the FVEAA an opportunity to test and evaluate one of three Ford ECOVANs which CECO will be acquiring. Each of these protoytpe vehicles vehicles represents a $100,000 expenditure. There was a considerable discussion about what the FVEAA could provide CECO. Suggested were an evaluation comparison with FVEAA conversions, a subjective analysis of the car from a consumer's viewpoint, and log of uses. Recharging of the sodium-sulfur batteries apparently requires a 3-phase, 240-volt source although this was inferred by looking at the charger connection. After discussion, it was agreed that President Woods would write a letter of acceptance to CECO and designate Members Stevens and Shafer to work out details with CECO.

The meeting program was viewing two videtapes, one of the American Tour De Sol attended by President Woods and the other of the crash testing of automobiles and safety belt material discussed by the August meeting speaker, Mike Rodgers from Packer Engineering.

The meeting was adjourned at 10:20.

Submitted by,

William H Shafer

Secretary

CORRECTIONS OF FVEAA MINUTES PUBLISHED IN THE OCTOBER, 1993 NEWSLETTER

The following amends portions of the August 22, 1993 Minutes as they appeared in the FVEAA Newsletter of September, 1993.

Beginning in paragraph 3, replace "Member...." with "Vice President Clark stated a correction to the July 16, 1993 minutes. In Paragraph 8, replace "the membership' with "Vice President Clark.

The July 16, 1993 Minutes were unaminously approved with the correction.

Vice President Clark stated the corrections to the June 18, 1993 Minutes.

In paragraph 3, replace 'Representative' with "Agent"..In paragraph 3, replace 'New England EV & Solar Car' with "American Tour de Sol". In paragraph 9, replace '9:30' with "9:00".

The June 18, 1993 Minutes were unaminously approved with the corrections.

Vice President Clark stated: "The Minutes of the May 21, 1993 meeting still have not been published in the Newsletter nor approved. The motion and unanimous approval of Member Clark as Vice President were recorded in those
Minutes. 2) Possibly the shortest FVEAA meeting ever convened was on June 18, 1993. 3) The titles on the FVEAA Newsletter cover page are still incorrect. Replace 'Treasurer with "Treasurer & Librarian" above Dale Corel's name. Replace 'Director' with "Director & Publisher" above John Emde's name.

'Treasurer Corel...' (Paragraph 7 continues unchanged).

In paragraph 8. replace 'Member' with "Vice President Clark stated the FVEAA is a tax-exempt, non-profit organization and per state statute, no tax is due"

In paragraph 11, replace 'Member' with "Vice President"

Respectfully submitted by,

Steven F Clark, Vice President

MINUTES OF THE MAY 1993 FVEAA MEETING

Treasurers report:

	2055.36
	1275.90
Total:	3331.26

The president gave a report of our entry into the design competition. Our entry was not acknowledged by the judges, also our text was lost after judgement and a new copy was requested by the competition committee. The president also gave information about hte events that he will be attending in the near future. The treasurers report was accepted along with the minutes of the April

meeting. The president also gave an announcement that our planned guest would not be attending today. Mike Rodgers would be our guest for the June meeting.

Al Engeldahl, coordinator for the COD auto shop was asked about using the shop floor for our Solar/EV event in Aug.

Suggested topics for the symposium were discussed:

Photo voltaic systems
standard EVs
Speakers from the U of I
Tour de Sol
Regenerative systems
Energy and cost savings possibilities
Illinois Solar Energy association
Commonwealth Edison Vehicle

Member Steve Clark noted that Bill Shafer has published an agenda in a former new letter dated 2/93

Our need for a library attendant who would be responsible for our whole library was discussed and a honorary membership was suggested to entice a volunteer.

Name tags for the members was discussed and it was suggested that the cost for tags be published in the next letter.

A vacancy in the position of Vice President was discussed and the President nominated Steve Clark for the position. The motion was second by member Vana. The motion was carried. Dale was nominated for librarian and seconded by John Emde. The motion was carried.

John Ahren, a departed member was honored as a pioneer member. It was discussed that any member in good standing should be continued in the membership role. It was also discussed that the family be offered the option to continue to receive the news letter. The meeting was adjurned.

Submitted
by Tom Schmidt

THE OVONIC
(ENERGY CONVERSION DEVICES) BATTERY

At the invitation of Dr Peter Lykos, Illinois Institute of Technology, I attended acolloquium on October 15 at that institution. The subject was the Nickel Metal Hydride (NIMH) battery for electric vehicles developed by Energy Conversion Devices (ECD) in Troy, MI. The presentation by Dr Stanley R Ovshinsky was based on his paper published in SCIENCE, Vol 260, 9 April 1993, pages 176-181.

The following was prepared from my meeting notes and the paper, which I wish to sharewith FVEAA members who are always interested in a "better battery" for EVs.

The Ovonic battery is similar to the Nickel-Iron battery developed by Thomas Edison and sometimes called the Edison cell. He initiated a battery investigation after finding lead-acid batteries unsatisfactory for his electric vehicle. At the time he observed, "There must be a better way (to store electricity), FIND IT!"

Both batteries use a potassium hydroxide (KOH) electrolyte. Instead of a nickel electrode, the NIMH battery uses an engineered, propietary mixture of vanadium, titanium, zirconium, nickel, cobalt, iron, and chromium. Electrochemical activity of the NIMH battery is superior to the nickel of the Edison cell due to the metallurgical phase mixture of the component metals achieved during manufacture. Development has increased the number of mixed-phase active sites. The spectrum of bonding energies available at the variety of active sites improves battery energy storage and volumetric efficiencies. As with all electrochemical batteries, the challenge is to improve the utilization of active material and increase surface area available for reactions to take place.

The NIMH battery has a nominal voltage of 1.2 volts per cell. It stores hydrogen as a reaction product in the solid hydride phase. Because of this feature, the NIMH battery does not electrolyze water in the KOH electrolyte which causes the Edison battery to emit copious quantities of gas during operation - particularly charging. The NIMH battery is a sealed unit.

During charging the NiOH electrode is oxidized and the metal hydride electrode is reduced. There is no net change in electrolyte quantity or concentration over the charge-discharge cycle.

ECD has expended considerable research efforts to produce the NIMH electrodes using disordered materials to improve battery performance.

How good is the battery? A comparison of battery parameters gives an idea:

Property	Lead-Acid		NIMH
	Available Today	Possible Development	
Specific Energy (Wh/kg)	35-45	80	80
Energy Density (Wh/liter)	70-90	135	215
Peak Power (Charged) (W/kg)	110	-	230
Power Density (W/liter)	150-200	250	470
Cycle life (80% discharge)	300-500	600	1000
Life (Years)	2-4	5	10
Recharge time- hours (From 80%)	6-8	6	1
Self discharge in 48 hrs	Data not available	>15%	<10%
Cost ($/Kwh)	50	<150	200 *

* Projected for 10,000 units @ 40Kwh.

Also refer to Fig 6 from the paper which shows Argonne Lab test data that compares depth-of discharge vs peak power for a number of EV battery types.

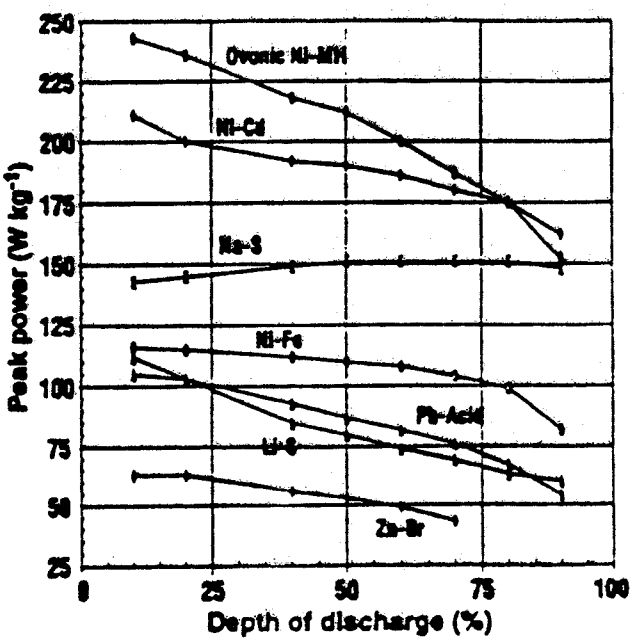


Fig. 6. Peak power versus depth of discharge, as measured (*17*) at Argonne National Laboratories, for a number of candidate EV battery technologies.

INSTITUTE

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. A news supplement to IEEE Spectrum

JULY/AUGUST 1993, VOLUME 17, NUMBER 4

Continual monitoring speeds charging, extends battery life

Secondary (rechargeable) batteries have many shortcomings, with lengthy charging times and limited service life among the more vexing. Although quick-chargers do exist, they tend to make batteries overheat, and hence to aggravate the service life problem.

Now a small Austrian company—Enstore R&D GmbH in Graz—has come along with a quick-charging technology that not only does not harm batteries, but will actually extend their lives. Moreover, in the case of nickel/cadmium batteries, the technology is said to eliminate the infamous memory effect—the reduction of battery capacity by repeated cycles in which partial discharging is followed by complete charging.

The essence of the Enstore charging technology is to continually monitor the state of charge of the battery during the charging process. Doing so allows the charger always to feed the battery as much current as it can handle without heating or building up excessive amounts of gas.

Of course, monitoring a battery's state of charge from its terminals is a far from trivial task. As explained by product manager Lisec Herwig, it involves charging the battery with a train of current pulses and measuring the battery voltage both during the pulses and between them. Enstore has figured out how to relate the measurements to the battery's state of charge for various electrode systems.

Equally important, the company has also determined the optimum charging current for various states of charge for three common battery types: lead/acid, nickel/cadmium, and nickel/metal-hydride. It has incorporated its knowledge into a patented IC, which can form the heart of a battery charger.

According to Herwig, it is quite simple to adapt existing charger designs to the Enstore chip. Among other things, switches must be added for programming the number of cells in the battery as well as its electrode chemistry. Using the chip will be even easier in the future, he told THE INSTITUTE, because the next version of the IC will sense those parameters for itself, without switches.

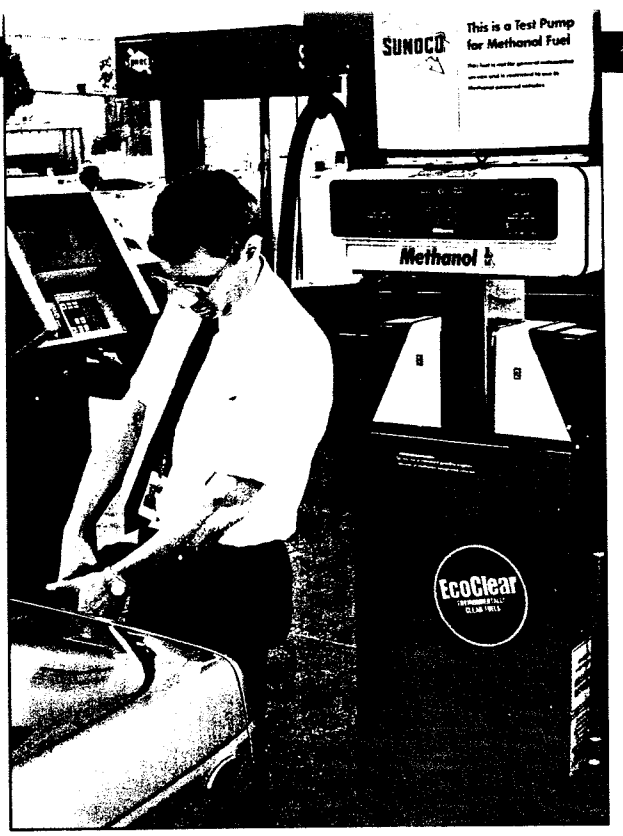
APPLICATION EXTREMES. The Enstore electrode-specific charging system (ECS) serves a wide range of battery uses, from cellular phones and notebook computers at one extreme, to electric vehicles at the other.

In the case of fairly small devices, like cellular phones and power tools, its main advantage over existing charging systems is probably its speed. It recharges a nickel/cadmium camcorder battery in 15 minutes instead of the more usual 1.5 hours. As a result, pointed out Jerry Eisenband, president of EnChip Inc., East Hanover, NJ, which represents Enstore in the United States, the need to lug extra battery packs around will frequently be eliminated.

For electric vehicles, at the other extreme, its main attraction might well be its ability to extend the service life of the battery until it equaled the life of the rest of the vehicle. (Enstore claims that the ECS can extend the useful life of a nickel/cadmium battery to 5000 charge-discharge cycles from its typical average of 500 cycles.)

Enstore was founded in 1989 by Wilhelm Johannes Harer, an industrial chemist interested in electrochemical energy storage and environmental protection. The privately held company has 15 employees.

—Michael J. Riezenman



To help meet national goals for greater energy independence and cleaner air, HV designers are encouraged to consider alternative fuels such as methanol, ethanol, and compressed natural gas.

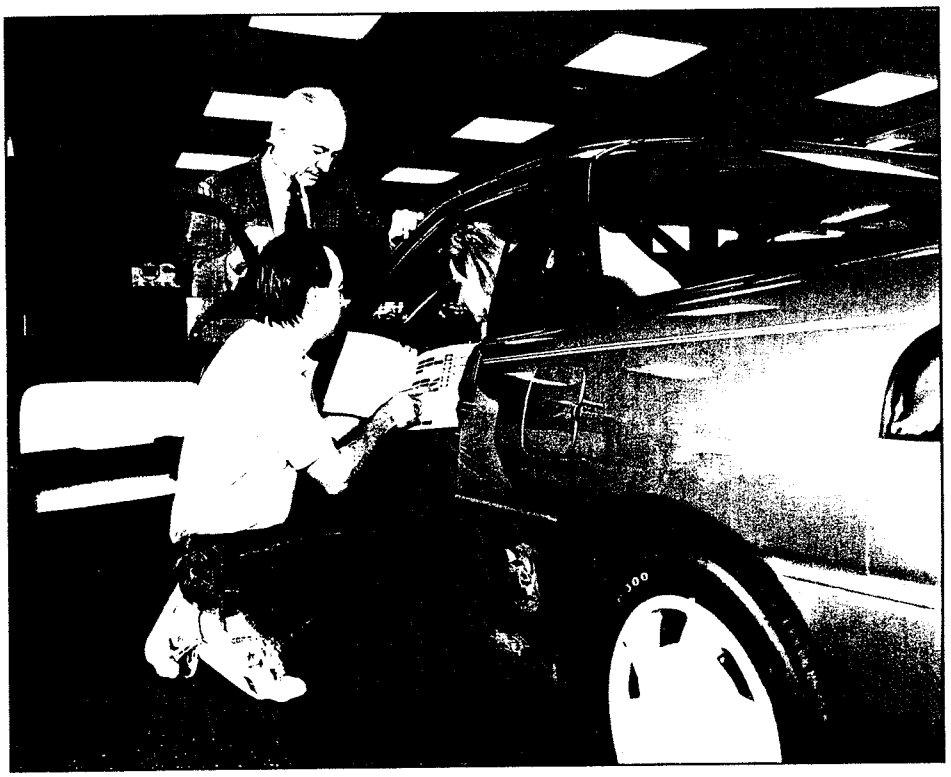
R&D collaborations such as this one will begin introducing us to a new age of energy-efficient "automobility" that we can enjoy in better health and economic security than ever before.

"About two-thirds of passenger-vehicle miles in the United States are driven in urban areas," he added. According to Johnson, these areas are home to almost 80% of the country's population.

If we also consider that more than 75% of U.S. households have two or more private vehicles, compared with about 7% in 1950, we begin to see the magnitude of our continuing love affair with the automobile.

Americans aren't the only ones who are so beguiled. According to Charles Lave, a professor of economics at the University of California, western Europeans are buying and driving more—not fewer—private cars despite high-priced gasoline, few roads, limited parking, and strict land-use controls.

Lave also found that, in most parts of the world, as personal incomes rise, so does the number of private cars on the road.

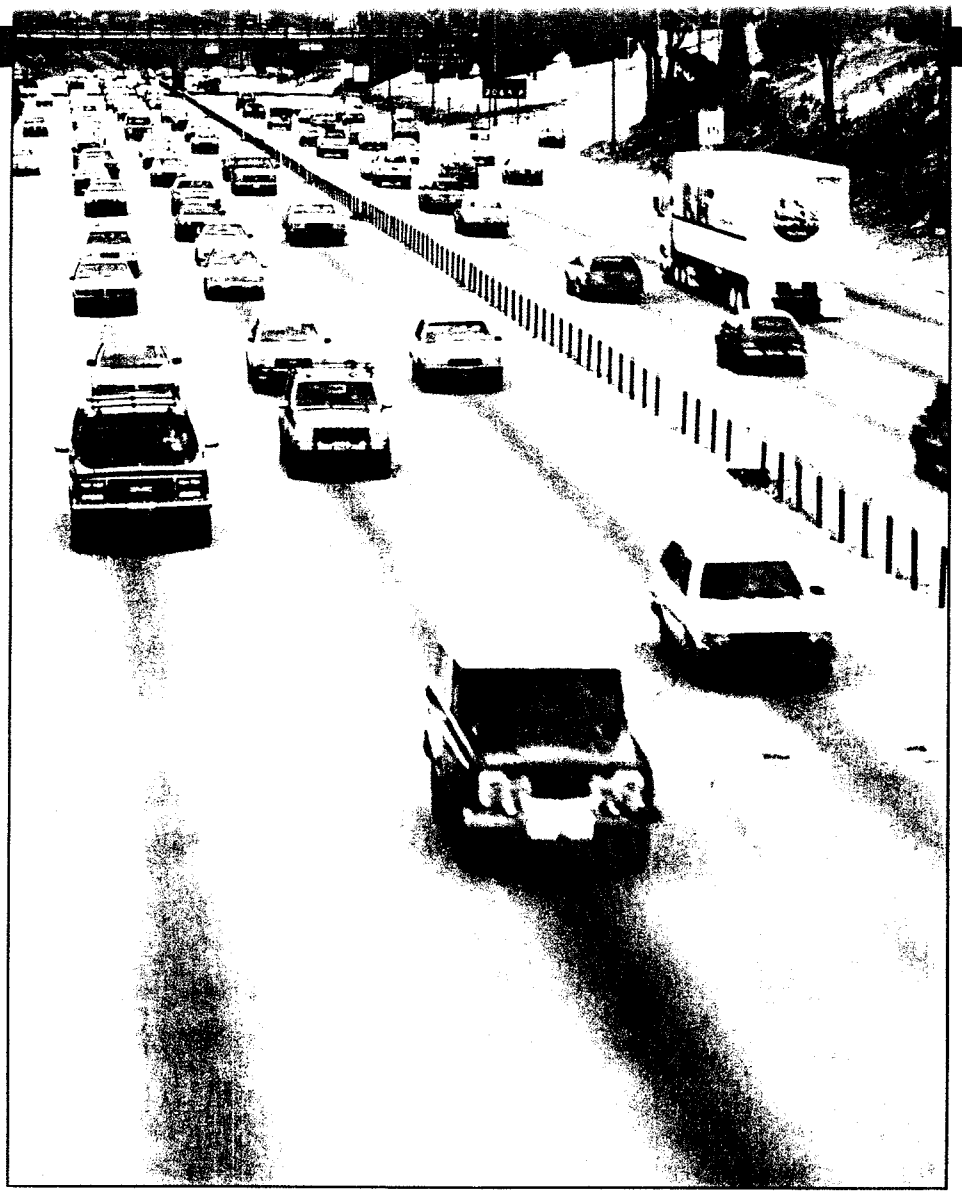


With consumer acceptance, U.S. sales of electric and hybrid vehicles may reach 1 million per year by 2010, according to a recent report published by the Society of Automotive Engineers.

Barring some compelling turn of events, we won't be seeing fewer automobiles any time soon, in our country or elsewhere. What is more likely is that R&D collaborations such as this one will begin introducing us to a new age of energy-efficient "automobility" that we can enjoy in better health and economic security than ever before.

NREL is now in the vanguard of some important changes in U.S. transportation. This could turn out to be a fascinating trip.

For more information about technical aspects of this program, contact Terry Penney, Manager, Advanced Vehicle Systems Branch, NREL, (303) 231-1754. For information about procurement aspects, contact Margaret Lemke, Supervisor, MRI Subcontracts, (303) 231-7016. ♦



Studies show that vehicle emissions now account for 75% of the carbon monoxide, 33% of the carbon dioxide, and 44% of the nitrogen oxides in urban air. Hybrid vehicles should help improve this situation by using alternative propulsion systems.

areas" for ozone and carbon monoxide in 19 states are required to have nonpolluting fleets in place by 1998. Reducing emissions is thus an important goal in DOE's hybrid and electric vehicle R&D programs.

Studies have found that vehicle emissions now account for 75% of the carbon monoxide, 33% of the carbon dioxide, and 44% of the nitrogen oxides in U.S. cities, despite tougher emissions standards. As smog-choked cities like Los Angeles enact laws calling for greatly reduced (or zero) tailpipe emissions, major changes in the nature of inner-city transportation will be needed.

Federal laws such as the Alternative Motor Fuels Act of 1988 and the Energy Policy Act of 1992 call for alternatively fueled vehicles in U.S. government fleets. By 1999, 75% of the government's fleet must be powered by alternative fuels or propulsion systems that don't pollute.

But the whole burden for these changes does not rest on automakers and related industries. The government has authorized millions of dollars in appropriations to help the private sector develop alternatively fueled and electric or hybrid vehicles; advanced batteries; and new fuel, repair, and maintenance infrastructures.

One of every seven jobs in our country is in the motor vehicle (or a closely related) industry, according to Paul MacCready of AeroVironment Inc. Franchised dealers alone employ nearly a million people. So public concern for the economic health of this industry is understandable.

Automakers know that several new vehicle concepts will also call for some major changes in transportation infrastructures. For example, some proposed HVs, and all electric vehicles, will need to be recharged periodically. Several electric utilities are already discussing plans and guidelines for recharging stations for such vehicles.

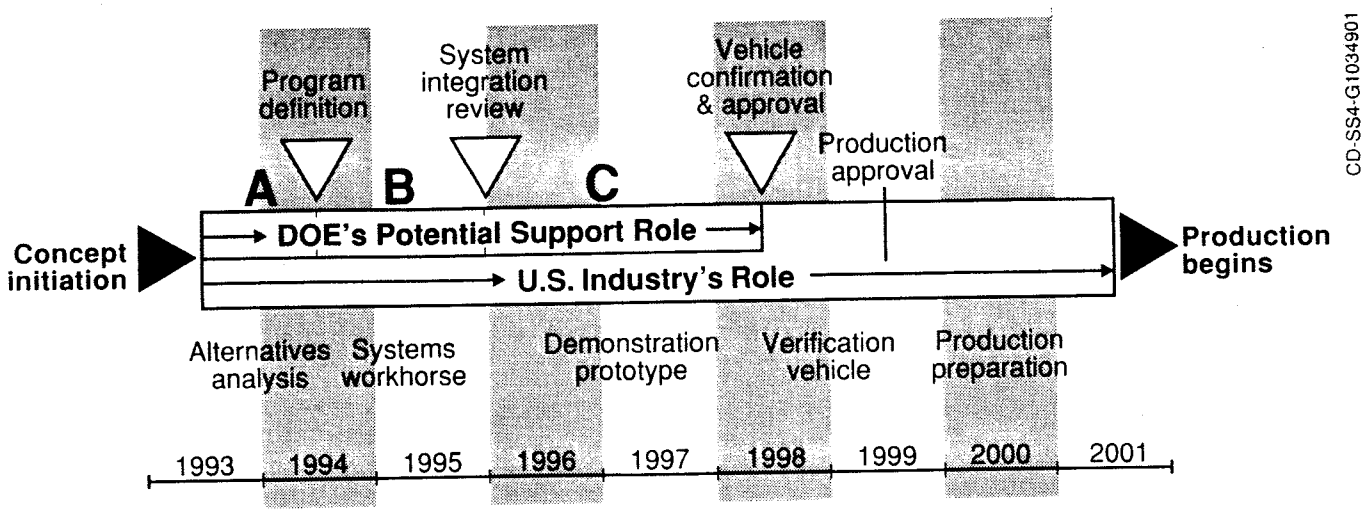
There will be some excellent opportunities for renewable electric technologies (such as photovoltaics) to provide electricity for these recharging stations. And renewables could do so without adding to the air pollution problems associated with conventional power plants.

More cars? Or better? Or both?

The World Resources Institute recently reported that the number of vehicles throughout the world will double in the next 20 years, given current trends. Other experts agree.

"The private motor vehicle now accounts for over 95% of all person-miles of surface travel in the country," said Elmer Johnson, a former director of General Motors, in the American Academy of Arts and Sciences *Bulletin* (November 1992).

These designs attempt to link the environmentally beneficial aspects of electric-powered vehicles (zero tailpipe emissions) with the extended driving ranges and rapid refueling capabilities of conventional vehicles.



The new hybrids

Industry subcontractors will develop vehicles with a drive system consisting of more than one prime mover. Some possible energy sources for HVs are spark-ignition, diesel, rotary, Stirling, and gas turbine engines; flywheels; ambient-temperature and high-temperature electric batteries; fuel cells; thermo-electrical devices; and ultracapacitors.

Some current HV designs combine an internal combustion engine and an electric motor powered by an electrochemical cell or battery. These designs attempt to link the environmentally beneficial aspects of electric-powered vehicles (zero tailpipe emissions) with the extended driving ranges and rapid refueling capabilities of conventional vehicles. This concept is only one of several possibilities, however.

"We're on a fast track to assist the domestic automotive industry in these endeavors."

—Terry Penney, Manager, Advanced Vehicle Systems Branch

Designers working on concepts that include a battery will probably be familiar with the work of the U.S. Advanced Battery Consortium (USABC), which was formed by the three biggest U.S. automakers to improve battery performance and service life. The Hybrid Vehicle Program's activities can include USABC findings, but the program won't be duplicating the consortium's activities.

To help meet national goals for greater energy independence and cleaner air, HV designers have been encouraged to consider alternative fuels in designs that incorporate an internal combustion engine. Designers also have to weigh target requirements for cost, performance, driving range, comfort, style, and refueling convenience against energy efficiency and emissions goals.

All new vehicle concepts, whether hybrid or electric, must meet federal motor vehicle safety standards.

Just what's driving this energetic R&D program?

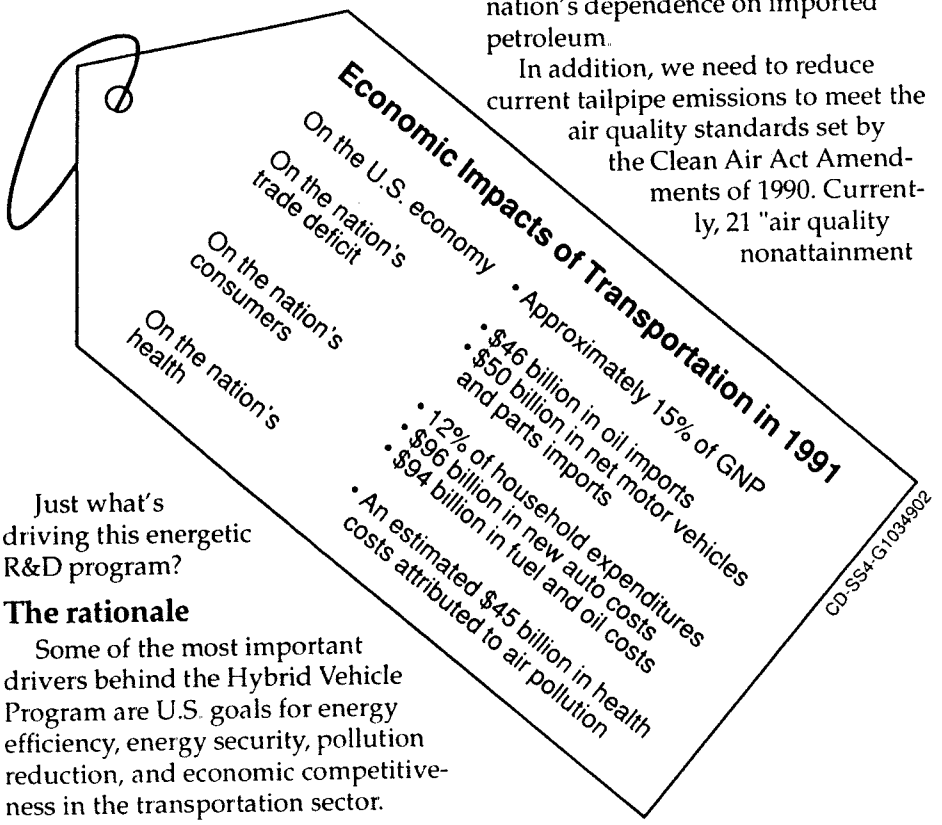
The rationale

Some of the most important drivers behind the Hybrid Vehicle Program are U.S. goals for energy efficiency, energy security, pollution reduction, and economic competitiveness in the transportation sector.

The average fuel efficiency of U.S. motor vehicles has improved about 50% since 1973, as vehicles have continued to meet new federal and industry mileage standards. Automotive experts admit, though, that new car designs usually meet consumer preferences for cars with more comfort, style, and convenience rather than more efficient engines.

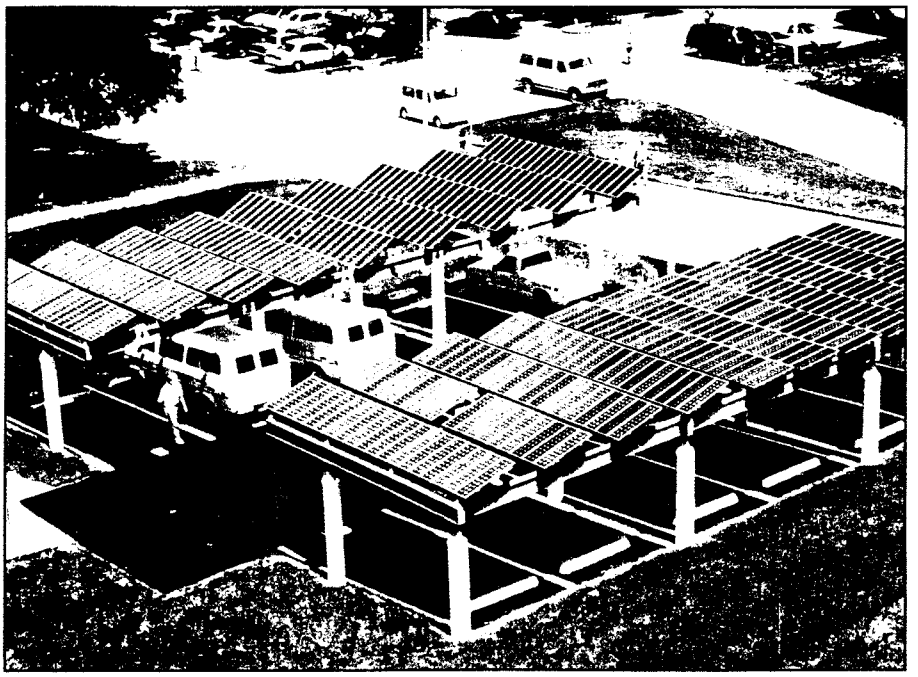
Because the transportation sector consumes more than 60% of the oil we use, and about half that oil is imported, energy-security goals are pressing America to produce vehicles with more energy-efficient propulsion systems. Using alternative fuels in our vehicles could also reduce the nation's dependence on imported petroleum.

In addition, we need to reduce current tailpipe emissions to meet the air quality standards set by the Clean Air Act Amendments of 1990. Currently, 21 "air quality nonattainment



Gearing Up for Hybrid Vehicles

Practical, energy-efficient vehicles accelerate toward the marketplace thanks to new government-industry partnerships



by Paula Pitchford

Sometime in the next decade or two, you could slide behind the wheel of your "personal driving machine" and turn the key, but you won't hear the familiar roar of a gasoline-powered engine. Instead, you'll hear the nearly silent hum of your new hybrid vehicle (HV).

HVs of the future will depend on at least two different kinds of propulsion systems to operate. An internal combustion engine might be just one of two or more propulsion systems modified to work in a hybrid design.

To help turn these designs into affordable vehicles, DOE has selected NREL's parent organization, the Midwest Research Institute (MRI) of Kansas City, MO, to manage the government's Hybrid Vehicle Program. This five-year, cost-shared partnership with industry is aimed at refining the propulsion systems of the cars and trucks we'll be driving in the next century.

Nearly all the major domestic and foreign automakers have worked on at least one HV concept. Most of the designs are still being developed for mass markets. The goal of the current R&D procurement is to assist industry in accelerating the market readiness of practical, cost-effective, energy-efficient HVs with low tailpipe emissions.

The new vehicles also have to appeal to a broad range of consumers. These are substantial challenges, but the automotive industry seems to be ready for them.

"There's an exciting revolution going on right now in the auto industry," said Terry Penney, who manages the Electric-Hybrid Vehicle Program for MRI and leads NREL's advanced vehicle systems research activities.

"The industry has substantially improved the competitiveness, quality, and reliability of its products," Penney said. "And automakers intend to maintain these standards in the cars of the future. We're on a fast track to assist the domestic automotive industry in these endeavors."

MRI has issued a competitive request for proposals to enter into cost-shared subcontracts to develop HVs. Phased collaborative work will assist industry in resolving any remaining technical and cost challenges associated with propulsion systems.

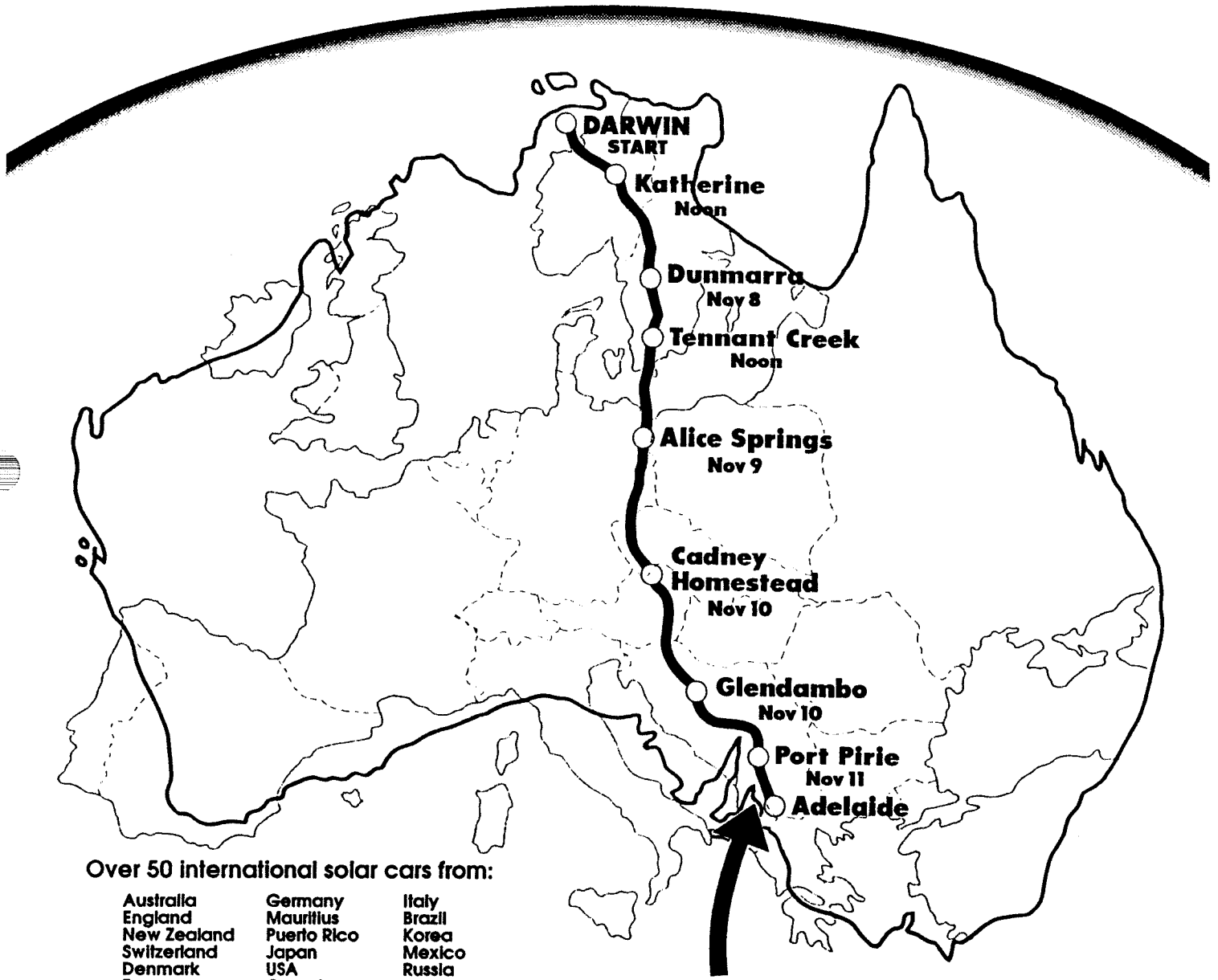
The subcontracts will help manufacturers move their best HV designs to assembly lines and finally into America's auto showrooms. Energy efficiency, emissions reduction, and global competitiveness are major DOE program objectives.

Hybrid vehicles now under development may recharge their batteries at PV power stations such as this one at the University of South Florida. (Photo courtesy USF)

DAIDO HOXAN INC.

WORLD SOLAR CHALLENGE

Starts November 7th 1993 DARWIN, AUSTRALIA



Over 50 international solar cars from:

Australia	Germany	Italy
England	Mauritius	Brazil
New Zealand	Puerto Rico	Korea
Switzerland	Japan	Mexico
Denmark	USA	Russia
France	Canada	

First car to finish on November 11th, 1993

DAIDO HOXAN

WORLD SOLAR CHALLENGE

Official Suppliers:

OMEGA · JTB · SUMITOMO MARINE · HOLDEN · GM · GS · The Government of South Australia · Department of the Environment, Sport and Territories

October, 93

1993 Entry List

Japan:

2. Honda R&D
3. Hokuriku Electric Power Co.
7. Panda-san
17. Team Doraemon
23. Nissan Motor Co.
24. JCJC Solar Car Club
36 Sofix
38. Mino Solar Special III
39. Mabuchi Sun Power Team
40. Hokkaido Automotive College
44. Le Soleil
49. Sun - EV
51. Tokai University
53. S & Y
55. Waseda University
56. Toyota Motor Corp.
77. KYOCERA SON OF SUN
151. Zero to Darwin / BePal 3
320. Solar Japan / Mainichi-Go
555. Ashiya University
599. Laughing Sun Racing
0. Hama Yumeka / Yutaka Tomida
* Neo PTLA Group *SOLAR AIRSHIP*

USA:

9. San Diego State University
10. Rochester Institute Of Technology
19. California State University, LA
25. California Polytechnic, Pomona
28. Team New England
31. University of Oklahoma
34. George Washington University
35. University of Michigan
37. Konawaena High School,Hawaii
101. Stanford University
150. Villanova University

Australia:

8. Dripstone High School
12. Monash Uni. / Melbourne Uni.
13. NT Institute of T.A.F.E.
15. NT University
22. Alarus / D.E. Lajivic
18. Annesley College
41 Mitcham Girls High School
30. Aurora Vehicles Association
111. Morphett Vale High School
888. Meadowbank T.A.F.E.

England:

20. Battery Vehicle Society
29. Solar Flair / Phil Farrand
50. T.R. 50 / J.G. Riches

Switzerland:

1. Engineering College of Biel
16. Heliox / Dominic de Vries

New Zealand:

6. Philips Solar Kiwi / Stewart Lister

Canada:

93. University of Western Ontario

Denmark:

32. Sonderborg Teknikum

Brazil:

88. The Banana Enterprise

Korea:

5. KIA Motors

Mexico:

11. Tonatiuh / Beatriz Padilla

Germany:

21. Helio Det 2 / Detlef Schmitz

Puerto Rico:

4. University of Puerto Rico

Russia:

46. Dr. Alexandr Popolov

DAIDO HOXAN

WORLD SOLAR CHALLENGE

PRESS RELEASE

WORLD SOLAR CHALLENGE 7 NOVEMBER TO 16 NOVEMBER

"the most important event in the world" *

Leapfrog Technology makes the Sun Run Shine

Countdown to 7 November 1993 for the 3004 kilometre race from Darwin to Adelaide and straight into the history books. Faster cars - that's the promise of the 1993 Daido Hoxan World Solar Challenge.

Solar race cars can now scorch down the Stuart Highway at speeds up to 90km/h powered only by the sun. Switch on the race cars' batteries and some will be able to overtake at 140km/h.

The race to save a polluted world's dwindling finite fuels has become a high technology big business. Some cars will cost millions of dollars.

Cars in the 1990 World Solar Challenge (WSC) were the pinnacle of solar vehicle design. Few thought they could improve significantly but specifications recently released by some teams shows that progress is dramatic. In the three years since the last World Solar Challenge, technology has leapfrogged a generation of development.

A WSC race car consists of an array of solar cells, an electric motor, a set of batteries, energy management computers and a highly efficient body and chassis to carry the electronics down the Stuart Highway.

Race rules limit the size of cars to a maximum of eight square metres. Leading solar cells from Australia, Germany, Japan and the USA will gather sunlight and convert it into electricity. Depending on the team's budget this can vary from 950 Watts to more than 1600 Watts. The Swiss Engineering School car from Biel, has a solar array generating a massive 1585 Watts.

BP Solar has supplied WSC competitors with more than 40,000 Watts of cells using the world acclaimed laser grooved technology invented by Professor Martin Green of the University of New South Wales. During the three years since the last race, the price of high efficiency silicon cells has dropped from $40 a Watt to just $10 a Watt.

Solar race cars rarely use cheaper production line cells. Racing cells cost from $15,000 to $1.2 million for each eight square metre panel. The dramatic fall in the price of production line cells is Australia's intellectual contribution to making solar energy a reality and reducing the world's greenhouse gases.

* Al Gore, the environmentally aware US Vice President

Electric Vehicle Update

California regulations require that two percent of each automaker's vehicles sold in that state in 1998 must be zero emission vehicles (ZEVs). This increases to 10 percent in 2003. Manufacturers selling fewer than 5,000 cars each year in California would be exempt. Baring some great technological breakthrough or a softening of the law, that means electric vehicles. Ford, GM, and Chrysler appear to be pooling resources to develop an electric car.

However, research and development is not exclusive to the big three auto makers. At the Second Washington Gas Natural Gas Vehicle Conference which was held in Alexandria, Virginia, Robert Hall, an automotive engineer for United Parcel Service stated that UPS is working with a consortium involving an environmental company, the Massachusetts Institute of Technology, and the Arthur D. Little Foundation to develop a hybrid vehicle. "What this vehicle will do for use and other fleets is that it will operate on an internal combustion engine powered by natural gas to go to and from its delivery area, and then during the day while it's operating on its delivery area, it would operate off electrical batteries," said Hall. "We feel that this technology needs to be pulled forward, and this project will enable us to learn a lot and also to possibly help get this part of the industry going." Hall states that actual normal delivery tests will probably be three or four years from now.

Development Of Import Electric Vehicles

The May/June 1993 issue of the *Beck/Arnley Worldparts Gazette* reports on the following import electric vehicles.

- Nissan plans to begin selling its electric version of the Cedric/Gloria sedan in Japan, beginning in December 1993. Estimates on the selling price range from $166,000 to $250,000. The vehicle uses lead acid batteries, has a top speed of 62 mph, with a range of 75 miles per charge, at a constant speed of 25 mph. Nissan is also experimenting with its Future Electric Vehicle (FEV) which can achieve a 40 percent recharge in just six minutes. It is slightly smaller than the Sentra, with a top speed of 81 mph and a cruising range of 156 miles at 25 mph.
- Toyota is testing two electric Crown sedans in Japan. Each can travel up to 84 miles (at 25 mph) on a charge and reach top speed of 68 mph. It uses lead acid batteries.
- Mitsubishi has an electric Libero van being tested in Japan. It can reach a speed of 81 mph on either lead-acid or nickel-cadmium batteries. At 25 mph its range is 155 miles. The price is estimated at $87,000 (lead-acid) or $156,000 (nickel-cadmium).
- Mazda is testing six electric MX-5 Miata roadsters. The Miatas have 880 pounds of nickel-cadmium batteries, a top speed of 80 mph. Performance is said to be equal to a 1.5 or 1.6 liter gasoline engine. Driving range is 120 miles at 25 mph.
- Mercedes is testing an electric 190E, using maintenance free sodium-nickel chloride batteries, which operate at a temperature of between 518 and 662 degrees Fahrenheit. A Mercedes engineer claimed that they can heat the interior using battery temperature. It has a range of 150 miles at 30 mph, or 90 miles at 50 mph. Top speed is 71 mph.

Littelfuse To Develop Power Fuses For Electric Vehicles

Littelfuse Inc. of Des Plaines, Illinois is developing high voltage fuses for electric vehicle applications. These futuristic fuses, with voltages that could be as high as 400 volts, are almost 20 times more powerful than the 12-24 volt fuses found in today's new car models. The support instrumentation and environmental chambers at the High Power Test Lab also are being used to simulate the actual conditions under which the industry expects these new high voltage fuses to operate.

"With these fuses, Littelfuse will be setting new standards—standards that never before existed in automobile high voltage fuse technology," says Heraclio R. Gomex, Power Fuse chief engineer. "The work Littelfuse is doing on power fuses for electric vehicles is an indication of the things we can do today that we once only dreamed of."

I believe almost every FVEAA member with a converted car would probably be willing to pay 4 times as much for a battery that eliminated rewatering, would extend the range of his car by almost three times, would have an expected life at least 3 times better, and had a power delivery capability twice that provided by his existing golf cart type batteries. The problems are cost and availability. The EDC projected cost is based on producing and selling 10000 40Kw units. They may find cost estimates difficult to meet in view of the expensive metals used in making the NIMH plates.

Another problem is recharge time. Our present chargers are generally supplied from readily available 15-amp, 120-volt (1.5 Kw) ac supply circuits and take 8 hours to recharge from an 80% discharge depth.

The NIMH battery can be recharged at a much faster rate. To recharge a 40 Kwh battery in 1 hour would require a 45 Kw supply circuit, probably a 3-phase, 230-volt source. This is not something found in a typical home. The power level for an 8-hour recharge would be 5 Kw which could be supplied by a 230-volt, 30-amp,(6 Kw), single-phase branch circuit similar to a circuit used for electric clothes dryers. The FVEAA addressed the recharging subject in its Infrastructure Design Competition entry.

I suggest we discuss this battery at our November meeting and if the members agree, send our observations to EDC .

William H Shafer
25 October, 1993

For Sale

1980 JET - ElectraVan

20 HP GE SCI Controller - 4 Speed transaxle - rear - Gas Heater - AM Radio - 17 6 volt & 1 12 volt batteries - 8000 actual miles - Lester 102/12 volt charger - no modifications - original electric manual & Body/Chassis manual

$3600

Mark Tilton
1013 North Rd.
Fox River Grove, IL 60021

Come by for a ride!!!

JET INDUSTRIES ELECTRA VAN 500

SPRING/SUMMER 1993

Progress Report

Electric Vehicles

GM will collect data from potential retail consumers during the electric vehicle demonstration program beginning in mid-1994.

50 for the Future – The GMEV Demonstration Drive Program

A message from Ken Baker, Vice President of Research and Development Center/ GMEV Program Manager

In 1994, we will take the pulse of the future.

We're taking the GMEV out of the lab and off the test track to learn how people like you will use and respond to this revolutionary vehicle. A small fleet of General Motors' electric vehicles will be produced and then placed with consumers, in cooperation with selected electric utilities, to get reaction to the GMEV's performance in everyday driving conditions.

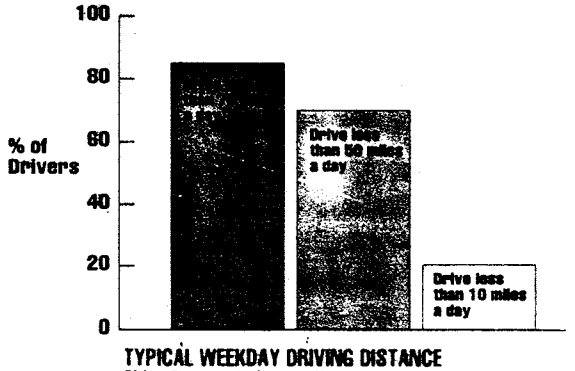
It's an important step in the commercial development of personal electric transportation. We anticipate this exercise will produce valuable insights into the way people interact with the EV. This should help us shape the next generation of electric vehicles for wider audiences – America, the continent, the world.

Throughout this process, your continued interest in electric vehicles is critical. The EV holds great promise for revolutionizing automotive technology – and your support for our progress has helped us make great strides. The success of EVs will depend upon technology, infrastructure and public acceptance in equal measure. Thanks for playing your part.

Study Shows GMEV Fits Today's Driving Habits

Will General Motors' Electric Vehicle meet your driving needs? Findings from a survey indicate the GMEV won't change the driving habits of most commuters: Nearly 85% of drivers surveyed in Boston, Houston and Los Angeles drive less than 75 miles a day, with about 70% driving less than 50 miles per day and 20% driving less than ten miles a day. The GMEV's city driving range is 70 miles (at 80% depth of discharge of the batteries).

- Most trips are made with just one person in the vehicle – the driver. About 20% travel with one passenger and less than 5% with more than two passengers.
- About 80% of targeted customers park their vehicles in their own garages or driveways – so most can recharge EVs conveniently at their homes. Only 16% park in a community parking lot/garage or on the street.



TYPICAL WEEKDAY DRIVING DISTANCE
Cities Surveyed: Boston, Houston, Los Angeles

GMEV Unveils Fourth Generation

In the three years since the introduction of the Impact prototype, General Motors Electric Vehicles' vision of personal electric transportation has traveled a long way. Engineers are putting the finishing design touches on Impact 4, up to 50 of which will be produced for the GM demonstration drive program next year (see article in this issue). Tentatively, manufacturing of the vehicles will begin this fall, with the demonstration-model Impacts ready by spring to early summer.

Impact 4 features a single motor design – an advancement that could help bring an electric vehicle closer to the marketplace. "The single motor design simplifies electronic contr[illegible] said Bruce Zemke of GMEV's Vehicle Integration Group. "It also provides for a more reliable propulsion system and will be less expensive to build."

The vehicle has a top speed of 75 miles per hour and a driving range of 70 miles in the city and 90 miles in normal highway driving.

Impact 4 retains its "teardrop" design which gives it a .185 drag coefficient that's better than most airplanes. When it's necessary to slow the vehicle, regenerative and electro-hydraulic anti-lock braking systems work together to convert the vehicle's kinetic energy into electric energy for return to the battery. The braking systems help extend the Impact 4's operating range by up to 25%.

Impact 4 was designed with safety in mind, incorporating dual air bags and an Inductive Coupled Recharging System that eliminates exposed contacts for recharging. The vehicle complies with all federal Motor Vehicle Safety Standards.