ELECTRIC AUTO EAA NEWS

ASSOCIATION

Sept. 1989 Vol. XXI No. 9

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
(916) 324-3490

***** FUNDING ANNOUNCEMENT ***** (ETAP)

FUNDING AVAILABLE FOR ADVANCED Energy Technologies Advancement Program

FOURTH LOCAL JURISDICTION SOLICITATION

and

FIFTH-ROUND GENERAL SOLICITATION

The California Energy Commission is planning to release separate Requests for Proposals (RFPs) for the Fourth Local Jurisdiction Solicitation and the Fifth-Round General Solicitation of the Energy Technologies Advancement Program (ETAP) in late August 1989. The Fourth Local Jurisdiction Solicitation is open only to local jurisdictions. The Fifth-Round General Solicitation is open to both the private and public sectors.

Through the ETAP, the Commission will be co-funding advanced energy projects that will increase the energy efficiency or cost effectiveness of energy technologies, or help to develop new, cost-effective alternative sources of energy. Projects must include hardware development. Nearly any type of advanced energy technology including those based on energy production, energy conservation (including advancements in recycling technology), load management, etc. is eligible for ETAP funding.

Approximately $5.2 million is anticipated to be available in fiscal year 1989-90 to co-fund qualifying proposals for both solicitations. Projects submitted under both the Fourth Local Jurisdiction Solicitation and the Fifth-Round General Solicitation will compete for this funding. At least $520,000 and up to $5.2 million will be available to qualifying projects through the Fourth Local Jurisdiction Solicitation. Individual projects for either of these solicitations may request up to 25 percent of the total funding available (i.e., up to approximately $1.3 million) for co-funding.

Projects can qualify for one of two types of ETAP funding: loans or repayable research contracts. The Commission will allocate between 50 and 70 percent of the available funds for loans. The remainder will be allocated for repayable research contracts. In prior fiscal years, the competition for loans has been much less than for research contracts. Up to 80 percent of the total project cost can be funded by an ETAP loan. For research contracts, ETAP can co-fund up to 50 percent of the total project cost. Loans are repayable at approximately an 8 percent interest rate. **Research contracts are also repayable under certain conditions**, and also accrue interest at approximately 8 percent.

The Commission has completed four General Round Solicitations and three Local Jurisdiction Solicitations resulting in 35 projects, totaling approximately $10.6 million dollars in ETAP funding. A list of ETAP projects approved as of June 30, 1989 is enclosed.

The tentative schedule for the Fourth Local Jurisdiction Solicitation is:

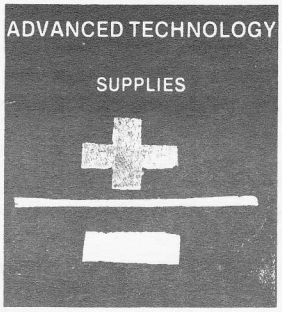
Request for Proposals Released --- August 31, 1989
Proposals Due ---------- October 20, 1989
Commission Funding Decision ------ May - June, 1990
Projects Begin ---------- As Early As July 1990

The tentative schedule for the Fifth-Round General Solicitation is:

Request for Proposals Released --- August 31, 1989
Proposals Due ---------- October 20, 1989
Commission Funding Decision ------ May - June 1990
Projects Begin ---------- As Early As July 1990

Flat polymer electrolytes promise thin-film power

Emerging solid-state batteries thinner than this page combine high energy density with mechanical ruggedness for applications ranging from smart cards to space



Even by today's standards, it is hard to imagine a practical battery thinner than the thickness of the paper on which this article is printed. But in laboratories all around the world, scientists and engineers are working on a new solid-state battery that could be fabricated much thinner than 100 micrometers. The battery uses a solid polymer electrolyte as the ionically conducting medium, instead of a liquid electrolyte.

Flat cells have been available for several years and have been incorporated into devices such as the Polaroid instant-film pack. However, these have been modifications of conventional liquid-electrolyte cell designs. Recent innovations in solid-state polymeric electrolytes point to the development of entirely new solid-state batteries that use lithium anodes, solid cathodes, and a solid polymer electrolyte that both separates and provides the ionic pathway between the anode and cathode.

The concept of a wholly solid-state battery is not new, but practical designs based on it may have far-reaching effects. Such batteries behave far better than those containing liquid electrolytes, which may suffer from high rates of self-discharge, leak electrolyte through battery seals, and operate poorly at both extremes of temperature.

In contrast, the slower rate of ion diffusion in batteries containing a solid polymer electrolyte reduces the rate of self-discharge; the absence of liquid eliminates leaks; and solid electrolytes function at temperatures as high as 140 °C, whereas some organic liquid electrolytes may vaporize at 100 °C or more.

The right stuff

The major problem in developing useful solid-state batteries has been identifying solid materials with sufficient ionic conductivity to serve as the electrolyte. In 1973, researchers at the University of Sheffield in England, led by Peter V. Wright, discovered that polyethylene oxide forms a natural compound, or complex, with a potassium salt, resulting in a material with relatively high ionic conductivity.

It wasn't until 1979 that Michel Armand, director of research at Centre National de la Recherche Scientifique, Saint-Martin d'Heres Cedex, France, proposed using the polymer as a solid electrolyte in lithium solid-state batteries. Subsequently, a large number of research groups have investigated a variety of polymer electrolytes.

At 10^{-4} (ohm cm)$^{-1}$ at 100 °C, the ionic conductivities of these solvent-free polymer electrolytes are comparable to those of the room temperature solid electrolytes lithium iodide (LiI) and silver iodide (AgI). However, these values are still far smaller than the 1 (ohm cm)$^{-1}$ exhibited by aqueous-based electrolytes used in, for example, lead-acid car batteries.

If the polymer electrolytes can be formed in very thin sheets, then cell resistance falls to a useful level. Such a device is entirely solid-state, with no liquid or gas involved. The feasibility of this type of battery has been tested in a variety of research cells, and in some prototypes of practical size

The first such batteries had to operate near 100 °C, because of the poor conductivity of the polymer electrolytes at room temperature. But recent technical articles from MHB Inc., Dayton, Ohio; Institut de Recherche d'Hydro-Québec (IREQ), Varennes, Québec, Canada; and others describe batteries using modified polymer electrolytes that can operate throughout a temperature range of −20 °C to +140 °C at voltages as high as 3.5 volts.

Performance data in a number of laboratories, including the United Kingdom Atomic Energy Authority's Harwell Laboratory, Didcot, England, and the University of Minnesota, Minneapolis, indicate that if polymer electrolyte batteries can be successfully scaled up, they should provide up to five times the energy density of a lead-acid car battery.

Experimental studies on small laboratory cells—from one to six square centimeters in area—show that such batteries now provide an energy capacity of up to 200 watt-hours per kilogram. Sustained power density has reached 1000 W/kg, with a peak power of 800 W/kg at half-charge.

Ultimately, researchers expect the energy capacity of a typical packaged battery, based on a lithium anode and a vanadium oxide (V_6O_{13}) cathode, to rise as high as 150 Wh/kg, with a sustained power density of 200 W/kg and a peak power of 900 W/kg at half charge.

M. Zafar A. Munshi and Boone B. Owens
University of Minnesota

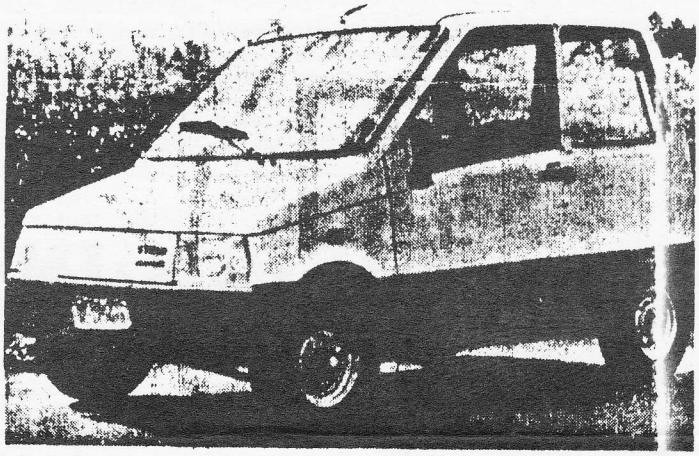
Defining terms

Energy density: the energy output of a battery, expressed in watt-hours, per unit weight or volume of the battery.
Ionic conductivity: the transit phenomenon that occurs as a result of positive and/or negative charge movement in an electrolyte when placed in an electric field.
Open-circuit voltage: the voltage of a cell or battery under a no-load condition measured with a high-impedance voltmeter.
Power density: the power output of a battery, expressed in watts, per unit weight of the battery.
Self-discharge: the loss of useful capacity of a cell or battery on storage due to internal chemical reactions: for example, chemicals evaporating, or electrolyte slowly reacting with the anode even on open circuit.
Shelf life: the length of time a battery is expected to retain charge when stored.
Thermal management: the means by which the temperature of a battery system is maintained within a specified range while the battery is charging or discharging.

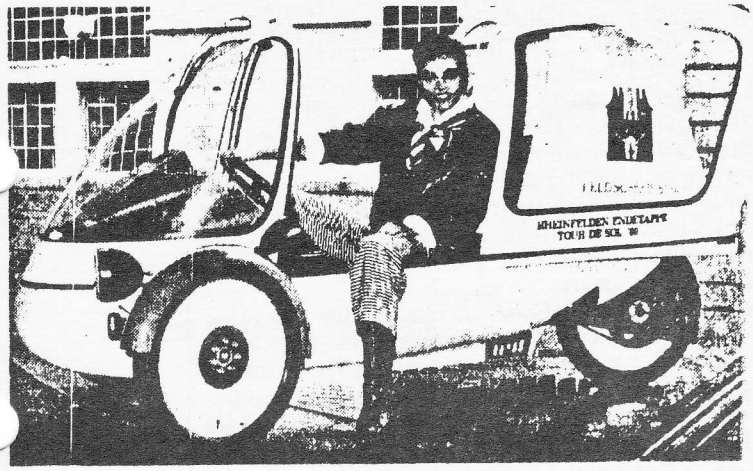
Tour de Sol '89

Vehicle No. 1 - The Panasonic Solar Team

Manager	Andreas Schneider
Driver	Andreas Schneider
Address	6247 Schotz
Weight (empty)	195 kg
Seating	1
No. of wheels	3
Max speed	110 km/h
1988 position	5th
For commercial sale	No
Registered for road	No
Sponsers	Panasonic, John Lay Electronics

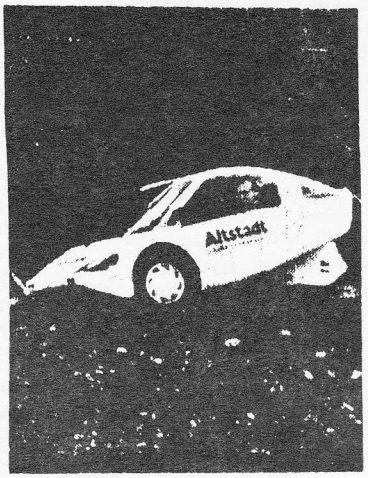


The Steyr Diamant (pictured above) from the Daimler group of companies was well-represented in the recent Tour de Sol in Switzerland. It seats two, with an empty weight of 660 kg and a payload of 190 kg (gross 850 kg). The vehicle is 2.5 metre long and 1.4 metre wide. The drive is electronic controlled, with power of 20 kW and a max. speed of 65 km/h. The battery charging time is approximately 5 hours.



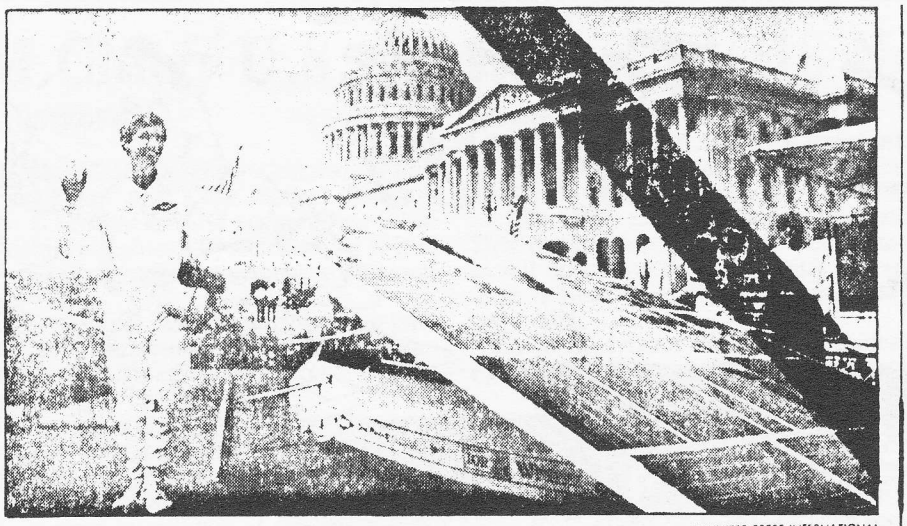
Vehicle No. 151 - Horlacher Team

Manager	Max Horlacher
Driver	Aldo Campoleoni
Address	4313 Mohlin
Weight (empty)	290 kg
Seating	2
No. of wheels	3
Max speed	80 km/h
1988 position	12th
For commercial sale	Yes
Registered for road	1988
Sponsor	Feldschlosschen



Vehicle No. 112 - Solar Team Hongg

Manager	Diego Jaggi
Driver	Diego Jaggi
Address	8049 Zurich
Weight (empty)	390 kg
Seating	2
No. of wheels	3
Max speed	100 km/h
1988 position	1st
For commercial sale	No
Registered for road	1988
Sponsor	Altstadt Versicherungen



BY UNITED PRESS INTERNATIONAL

L.A. to D.C. Without Gas

After crossing the United States in a solar-powered car, James Worden savored his accomplishment yesterday in Washington. Worden, 22, designed the three-wheeled vehicle at the Massachusetts Institute of Technology. He left Los Angeles on July 19 and shared the driving with three others. Solar panels power an electric motor in the 270-pound car, which reached 90 miles an hour at times. Worden had a few flat tires on the 17-day, 3,200-mile trip, but his biggest problem was when a truck broke down while hauling the car west.

FUSION-IN-A-BOTTLE FIZZLES

Given the general skepticism that greeted the alleged findings of Martin Fleischmann and B. Stanley Pons last spring, cold fusion appears to have received its postmortem at the very moment of its delivery into the media spotlight. But had things turned out differently for the two electrochemists, the brainstorm that overtook them on a hike up a Utah canyon in 1984 might have gone down in the annals of scientific lore alongside Newton's apple and Kekulé's dream of the benzene ring. As Pons and Fleischmann recount it, the idea struck as they were pondering the significance of an odd characteristic of palladium, a metal that absorbs large quantities of hydrogen. In the presence of an electric field, the nuclei of the hydrogen isotope deuterium move unusually freely within palladium's atomic structure. Could those nuclei ever come sufficiently close together, they wondered, to result in nuclear fusion?

Not long afterwards, the two came up with a device to test their theory: a power supply and two metal electrodes—one palladium, the other platinum—in a bath of deuterium oxide and mineral salts. At first the results were disappointing, but one day the palladium cell began to heat up. Convinced that the experiment was now releasing up to four times the energy that it consumed, the two scientists concluded that nuclear fusion had occurred.

Fleishmann and Pons' announcement of their discovery at a press conference in March provoked a maelstrom of controversy. Skepticism mounted steadily as scientists attempting to replicate the team's results failed to produce both excess heat and neutrons—a hallmark of fusion—in their experiments. Laboratories around the world—in Hungary, Italy, Brazil, India, and the Soviet Union, as well as at Stanford, Texas A&M, and the University of Washington—claimed to have detected heat, neutrons, or other by-products of fusion, but none could report the presence of heat *and* neutrons in a single experiment. The most promising source of support quickly crumbled when a research group at Georgia Tech retracted its results less than two weeks after announcing confirmation of the Utah experiment at a meeting of the American Chemical Society on April 12. Then, at the spring meeting of the American Physical Society in Baltimore, researchers reporting on a collaboration between Brookhaven National Laboratory and Yale said they had found no evidence supporting Fleischmann and Pons' observations. A week later, on May 8, Britain's top atomic energy lab at Harwell announced that it had failed to generate large quantities of heat by nuclear fusion at room temperature despite cooperation in the experiments from Fleischmann.

A lot is at stake when it comes to judging the merits of a possible breakthrough as momentous as this one—Nobel prizes, patents, wealth, and fame—not just for the researchers, but for their universities and backers as well. In these circumstances, the frantic scramble to be the first to confirm or disprove Fleishmann and Pons' results was to be expected. But the bitterness with which their work has been criticized cannot be attributed merely to the relief and gratification of envious peers.

At issue is respect for scientific method, the procedures that have guided and constrained the formulation and testing of scientific hypotheses since the Renaissance. One of its most fundamental principles is the need for controls. As the editor of the British journal *Nature* charged in his oft-cited editorial, Fleischmann and Pons' announcement of their results before performing even the most basic control experiments was "a glaring lapse from accepted practice." At the chemical society meeting in Dallas, Harold Furth, director of Princeton University's Plasma Physics Lab, emphasized the need

for an experiment showing that the same reaction does not occur when ordinary (as opposed to deuterated) water is used. But Stanley Pons declined to take up the challenge, replying that other control experiments had been performed.

Apart from the questionable accuracy of the two chemists' work, the scientific community has also been exercised by the way they have gone about reporting it. *Nature* described the ongoing series of announcements as "science by press conference." But it is Fleischmann and Pons' perceived lack of candor that has most offended scientists. Not only did they announce their findings before publication of a rigorous technical paper—another departure from protocol—but the article that did appear, in the Swiss *Journal of Electroanalytical Chemistry and Interfacial Electrochemistry*, was not considered sufficiently detailed. Likewise, at subsequent meetings and press conferences, the two left unanswered many questions that would have enabled other scientists to duplicate their work, claiming that they themselves were ignorant of some of the variables involved. And at the annual meeting of the Electrochemical Society on May 8, Fleischmann and Pons refused an invitation to submit small pieces of their electrodes to independent analysis at M.I.T. or at Sandia, claiming a prior commitment of the rods.

Barring the unlikely explanation that Fleischmann and Pons simply fabricated what data they have supplied, what—if not fusion—can account for their observations? One possibility is that they underestimated the amount of energy going into the device in the first place, and thus were misled by the measurements of heat being released. Another criticism centering on measurements suggests that the scientists placed their thermometers too close to the palladium rod and failed to ensure that the water was the same temperature throughout. At Stanford University, a materials science professor whose experiments with ordinary and heavy water appear to support the claim of excess heat, noted that his results were strongly influenced by how the palladium electrodes were fabricated. As to the helium purportedly created by the fusion of deuterium ions, a Caltech chemist said that his team of researchers also detected helium, which turned out to derive from the ambient air rather than from the experimental device.

Although scientists are said to be staking real money on the outcome of the furor over cold fusion—with the odds against the breakthrough placed at 100 to 1—the idea is not necessarily dead. Predictions that vast amounts of cheap energy from cold fusion are just around the corner are unlikely to be realized, but more modest claims may prove a fertile source of further research.

At about the time that Fleischmann and Pons first embarked on their experiments, a physicist at Brigham Young University, Steven Jones, was attempting to produce fusion by introducing hydrogen and deuterium into various metals. By the end of last year, he and his research team were convinced that their experiments were yielding small quantities of neutrons. Jones' device was essentially identical to that of his colleagues at the University of Utah, but his results differed in one crucial respect: the energy levels he observed were a billionfold lower than those claimed by Fleischmann and Pons. Jones believes that fusion is occurring in his experiments, but at a level far below what would explain the energy allegedly produced in the Utah lab. Moreover, Jones did not neglect to perform the ordinary-water control experiments, declined to discuss his work before publication, and made no extravagant claims for its potential commercial application.

Fleischmann and Pons continue to insist that their apparatus produced levels of heat too high to be accounted for by chemical reactions alone, but they have backed off from some of the supporting claims. They now admit that shortcomings in instrumentation led to erroneous measurements of neutrons and helium, but suggest that the heat release will eventually be explained by "a hitherto unknown nuclear process or processes." At the May conference sponsored by the DOE and Los Alamos to assess the phenomenon, the consensus on cold fusion was strongly negative. Many agreed, however, that future research should be devoted to explaining the generation of small quantities of neutrons, which some scientists claim to have detected in the course of attempts to replicate the results of the Brigham Young and Utah teams. Although these neutrons are far too few to explain the excess heat reported by the latter, they might be evidence of a hitherto unrecognized low-level nuclear reaction, such as sporadic hot fusion on a microscopic scale.

As to the future of Fleischmann and Pons, a rumor that they suspect some unspecified chemical change in the palladium electrode—rather than fusion—as the cause of the excess heat production has given rise to speculation that the two are paving an alternate road to renown. If the putative chemical change turns out to be valuable, the speculation continues, Fleischmann and Pons' desire to be the first to know it might explain their evasiveness regarding analysis of the electrodes and other details of their work.

—Gina Goldstein

EAST BAY RALLY 8/11/89

POSITION FINISHING	DRIVER'S NAME	CAR TYPE	CITY	BATTERY COUNT (6V)	MILES
1	Gordon Schaeffer	VW Rabbit	San Rafael,CA	17	67.2
1	Tony De Bellis	Dodge Omni 007	Danville, CA	20	67.2
2	Lou Mc Millan	VW Square Back	Berkeley, CA	16	33.6
3	Dave Cole	Dodge Convertable	Berkeley, CA	10(12V)	28.0
3	John Wasylina	Renault	Pleasanton, CA	8(12V)	28.0
4	Angus Mc Donald	3 Wheel Shopper	Berkeley, CA	4	22.4

GM Chief: U.S. Must Back IVHS Now

By JIM OSTROFF

WASHINGTON (FNS) — General Motors president and CEO Robert Stempel said the U.S. must initiate research on Intelligent Vehicle Highway Systems today if it is to have a viable highway system in the next century.

But Mr. Stempel, who was addressing participants at a Department of Transportation-sponsored seminar on the nation's future transportation needs, declined to say whether the government should embrace an Apollo-like approach that would make IVHS a national priority backed by billions of dollars.

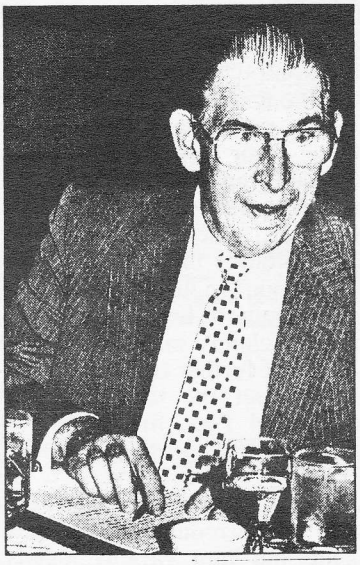
Various Congressional committees are considering funding for a U.S. IVHS program as part of a new highway bill, but to date, no consensus has emerged on the issue.

"We are committed," he said of GM, "to the idea of intelligent highways and intelligent vehicles" as a means of reducing highway congestion and its resultant loss of productivity as well as cutting air pollution. "If we want a viable highway transportation system in this country in the next century," Mr. Stempel said, "it's time to look at the whole question of intelligent highways, what our goals should be for such a system and how we are going to achieve them."

GM is testing prototype IVHS systems in the congested southern California corridor as part of Project Pathfinder, said Mr. Stempel, adding that the automaker expects to conducts test of similar prototypes in other areas in the future. He did not provide additional details.

Mr. Stempel said he hopes Pathfinder will provide sufficient experience to demonstrate whether such systems in fact do save commuting time, ease congestion and pollution. This experimental system, which should be in full operation by next spring, is receiving $1.65 million in combined federal and industry funds.

By comparison, the GM president said PROMETHEUS, an IVHS program being developed jointly by several European nations, has received a $650 million commitment to develop a working smart-car, smart-highway system by the late 1990s. The Japanese also are working to establish a similar system.



STEMPEL: Intelligent Thoughts

"It is very important that we see full government coordination of such a program so the systems will be compatible with each other (nationwide) and perhaps with those developed in Europe and Japan," Mr. Stempel said after the seminar.

"There are 110 million commuters on U.S. roads today, compared with 59 million in 1950, with (the result) that traffic congestion now causes more than 2-billion hours of delay a year at a cost of $73 billion in lost productivity," he said.

Noting that urban traffic volume is increasing 6 percent annually, the GM president said new highway construction to offset this trend is neither desirable, nor feasible. But at the same time, he dismissed new mass transit construction as an alternative since "In most parts of this country, people have shown time and again they prefer" to drive automobiles.□

168 MILES ON ONE CHARGE!

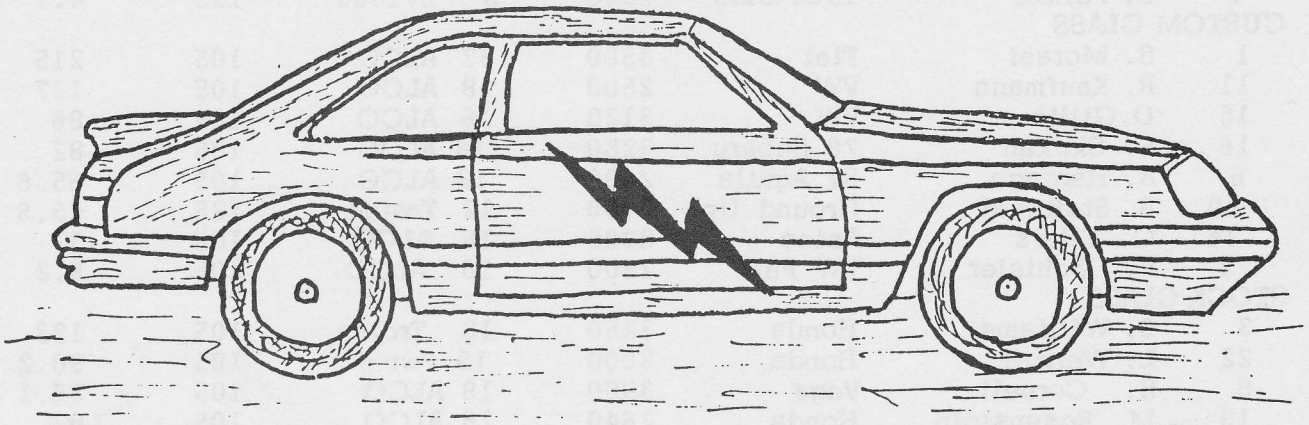
The annual rallies of the USA's Electric Auto Association have produced many surprises over the past ten years — but the 1983 event gives EVers something that many consider the greatest accomplishment yet! A talented young EAA member ran his converted Fiat a distance of 168 miles on a single battery charge — a feat believed to be not even nearly matched by any EV of comparable size and weight. The winner, Saied Motaei, is pictured here with his most amazing EV. □

17 th ANNUAL

ELECTRIC CAR RALLY

By Electric Auto Association

1249 Lane St. Belmont, Ca. 94002



Date Sept. 16th 1989 9:30 AM to 4:00 PM
Location - 1/4 mile East of Mathilda at 215 Moffat Park Dr.
Sunnyvale, Ca.

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Results INTERNATIONAL Rally

CAR NO.	OWNER's NAME	CAR TYPE	GROSS WT.	BTRY NO.	BTRY MFR	MIN.	MILES
ANTIQUE CLASS							
1	B. Palmer	1904 Olds	1300	6	EV1000	135	4.1
CUSTOM CLASS							
1	S. Motaei	Fiat	3500	32	ALCO	105	215
11	R. Kaufmann	VW	2500	18	ALCO	105	127
15	D.Gillis	VW	3120	16	ALCO	105	86
16	S. Skokan	78 Subaru	3250	18	ALCO	105	82
6	A. Hardage	81 Aquila	2490	12	ALCO	105	65.6
20	B. Steinfeld	Ground Up	2000	12	Trojan	135	65.6
24	C. Ellers	Aztec	3200	16	ALCO	105	37
9	V. Schisler	VW Pan	2900	16	ALCO	105	8.2
STOCK CLASS							
3	B. Williams	Honda	3250	18	Trojan	105	123
22	L. Wenzel	Honda	3000	18	Pwr +	105	90.2
8	S. Cornell	Vega	3900	18	ALCO	105	86.1
18	M. Rosenstein	Honda	2640	16	ALCO	105	82
28	L. Macmillen	VW Wagon	3300	16	ALCO	105	65.6
21	B. McCaskie	VW	3250	16	Trojan	135	61.5
25	E. Schanz	King Midget	2160	12	ALCO	105	57.4
34	L. Goodell	Pinto	3650	16	Trojan	135	57.4
29	L. Henstreet	VW	2660	12	ALCO	105	53.3
31	I. Tillin	Honda	2550	14	ALCO	105	53.3
4	R. Nadreau	Fiat 850	2800	18	Exide	105	49.2
26	W. Kuehl	Pinto	3200	16	Trojan	105	45
13	E. Peterson	VW Bug	2644	12	PWR +	105	41
17	J. Newell	Fiat	2500	12	ALCO	105	36.9
32	M. Milton	Datsun	3600	16	Trojan	135	36.9
2	G. Izuno	Fiat	2580	12	Marine	?	28.7
35	F. Fortune	Toyota	3300	18	ALCO	105	28.7
23	C. Ellers	Datsun PU	3800	14	Trojan	105	24.6
33	B. Jackson	Ground Up	3000	12	?	105	24.6
19	P. Mauch	Nsu-Audi	2255	8	Trojan	135	16.4
7	C. Olson	Nash Metro	3460	18	Pico	105	12.3
5	A. Hardage	Fiat 850	2487	12	EV1000	105	4.1
30	B. Palmer	Vega	3300	12	Trojan	135	4.1
27	J. Herbner	Vega	3700	12	Trojan	135	4.1
37	J. Bolger	Chrysler	3900	20	US	105	4.1
2/3 WHEEL CLASS							
14	A. MacDonald	El. Shopper	900	4	Trojan	105	61.5
10	B. Fulton	Ground Up	435	2	Interstate	105	24.6
12	R. Paulson	Ground Up	385	2	Gould	105	16.4

Now extensive surveys in Europe and the UK reveal a rapidly-developing future demand for battery-powered ground equipment in those areas for an economical solution to soaring fuel costs.

The running-cost benefit of airport EVs is emerging as the big plus for battery-electrics. This has been given a big boost by recently available figures from a long investigation by Eastern Airlines in the US.

ONE HALF OPERATING COST CONFIMED AGAIN

These show that taking a cross section of their vehicles, for every dollar's worth of petrol consumed, only 2.6 cent's worth of electric charge was needed: a staggering difference!

The benefits

These benefits help further explain why the choice for airport ground vehicle support is racing in favour of EVs.

Low maintenance costs come from the EV inherent simplicity and few moving parts. The same Eastern Airlines survey referred to above found it costs only half as much to service their EVs as it does to similarly maintain their internal combustion-engined models.

Driver hopes to see surge of interest in electric cars

By Daniel Blume
Staff writer

PLEASANTON — When John Wasylina turns the key to the ignition in his car, the engine doesn't start. The car is silent. And his gas gauge reads empty.

But that won't stop him from driving the car to Livermore and back.

Times/Thomas Ovalle

JOHN WASYLINA cruises silently in his electric car. Instead of a gas gauge, he uses meters that tell him how much charge he has left in his batteries, the voltage and the amperage.

Wasylina's Renault Alliance doesn't need an engine or gas because it runs on electricity.

Wasylina, 80, has been taking gasoline-powered engines out of cars and replacing them with batteries and electronic conversion equipment for 25 years.

His fascination with electric-powered transportation dates back much further. When he was a kid, he rigged up a battery and starter to a wagon and he was off. Later, at age 14, he saw his first electric-powered car.

Sixty-six years later, an electric car still is are a rare sight on the road, but Wasylina believes its time has come.

Within 20 years, he predicts, 20 percent of cars will be powered by electricity.

"It's got to come, because they're getting better and better batteries. They're now making batteries that are 10 times better than these," said Wasylina, who is a former owner and operator of a Silicon Valley transformer company.

Wasylina's 10 12-volt batteries give him enough electricity to drive about 40 miles before he has

Please see **CAR**, Page 2A

From Page 1A

to recharge them. The Renault, which he has driven since 1985 on trips within the Valley, is powerful enough to fit in easily with the flow of traffic and cruises silently at 50 to 55 mph.

For longer trips on the freeway, Wasylina uses a gasoline-powered car. But with lighter, longer-lasting batteries that are being developed, he may be able to rely completely on his electric car.

Wasylina and other electric-car enthusiasts tout their vehicles as the answer to growing environmental problems.

They don't cause pollution, they don't need oil or gas and they don't affect the ozone layer, said Lloyd Wenzel of Alameda, who is president of the East Bay chapter of the Electric Automobile Association.

Wenzel said the cars also are much cheaper to drive and require relatively little maintenance, because there are no spark plugs to replace, no valves to adjust and no oil to change.

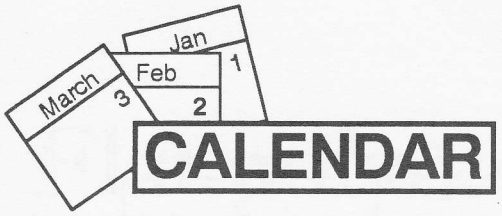
The reduced maintenance requirements help explain why the big car companies don't push them, Wenzel believes. With almost no parts to replace except tires and brakes, the auto industry can't make as much money on them, he said.

But members of the Electric Automobile Association don't let the dominance of gasoline-powered cars discourage them.

On Aug. 12, they plan to hold their annual Electric Car Rally in Oakland at the PG&E Service Center at 4801 Oak Port St.

The rally, exhibiting about a dozen electric cars, will be from 10 a.m. to 3 p.m.

Wasylina said his car, which has won awards from the Electric Car Association in the past, will be among those exhibited.



CALENDAR

Notice of Santa Clara Rally: Sept. 16, 1989 9:00 AM Check in Sunnyvale, Ca. Followed on Sunday Sept. 17 with a symposium.

August 7 -10 SAE Conf. & Expo Future Tran-Technolgy, Vancouver, BC

August 6 - 11 IECE 1989 Intersociety Energy Conf. Washington, DC

Sept. 8 - 16 ENER RUN alternatively powered Vehicles, Temecula, Ca. Canceled

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Sept. 1989

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