ELECTRIC AUTO ASSOCIATION

CURRENT EVENTS

July 1991 | Promoting the Use of Electric Vehicles Since 1967 | Vol. XXIII No. 7

Discovered: The Perfect EV Battery

by Paul H. Brasch

How about a $3,000 retail battery that would give you a 200+ mile range per charge (30kwhr) and deliver 300-1,000 cycles yielding more than 50,000 miles of life. You could pull 150-200 Hp out with only about a 10% voltage drop, and it has greater than 90% voltage efficiency (charge/discharge efficiency).

It would weigh less than 500 lbs. and be less than 8 cubic feet in volume, including insulation. It runs at 150 to 200 degrees F (slightly more than hot coffee) and could be recharged in as little as 1 hour, but 6 hours would be reasonable as you can only get about 5 kw from a 220v outlet at 23 amps.

In addition to all of the wonders above - it has the toxicity of the caffeine in coffee and is biodegradable. It has no liquid in it and is self-healing if internally shorted. It is made like a capacitor in the electronics industry.

What is this magic battery? It is not a Zn-air system. (see Zn-air story, pg. 4). It is called a Lithium-polymer battery, and was discovered at Lawrence Berkeley Laboratories (LBL) over two years ago. This is the story of the battery that in my opinion will change the world.

It started about 4 years ago at LBL where researchers who had been working on high energy sodium sulphur battery systems, realized that even if they became operational, they still worked at very high temperatures. They thought for themselves - would they like driving a car that had 450 to 700 degree F molten salts in large quantities in it? Their answer told them to look into lower temperature systems.

In research into organo-sulphur compounds that melt at lower temperatures, they found intriguing polymers. When they applied these polymers to battery technology about 2 years ago, they got ENORMOUS energy and power densities. They quickly patented the invention. DOE and the University of California have licensed the technology to the inventors so that it will not be bought and shelved.

The inventors have formed a private corporation to develop this technology into marketable products. The company is already in place and is called PolyPlus Inc., located in Berkeley, CA. Their first product will be a room temperature battery for laptop computers.

There are two variations to this Lithium-polymer technology. One is the 180 degree F high power EV form and the other is a low power - though still high energy - room temperature form. This latter is what PolyPlus is working on now for a commercial product. Eventually, given money and proof of market, they will build an EV type and size battery for testing. This is one of only 3 battery systems under consideration for backing by the U.S. Advanced Battery Consortium (USABC) and the first to be looked at.

▶ *Continued on page 2*

EV's Get a Recharge

by David Lammers
Electronic Engineering Times
June 3 1991

Toyota City, Japan - Electric vehicles (EVs) have been an object of research in Japan since 1971, when MITI started a cooperative-research program to explore them. Recently, the incentive to develop an EV has increased significantly because California—a gold mine for Japan's motor-vehicle makers—has mandated that ZEVs (zero-emission vehicles) must account for 2 percent of the cars sold by 1998.

No surprise then that, at this year's Tokyo Motor Show, EVs and other environment- and safety-oriented vehicles are expected to take center stage, pushing aside the high-performance vehicles so in the limelight two years ago.

Toyota and other companies have developed EVs that can be used as garbage trucks, post-office vehicles and government fleet vehicles as part of the Japanese government's push to reduce urban air pollution. A passenger car that "Green" customers will choose to buy is the next big target.

During the 1970s, Toyota developed an EV that could run 450 kilometers (270 miles) on one charge, but it used a zinc-air type battery that was difficult to recharge. "We overemphasized performance and developed an EV that was difficult to use in the real world," explained Masahiro Ohkawa, who has been in charge of Toyota's EV research team singe 1981. "We learned a lesson, and went back to form a new research group in 1981 that would take a more practical approach to EVs."

▶ *Continued on page 7*

INSIDE

LIPoly

continued from front page

Now lets talk about the details. (See fig. 1)

First of all, there are the current collectors. These make contact with the negative and positive electrodes and conduct the current out of the battery. They are made of metallized mylar, like you see inside a potato chip bag. This is very cheap and made in very large quantities around the world.

The first electrode is the negative, which is a thin film of lithium metal. This is basically non-toxic and environmentaly benign even in landfill. Lithium is used in some medications and is the 6th or 7th most abundant element in the earth's crust.

Then comes the solid electrolyte - Poly-Ethylene Oxide (PEO). This material conducts the ions between the electrodes, just as the acid in a conventional lead-acid cell does, enabling current flow for charge or discharge. This material is biodegradable and is easily made. It dissolves in water and many years ago was used to wrap laundry detergent. You would just drop a packet into your washer - I think it was called Salvo.

Lastly comes the positive electrode, which is the new breakthrough discovered at Lawrence Berkeley Laboratories. Operating on an entirely new principle for energy storage, they developed a novel class of solid-state, organic electrodes. This material uses a protein folding mechanism to store the energy. This is a natural biochemical reaction, but has never been used for energy storage before. These new electrodes are called SRPE (solid redox polymerization electrodes).

This is where the energy is stored - in the making or breaking of molecular bonds (polymerization/depolymerization). When in the charged state, the electrode is a polymer. When discharged, it is a monomer. This is a highly reversible reaction in the right chemical configuration.

This battery uses thin film technology - like Saran Wrap is made. That equipment typically makes 1,000 ft/min. An EV cell is only 4.4 thousandths of an inch thick. All of the materials are cheap and they are mouldable. Although it could be made like a capacitor, it also could be moulded into shapes to fit body cavities. Of course you still have to keep it warm.

The output voltage is about 3 volts and the discharge curve is very flat for all but horrendous power drains. In figure 2 the Jd=2mA/cm2 curve (discharge at 2mA/cm2) represents 1,000 amps discharge at 100 volts for an 18,000 square foot battery, according to my calculations. This is the size of the battery mentioned in the introduction.

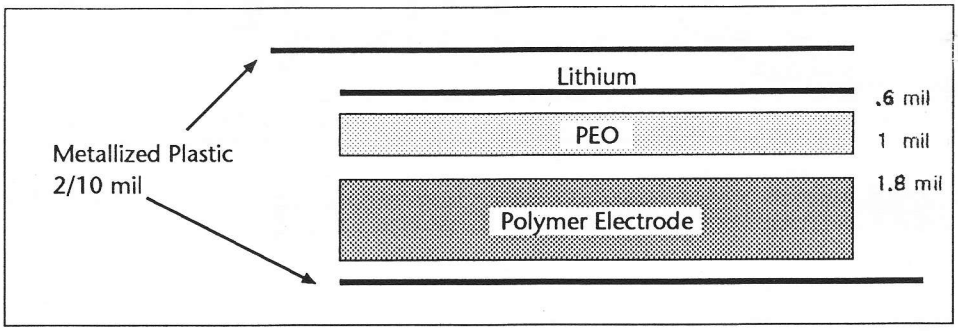

Figure 1 Polymer cross-section, 4.4 mil total

This is of course based on the laboratory cells. These have been discharged to the phenomenal rate of five minutes. (see Jd=10mA/cm2 curve) So even if the production product performed only half as well - it would still allow acceleration like the "Impact" or possibly even better.

Lastly, the estimated cost is about $70 per kwhr wholesale. This compares with about $60/kwhr for lead-acid.

Now where are the bugs? It has not been built and tested for EV use yet, but the scale-up should pose no unforeseen problems. A Canadian firm has scaled up a similar system by a factor of 2,000 from small lab cells with no problems.

On the plus side it exhibits no self-discharge so a charged battery should have a 10 year shelf life. And it can survive 180 deg C. Its only known problem is that it can't tolerate overcharge like lead-acid can. But this can easily be solved with electronics to monitor and control the charge. Also in extremely high rate discharges, thermal control could be a problem. But I feel that this could be addressed through engineering.

In summary, this battery has so much going for it that I am convinced that it or a version of it will help to save this polluted planet of ours. After personally waiting twenty years for this invention to happen I can BARELY wait for the commercial product. Just one or two more sets of lead-acid batteries should do it.

Electrics WILL NOW conquer the world. More power to them! ■

My hearty thanks to Dr. Steven J. Visco of LBL and PolyPlus for the information this article is based on. — Pb.

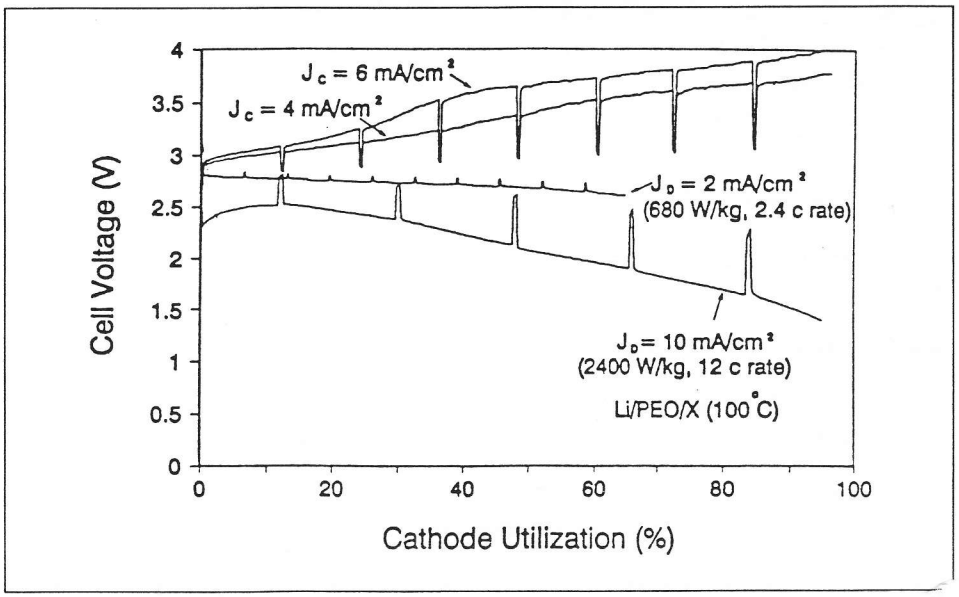

Figure 2 Charge and discharge curves

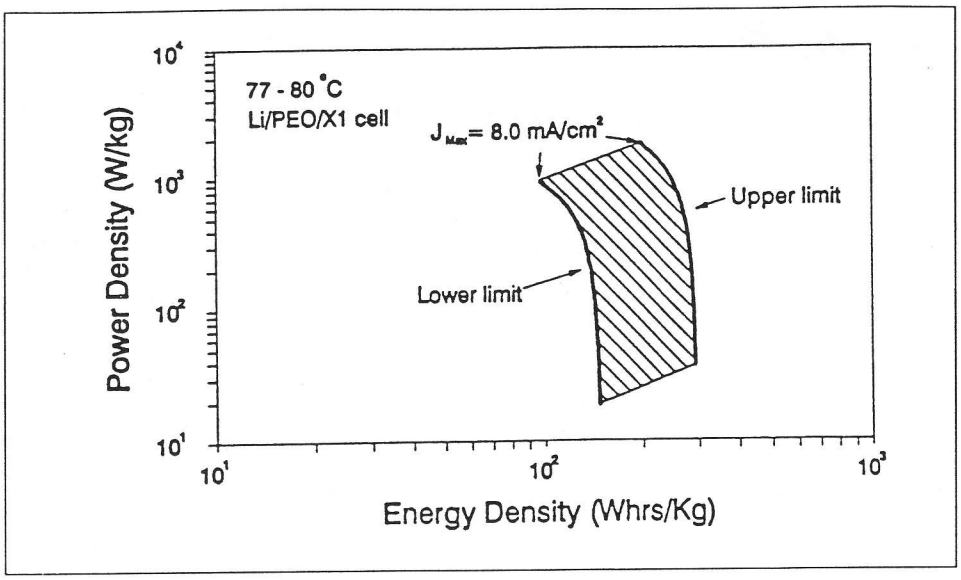

Figure 3 Energy density versus power density

WOW!

Here is a plot of power vs energy densities for the Li-polymer battery.

News & Comments

On June 23, 1991 the 24th annual **Palo Alto Concours d'Elegance** was held with six EVs on display. Twenty five thousand attended last years event, and it appeared to be the same this time. At this event we passed out an estimated 1500 newly made brochures and perhaps 400 copies of a white paper on the facts about EVs that I have researched. Both of these will be available at your local chapter on request. Chapter Presidents should call with the number they need. I suggest half a dozen or more brochures for each attending member so that they may give them to those interested. The white paper is also available but may appear as an insert in a future issue of CURRENT EVENTS.

On July 13th the **East Bay Chapter** holds its **Rally** in Oakland. (See announcement, pg.8)

Upcoming is the **Clean Air Revival** in Pacifica Aug. 3 & 4. (See the insert) Under the careful tutelage of Steve VanRonk, working with a full crew and more than a dozen sponsors including the City of Pacifica, this looks to be a major event.

Then follows **SEER 1991**, in Willits, CA Aug. 9-11.

Also on the 11th, for those who don't or can't attend SEER, we have been invited to show 2 or 3 EVs at the **San Lorenzo Valley CONCOURS D'ELEGANCE** at Highlands Park in Ben Lomond in the Santa Cruz Mts.

In other news; missing from the June issue was the report that the **Santa Clara Chapter** voted to change its name to the **Silicon Valley Chapter** and will henceforth be such. We never had a tie-in to Santa Clara but we started to call it that before the name Silicon Valley had been coined.

I have gotten many favorable comments and letters about the **new format for the newsletter.** Thank you all. I hope to start a full letters column with the next issue. Also the first EV conversion story, complete with pictures, has come in from Arizona. It should appear next month. Lets have more conversion stories.

Next month there will also be a report on the **Calif. Clean Air Race** from one of the judges. And full information on the **19th Annual Rally and Symposium** put on by the Silicon Valley Chapter. Also I hope to have a questionnaire for all EV owners to fill out and return - to develop a database of member & vehicle profiles. We need to know what we have in detail out there.

At the July 20th Silicon Valley meeting, Tom Turrentine from the **Institute of Transportation Studies, UC Davis** is scheduled to talk. He may have some solid statistics on the numbers of EVs that are out there and what it will take to convince the public to buy/build them. 10am 5301 Stevens Creek Blvd HP plant. It's great to have more paid ads this time around. They got in just before we raised the rates. Note the new rates. With our circulation increasing, so too will our rates. Same rate of 5 lines for $5, 5 line min. though. Note the insert ad from Electro Automotive. Now **THERE** is a **MOTOR** to make your car go! That's all for now. THINK EVs! —Pb

'Refuelable' Electric Car Battery Development

LA Times 5/31/91 • By Michael Parrish and Donald Woutat

A battery that could be quickly refueled, like a car's gas tank, has joined the race to develop the first practical electric car.

Westwood-based Luz International Ltd., which produces 95% of the world's solar electricity, said Thursday that the concept could help replace the polluting internal-combustion engine. Luz said it plans to demonstrate its battery—which uses a silvery liquid slurry to produce an electric charge—with a test run from Sacramento to Los Angeles early in 1992.

While experts find the battery intriguing, many see hurdles before it can meet Luz's expectations. For one thing, unlike other experimental batteries, the Luz device needs an extensive and costly support system for refueling. No one outside the company has yet studied a working prototype of the battery. And the company has no estimates of the cost of its battery and the infrastructure it would require. "You really only know - when you have a cell that you can test," said Philip N. Ross, senior scientist at Lawrence Berkeley Laboratory, a federal research center operated by the University of California. The Luz battery, Ross said, is an evolutionary — not revolutionary —refinement of a design developed in France in the early 1970s.

Still, Luz announced the technology with high hopes. "The battery is in its final stages of test, and its performance is beyond expectations," said Yehuda Harats, leader of the technical team for Israel-based Luz Electric Fuels, the subsidiary of Luz International that is developing the battery.

The battery creates electricity through the interaction of a syrup-like zinc slurry and the oxygen in ordinary air. Such zinc-air batteries are lighter than traditional lead-acid batteries — a critical factor in extending the range between refuelngs.

The Luz system would also save weight, says the company, because its elements wouldn't be recharged in the vehicle. When a battery ran low, the driver would stop for four to six minutes at a filling station while the old slurry was replaced with freshly charged liquid. The used slurry would be recharged, probably at off-peak hours, at central facilities that could be built near utility plants. Luz wants to introduce the battery first to commercial delivery fleets in the Los Angeles area. As the filling- station system expanded, private automobiles could use the technology too, the company believes. The privately held company hopes to introduce the first filling station in LA in 1993 or 1994.

"The concept of refueling the battery is a rather elegant one in technology," said Alan C. Lloyd, chief scientist for South Coast Air Quality Management District. Still, he said, the district "would have to look at everything closely" before lending the battery its support.

The Luz battery is a new wrinkle on an estimated 30 to 40 battery technologies under development around the world. Research has stepped up sharply with the approach of California's requirement that auto firms begin selling "zero- pollution" cars in 1998. The biggest effort began earlier this year with the formation of the U.S. Advanced Battery Consortium, a joint project of the Big Three U.S. auto firms, the U.S. Department of Energy, the Electric Power Research Institute and others.

Luz approached Southern California Edison about joining the project a year ago, said Joe Reeves, a research manager at the utility. But Edison was already committed to another zinc-air battery that has since developed with Dreisbach ElectroMotive Inc. (DEMI) of Santa Barbara. "The zinc-air battery has been around, but the (slurry) concept they have is new," Reeves said.

The DEMI battery can be recharged from existing electrical outlets in a vehicle owner's garage, eliminating a traditional problem with zinc-air batteries, Reeves said. By contrast, the Luz system would require major expenditures to build central recharging facilities and filling stations and to truck the slurry between them.

However, the Luz technology would make it possible to refuel within minutes, as opposed to an overnight recharging for other electric car batteries. That would better approximate the convenience of gasoline filling stations.

Luz says its battery could power a car up to 300 miles on one charge _ about twice the potential of most other battery technologies, according to a spokesman for the battery consortium. However, the Edison-DEMI battery powered a Plymouth Voyager minivan 223 miles on a single charge this year.

Government backers of alternate fuels expressed cautious support. If the Luz system looks promising, "I'm sure we would work up some kind of support, some public monies for a trial, and perhaps find a fleet user like Edison or the Department of Water & Power," Los Angeles City Councilman Marvin Braude said.

Braude sponsored the L.A. Initiative, a contest to build an electric vehicle designed from the ground up — not just adapted from a gasoline model. The winning design used conventional batteries, but Braude said it could as easily run on the Luz technology. ■

There's that word 'practical' again. It seems to me that since you have to sleep each night anyway, what's wrong with an overnight charge? The Li polymer battery claim is 1 to 4 hrs. to recharge. See article on pg.1. —Ed.

More on Electromechanical Energy Storage (Flywheels)

by Bill Palmer

This expands on the data in the May issue from Dr. Richard Post's presentation at Stanford on his development work on flywheel energy storage. He described modular flywheels in 10" cubes weighing 12.75 lb. which can store .65 to .93 kWh when turning at 100,000 to 200,000 rpm. The flywheels spin in a vacuum with magnetic suspension. They are made of several concentric cylinders of graphite fibers with a resilient bond layer between cylinders. At the center of each flywheel assembly is an inside-out electric motor. The rotor is a hollow cylinder mounted inside the innermost flywheel cylinder. The motor stator is in the center and is wound like a conventional motor stator. In the "air gap" between motor rotor and stator is a magnetically transparent metal tube which forms the center of the cylindrical doughnut-shaped vacuum containment. Since the motor windings are stationary and located outside the vacuum envelope, there are no shaft seals and no wires penetrate the vacuum envelope.

A median energy density of .75 kWh per module is about the same as a typical golf-cart battery such as the Trojan GC-2H which provides about 125 Ampere-hours at the one hour rate. (125A*6V/1000=.75kWh). The Trojan weighs 77 lb. so its energy density is 9.75 Wh/lb. The flywheel weighs 12.75 lb. so its energy density is (.75*1000/12.75=59 Wh/lb.). That's a six times improvement in specific energy. The flywheel volume is slightly larger: .55 cu.ft compared to the Trojan battery at .49.

So what can these flywheels do for electric cars? First let's see how much energy electric cars need. A review of the results of six EAA rallies reveals that the five cars in each rally which went the farthest, the most efficient cars, averaged 5.7 miles per battery. If we assume that the Trojan GC-2h is typical of the batteries used, then .75 kWh/5.7 mi=.132 kWh per mile. Recent articles on the GM Impact stated that its batteries stored 13.8 kWh which would take it 120 miles. That's .115 kWh/mi. The Impact operates at 320 Volts so the current is much lower permitting less I2R loss. For the best EAA cars to go 120 miles on revved-up flywheels would take 22 flywheel modules. (.132 kWh/mi*120 mi/.75 kWh/module=22) At 12.75 lb. per module that's only 280 lb. of flywheel "battery" compared to about 1200 lb. of lead-acid.

Lighter weight is not the only advantage of flywheels. They enable high voltage, low current systems without the desired voltage determining the number of modules required. The motor in each module is, of course, the means of storing energy in the flywheel and retrieving energy from it. Motors can be wound for practically any voltage, unlike batteries which have essentially fixed voltage per cell. It takes a lot of batteries to get a high voltage system so the current losses can be reduced. The Impact has 32 ten volt batteries. Flywheel motors can be built for practically any voltage such as a standard industrial voltage of 480 V. The number of flywheel modules in a car could be as many as the car will hold, or as few as are needed. They would be connected to the main electrical bus in parallel. The main traction motors could be standard industrial 460 volt motors, though lightweight aircraft motors would be preferred.

The bad news is that Dr. Post estimates that commercial availability of his flywheel modules may be ten years and many millions of development dollars away. He thinks developing a magnetic suspension system capable of handling the bouncy mobile environment will be the most difficult task. He gives us hope, however, that there may something down the road to help us clean our air other than the ever elusive exotic batteries we read about but cannot buy. ■

Announcement from EAA Headquarters

The EAA has been operating with too few members participating in operating policy decisions and with bylaws that need to be revised. Therefore, to correct these conditions, the following plan is proposed: (1) members who are willing to serve on the board of directors are urged to send their names and qualifications to EAA headquarters immediately—definitely not later than Aug. 1. The principle requirement in addition to being a member is attendance at regular board meetings in the San Francisco Bay Area. (2) proposed new bylaws will be published in the Aug. *CURRENT EVENTS* for member consideration and comments. (3) candidates for the board and their qualifications will be listed in the Sept. *CURRENT EVENTS*. (4) at the annual Symposium meeting, the candidates will be introduced and the proposed bylaws presented. (5) since insufficient time will be available before the Sept. meeting for members to consider the candidates and the bylaws, the voting on these will be by mail ballot in October. ■

World's Largest Photovoltaic Plant to be Built

SJ Mercury News, 7/91

Devcon Construction Inc. of Milpitas said it will begin construction this summer in Fairfield on what it claims will be the world's largest plant manufacturing modules that convert sunlight into electricity. The 65,000-square-foot plant is funded by a pension fund of the Sheet Metal Worker's Union and will be run by Advanced Photovoltaic Systems of NewJersey. ■

Review of IEEE/SSIT Conference on Transportation Problems of Silicon Valley

San Jose State University May 18, 1991

By Bill Palmer

Can technology solve our transportation problems: vehicular congestion, pollution and energy consumption? This was the the subject of presentations at the all-day conference sponsored by the Institute of Electrical and Electronic Engineers' (IEEE) Society on the Social Implications of Technology (SSIT).

State Senator Dan McCorguodale, who serves on several state and national committees on transportation, natural resources and the environment assured attendees that government is fully aware of the problems and is doing what it can to help solve them.

Jerrett Walker, an independent transit consultant, described how rail transit with bus feeders scheduled to minimize transfer waits would increase transit convenience. That would attract people out of their cars, onto transit and thereby decrease congestion, pollution and energy consumption. That technology has been available for many decades.

Dr. John Reuyl, Director of the Hybrid Electric vehicle Project, sponsored by the Electric Auto Association, described the project's XA-100 electric car with unlimited range. Operated on local trips, on battery power, it is a zero emissions vehicle. For country driving, powered by a small engine-generator, it is an ultra low emissions vehicle. Since it can be recharged from utility electric power overnight when most of the utility's generation is from hydro, the car helps reduce pollution and consumption of fossil fuels.

Dr. Walt Zavoli, Vice president of ETAK, Inc. described new technology for vehicular navigation and information systems. The navigation system displays a map with the vehicle location on a CRT screen in the vehicle. As the vehicle moves the map moves to guide the driver to the destination. The information system involves TV cameras and sensor loops embedded in roadways to gather traffic information, process the data and inform the public of traffic conditions so alternative routes can be used to avoid congested areas.

Andy Harris, of Apple Computer, told how he avoids commuting by having a second office in or near his home and communicating with the company office by telephone and computer. He goes to the company office once or twice a month. He predicts exponential increases in telecommuting, video conferencing and electronic information exchange. These eliminate transportation problems for the people who use them.

Al Spivak, a founder of the Modern Transit Society and member of the Santa Clara County Transportation Commission said that technology cannot solve the transportation problems of Silicon Valley or anywhere else, because lack of technology is not the cause of the problem. The automobile has been subsidized with free roads and free parking. Transit systems which are not free cannot compete.

A panel discussed state legislation and regional perspectives. Panelists were: Chris Brittle of the Metropolitan Transportation Commission, Irwin Mussen of the Bay Area Air Quality Management District, Steve Heminger of the Bay Area Council and David Bomberger of the Greenbelt Alliance.

Chris Brittle described the federal, state and regional transportation planning agencies and processes.

Irwin Mussen described the Bay Area air quality as improving. The California Clean Air Act of 1988 attempts to improve it by Transportation Control Measures (TCMs) such as tighter vehicle emission standards, enhanced inspections (smog checks), tighter controls on industrial sources to reduce vehicle trips, miles driven and congestion.

Steve Humminger said that the Bay Area Council advocates a "market-based" strategy instead of legislation. Drivers should pay for the costs imposed by their choice of transportation. Registration fees should be proportional to vehicle emissions. Tolls on bridges and highways and gasoline taxes should be higher. Parking fees should be charged at work and shopping place parking lots.

David Bomberger claims that uncoordinated land development has caused severe traffic congestion, adverse air quality, lack of affordable housing, poverty and social congestion, declining competitiveness, loss of community identity and destruction of agricultural and other open spaces. He said that a regional greenbelt will correct many of these problems. Mass transit should not be burdened with the requirement that it pay for itself when no such requirement is placed on streets, highways and parking lots.

James Zuchelli of Californians for Constitutional Government spoke for freedom of individuals and goods to move from place to place. He said that restricting automobile use restricts that freedom and that we need cleaner cars, not disincentives for their use.

Cynthia Petty, of Apple Computer, described how Apple Computer encourages employees to use alternate transportation with a shuttle bus system and transit ticket subsidies. Apple also encourages telecommuting as Andy Harris described earlier.

James Kaufman, an urban planner, described how residential neighborhoods can be designed so that most residences are within a five-minute walk of the neighborhood center. At the center would be a cluster of schools, shops, churches, offices, meeting halls, museums and rail and bus transit stops. By bringing most of the activities of daily living within walking distance everyone, especially the young and the elderly, gain independence of movement. That reduces the need to use cars and so helps solve our stated problems.

Summary: Government and regulatory agency people think that legislating higher taxes on car use and requiring cleaner cars will solve the problems. Transit people say that if drivers had to pay the full cost of the streets, highways, parking lots and traffic control in proportion to their use of those facilities, many of them would use mass transit whenever they could. The environmentalists side with the transit people. All of the technology that's needed has been available for most of this century. The solution to congestion, pollution and consumption of fossil fuels lies either with our voluntarily using transportation means that move people and goods more efficiently and uses fewer

▶ *Continued on next page*

Conference

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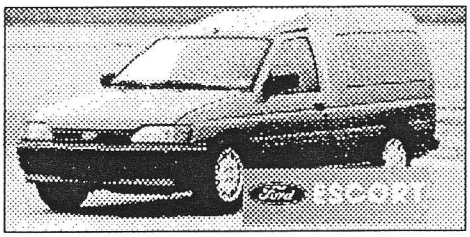
vehicles or we will be forced to do so by law. In the meantime our quality of life deteriorates with each passing day as vehicular congestion and pollution get worse and our reliance on fossil fuels expose us to international political instability. We have exposed the enemy. It is us. ■

Amazingly, some people are totally opposed to EVs because they are better than gas cars. The President of the Modern Transit Society takes this position. —Ed.



This is Ford's electric Escort van. They plan to build and evaluate 100 of these, starting next year.

Batteries:	Sodium sulphur
Top Speed:	75 MPH
Range:	100 miles
Payload:	1,000 lbs.

Recharge

continued from front page

The team has made the most progress in developing an ac induction- type motor powered by zinc bromine batteries. Ohkawa said that "our efforts are mainly going in that direction."

The Toyota research group developed a dc shunt-type motor that achieved a 91 percent efficiency rating with relatively little chopping noise (the sound caused by switching the current on and off rapidly). However, the dc motors were complicated and difficult to manufacture. Also, the dc motor has brushes that suffer friction wear and spread debris, requiring more maintenance.

Since 1983, the group has worked to improve the ac induction motor's "drivability": the driver's control of the vehicle's acceleration. The ac induction motor is compact in size, and runs at 10,000 to 15,000 rotations per minute, significantly fewer rotations than General Motors' electric motor, Ohkawa claimed.

Ohkawa would like to hear from semiconductor companies interested in developing better power ICs capable of handling the large voltages in EVs with minimal loss. And better ac/dc converters are needed to recharge the batteries. Ohkawa believes that the future of electric motors is "quite rosy"; but when it comes to the batteries, there "are so many obstacles."

For its prototype electrically powered van, Toyota developed a hermetically sealed nickel-cadmium battery in cooperation with Japan Storage Battery Co. Chubu Electric Power Co. will have Toyota manufacture the vehicle for Chubu Power's own use and as an escort vehicle for marathon races. Nevertheless, a passenger car would require 18 or 20 large Ni-Cad cells, which are expensive, apt to lose power in cold weather, and good for only 1,000 to 1,500 recharge cycles.

Ohkawa, a calm man, sees tough problems with every kind of battery technology. He estimates that with normal stop-and-go driving, a Ni-Cad powered car would have a range of about 60 miles per charge. The zinc-bromine batteries must be periodically completely depleted-a "perfect discharge, which is troublesome to the average user." Nickel- hydride batteries bear the stigma of danger: the H gas can explode.

The practical EV is likely to be a hybrid vehicle, with an engine that could run the vehicle and help recharge the battery. Ohkawa sees some promise in recapturing 5 to 10 percent of an EV's kinetic energy to help recharge the battery.

Remember the Peking-to-Paris rally of 1907? The Great Race, sponsored by the French newspaper Le Matin de Paris, was won by an Italian team let by Prince Scipione Borghese. To keep the ball rolling, how about an "EV challenge" from San Diego to Seattle, or from Tokyo to Sapporo.

Ladies and gentlemen: Charge your batteries! ■

Sounds like they were not impressed with their Zinc-air systems. Also, few EAA members have had much brush troubles with their dc motors. —Ed.

PRESS RELEASE May 24, 1991

New England EAA Receives Award from EPA

The New England Electric Auto Association (NEEAA) received an award today from the U.S. Environmental Protection Agency. The award is for their work in promoting clean-burning fueled vehicles. Bob Batson of Maynard, Massachusetts received the award on behalf of the NEEAA from Paul Keough, Regional Deputy Administrator for the EPA. Batson is the founder and President of the organization.

The NEEAA is now the largest chapter of the national Electric Auto Association (EAA). The national EAA is a volunteer organization of EV enthusiasts with 15 chapters throughout the U.S. and Canada. Presently, there are more than 90 members in the NEEAA which was formed in May of 1990. Meetings are held quarterly on Saturdays (1-5 PM) to accommodate members throughout New England, as members and guests travel from Maine, Connecticut, and New Hampshire on a regular basis.

The award ceremony took place at the Rhode Island Capital on Friday, May 24, at noontime. The ceremony was part of the 1991 American Tour de Sol, a solar & electric car race from Albany NY to Plymouth MA. This 5 day race is sponsored by the Northeast Sustainable Energy Association and included 25 vehicles from high schools, colleges, individuals, and EV manufacturers. ■

Way to go Bob! —Ed.

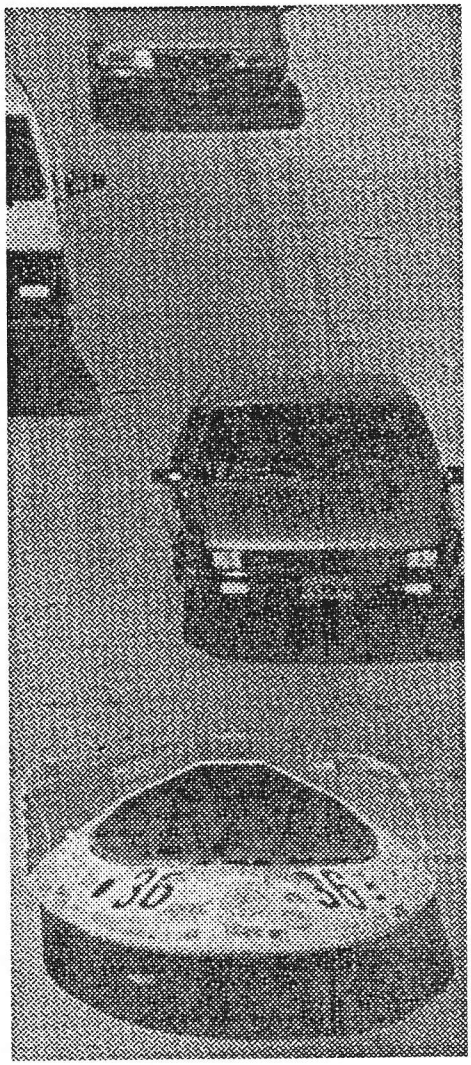
East Bay Chapter Electric Auto Rally

July 13,1991

Sign in:	9:30am
Start:	10:00am
Lunch:	12:00 Noon
Resume:	1:00pm

Starting point:
5th Ave. & E. 8th Street, Oakland. Located at the east edge of the Laney College playing fields. The course will be 3.8 miles around Lake Merritt. Take US 880 (Nimitz Freeway) to the Braodway exit. Take 7th Street east through the Laney College campus. Prizes for distance and efficiency.

Call Gordon Schaeffer
415/582-6813 7–10pm



Letters

Dear Mr. Newell,

In your May issue, you have an article about "A Good Reason to Write a Letter to Your Congressman." You state that over 23 million of these batteries are improperly discarded which is not correct. As a member of a battery manufacturers coalition group and publisher of the trade magazine, The Battery Man, I have reliable information that in the years 1987, 1988 and 1989, the recycling rates were 88.5%, 91.0% and 95.3%. We also have surveys that show around 30,000,000 batteries are sitting around in garages and barns. Based on our information, I doubt that there are as many as 5 million batteries improperly disposed of.

I can assure you that no one in the battery industry wants to see any batteries being disposed of in land fills as the industry has been an active re-cycler for the past 70 years. It might be of interest to you to know that over 90% of batteries are presently being manufactured from secondary lead.

It would be nice if someone discovers a storage battery that would run a vehicle from Sacramento to San Jose at 65 mph and back again, but don' t blame the lead-acid battery industry for not producing it. There will be almost 100 million dollars spent by DOE and private firms this year to develop a "miracle" battery and if they don' t come up with anything more than they have in the past 15 years, it might be time to start stringing up trolley wires to make an electric vehicle work.

Yours very truly,
Celwyn E. Hopking
Executive Secretary
I.B.M.A.
(Independent Battery Manufacturers Association)

It' s great to hear that the numbers are better than the May issue claims, but even if the number is 3,000,000, that is a lot of lead. Let' s hope that it can be improved upon. Note the article on Li polymer. —Ed.

Corrections

In the May issue, there are two errors in my article "Report from Phoenix". Although Gary Jackson ran his 3-wheeled Doran in the Qualifying laps, it was disallowed from the actual race. He had a backup car that is a VW Rabbit that did run and won third place. Also, there is a typo in reference to the speed of the Swatch car. It won with average speeds in the 60 mph range. —Ed.

HELP WANTED

We want your help on this newsletter! We're looking for articles, reports, how-to stories, etc. Especially valuable are "how-I-did-it" stories about any recent conversion adventures you may have had. Don't worry about your writing ability, just send in the facts and your phone number and we'll will turn them into an article for us all to learn from and enjoy. Send to:

Paul Brasch, Editor, ***CURRENT EVENTS***
1968 Elden Drive, San Jose, CA
95124-1313

Want Ads

1982 Renault Le Car "Lectric Leopard",De Lux Mod., Sun roof. New batteries, 3,500 miles $5,000 206/482-3687 Washington

HELP: Need repair of Willy #9 controller. Have schematics and constr. books. Will pay fair market. Gene Cosmano 5550 N. 44th St., Phoenix. AZ 85018. Call collect after 5pm 602/840-2497

WANTED! Shunt/compound motors, 72-120 volt, 10 to 30 HP. George McCrae 1322 Hope Road, North Van, B.C. Canada,V7P1W7

FORD ESCORT electric. New batteries, new tires. Wiring gone over. Runs smooth as glass. Just repainted yellow 415/851-3024

ELEC. CAR, 1960 NSU Prinz Car relic or 400-A Westinghouse motor alone worth price. Nds brake wk & batt.s $525 Roy A. Renner 20480 W. Walnut Dr.,Sonora,CA 95370 209/532-9785

FOR SALE Home railroad parts-12 laminated masonite rr whls, 6 3/4"thred rod axles, nuts, sprockets,chain,how-to-man,31/2 HP 24vdc gearmtr(surplus price $250) laminated masonite hopper all for $100 Dave Abell Bx 103 Finley CA 95435 707/263-6652

1981 JET FORD ESCORT white, PMC cont., batts. less than 1 yr old, Good cond. in/out Lisa 408-954-6031 day Dan 415/965-8476 evs

FOR SALE elec. motorcycle Suzuki T-250 cnvrsn; cafe racer/24v mtr,V-belt drv, fairing, one-up seat, rear-set & clip-on's; nds wk & bats; all for $100 Paul 415/325-3012

FOR SALE 37 HP GE dc mtr from Dodge Elec. Truck $300; also 96/12v and 102/12v Lester chgrs $200ea 415/388-0838

Ad Rates: 5 lines for $5.00. ($5 Minimum) 1/4 page for $30.00. All advertisement submittals must be "camera ready."

The EAA is not responsible for the accuracy of ads.

Calendar

July 13, 1991 East Bay (CA) chapter meeting RALLY. *See ad on previous page.*
August 3 – 9, 1991 Intersociety Energy Conversion Engineering Conference
Boston, MA 708/352-6611.
August 3 - 4, 1991 Clean Air Revival Solar Expo and Motor Sports Show
55 New Montgomery St., San Francisco, CA 94608 415/495-0494.
August 9 – 11, 1991 SEER 1991, Willits, CA (Final Round Electrathon Champ Trail).
August 18 – 22, 1991 '91 ASME Int'l. Computers in Engineering Conference
Marriott Hotel, Santa Clara, CA.

EAA Chapters

ARIZONA

■ **Phoenix**
Lee Clouse 602/943-7950
P.O. Box 11371, Phoenix, AZ 85061
Meetings: *4th Saturday/month 9am – Noon*
Even months: *Chapman Chev., Baseline Av. at McClintock.* Odd months: *Lou Grubb Chev., 27th at Camelback, Phoenix*

CALIFORNIA

■ **East Bay**
Jim Danaher 415/339-1984
1986 Gouldin Rd., Oakland, CA 94611
Meetings: *2nd Saturday/month 9:30 – Noon*
PG&E Service Center, 4801 Oakport St. (880 frontage road south of High St.), Oakland

■ **North Bay**
Bob Wing 415/669-7402
P.O. Box 277, Inverness, CA 94937
Organizing meeting Sept. 21, 1991
Location to be announced.

■ **Peninsula**
Jean Bardon 415/355-3060
540 Moana Way, Pacifica, CA 94044
Meetings: *1st Saturday/month 10am – Noon*
San Bruno Public Library (d'nstairs), San Bruno
No meeting Aug. 3 due to Clean Air Revival

■ **Silicon Valley**
Paul Brasch 408/371-5969
1968 Elden Dr., San Jose, CA 95124
Meetings: *3rd Saturday/month 10am – 1pm*
Hewlett Packard Santa Clara facility, Stevens Creek Blvd. at Lawrence Expwy., Santa Clara

■ **San Jose**
Don Gillis 408/225-5446
5820 Herma, San Jose, CA 95123
Meetings: *2nd Saturday/month 10am – Noon*
1592 Jacob Ave. (near Meridian), San Jose

■ **Los Angeles**
Irv L. Wiess 818/841-5994
2034 N. Brighton "C", Burbank, CA 91504
Meetings: *1st Saturday/month 11am – 1pm*
Pasadena City College, 1570 E. Colorado Blvd., Rm. E220, Pasadena

NEVADA

■ **Las Vegas**
Gail Lucas 702/736-1910
Desert Research institute
2505 Chandler Ave. Ste. 1
Las Vegas, NV 89120

TEXAS

■ **Houston**
Ken Bancroft 713/729-8668
4301 Kingfisher, Houston, TX 77035

WASHINGTON

■ **Seattle**
Ray Nadreau 206/542-5612
19547 23rd N.W., Seattle, WA 98177

NEW JERSEY

■ **Hackensack**
Kasimir Wysocki 201/342-3684
293 Hudson St., Hackensack, NJ 07601

NEW ENGLAND

■ **Maynard**
Bob Batson 508/897-8288
1 Fletcher St., Maynard, MA 01754

SOUTH FLORIDA

■ **Ft. Lauderdale**
Steve McCrea 305/463-0158
101 SE 15th Av., #5, Ft. Lauderdale, FL 33301

VANCOUVER, B. C.

■ **Vancouver**
VEVA 604/987-6188
543 Powell St., Vancouver, BC V6A 1G8

■ **American Solar Car Ass'n.**
Robert Cotter
P.O. Box 158, Waldoboro, ME 04572

NON-AFFILIATED GROUPS

■ **EVAOSC**
Ken Koch 714/639-9799
12531 Breezy Way, Orange, CA 92669

■ **EVCO** 604/987-6188
Box 4044 Sta "E"
Ottawa, Ontario CANADA K1S 5B1

■ **DEVC**
George Gless 303/442-6566
Denver, CO

■ **Fox Valley EVA**
John Stockberger 708/879-0207
2S 643 Nelson Lake Rd., Batavia, Il 60510

For info on the EAA, send SASE to the address below or call 415/591-6698 or 415/685-7580. Please call weekdays 10am – 5pm Pacific Time.

EDITOR: Paul Brasch DESIGN/PRODUCTION: John Broenen CONTRIBUTORS: John Newell, Bill Palmer, B. Brooks

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