



GOOD NEWS / BAD NEWS

The bad news was that our premier speaker for Saturday the 16th of February took ill the evening before the meeting. Obviously it can happen to anyone; Rock stars, Presidents, and scientists as well. I had to console myself by thinking that after 20 years of waiting for good news about better batteries, I can wait another month or two. Especially if the claims are **real**.

Saturday morning at 7:00 am after hearing the bad news, I asked Dr. Visco for some good news to tell the membership. "Does it still look like its 3 to 4 times better than lead-acid" I asked? "Yes" he said. In the GM Impact, the claim of 110-120 mile range at 55 mph should be EASILY tripled. And the newly formed consortium of the big three is considering this battery as one of only three that they will be researching. So there is a chance of some serious funding to make this new battery a reality.

I then asked about the start-up company that he had told me about in the past. He said that its facilities are almost operational,

but that it would be making only small cells - at least to start. This prompted me to ask about scale up worries. He replied that he doubted that there would be any as a Canadian company had scaled up by a factor of 2000 a similar battery from small lab units without a problem.

This new battery is called a Lithium-polymer battery. He told me that it uses a thin layer of lithium metal, a solid polymer electrolyte, and a conductive plastic electrode. "If it were not for the lithium, it would be all plastic." He said. He promised to reschedule his talk to us when he returned to work and checked his calendar. With that I let him return to his sick bed.

So although I am very sorry that we did not hear him speak Saturday, especially for those who came a long way. I am happy about the report he gave me and that there will be another chance to hear him speak. Hopefully in March or April.

Things are looking up, so keeping on charging!

Pb 2/19/91

HX3 HYBRID IS GM'S LATEST 'ALTERNATIVE POWER' CONCEPT CAR

DETROIT -- General Motors unveiled another member of its growing family of "alternative power vehicles" today at the 1991 North American International Auto Show. A hybrid experimental vehicle, dubbed the HX3, is one of a number of personal transportation alternatives being explored by GM's Technical Staffs.

While experimental in nature, the HX3 "sedan of the future" is a test bed for several emerging technologies that will help the industry achieve new benchmarks in vehicle emissions and fuel economy. The five-passenger vehicle also crosses traditional boundaries in automotive design, redefining the look and function of a passenger car.

A team of engineers and designers was selected from GM's Advanced Engineering, Design and Research staffs and several component divisions to develop and build this concept vehicle. Among the technologies demonstrated with the HX3 is the ability to power the vehicle's two electric propulsion motors from either stored or generated energy. The HX3 achieves a zero-emissions level when operated from energy stored in a battery pack.

With the flip of a switch, the HX3 can also be operated using a gasoline-powered engine that generates electricity. A high efficiency Magnequench alternator is directly attached to the crankshaft of the HX3's internal combustion powerplant. An inverter pack built by GM Hughes Electronics is used to control the electric motors as well as to charge the vehicle's batteries from an electrical outlet.

A third function allows the vehicle to be used as a generator -- an auxiliary power source that could be used to run home appliances during a power outage, for example.

The concept car's powertrain consists of a battery-pack of 32 lead-acid batteries, two AC induction motors that deliver a total of 120 hp to power the HX3's front wheels, and a 906-cc gasoline engine that, through the alternator, generates up to 40 kilowatts of electric power. That's enough to provide emergency power to a couple of average homes.

When used in the hybrid mode, the engine operates at a single speed selected to optimize fuel economy -- about 2500 rpm. In this mode, it achieves a level of performance and driving range similar to today's crop of minivans. Its overall efficiency is further enhanced by the use of special Goodyear P175/65R/17 aero tires with ultra low rolling resistance. The car is fitted with a 10-gallon fuel tank.

In the zero-emissions mode, the electric motors draw only on the energy stored in the battery pack. GM's Delco Remy Division supplied the battery pack, which can be fully recharged in as little as two hours using a 220-volt, 100 amp electrical current. The more traditional 110-volt, 15 amp current used in homes can also be used to recharge the batteries. In addition, 110- and 220-volt output sockets are installed when auxiliary power is desired.

The HX3 features a Delco Moraine Division electro-hydraulic, anti-lock braking system. The regenerative braking system is integrated with the HX3's inverter to feed energy back to the batteries. This energy would otherwise be lost during braking.

Borrowing from the technology developed for GM's solar car, the Sunraycer, solar cells on the roof of the HX3 are used to power an auxiliary ventilation system. The use of solar energy allows the ventilation system to run continuously to reduce the vehicle's interior temperature on warm, sunny days.

The HX3 introduces several new design concepts for passenger cars. Three factors dictated much of the design: aerodynamics, packaging the powertrain and accommodating people. But the inspiration for the sleek profile comes from the form and function of jet aircraft.

The HX3's tapered shape achieves an exceptional 0.258 coefficient of drag. The front end features eight compact high-intensity headlamps -- enhancing the "electric" character of the car. The placement of the small lamps high on the front end of the car helps improve visibility at night.

The side of the HX3 is unusually sheer. A continuous unbroken surface extends from front to rear, ending in a crisp edge to stabilize rear-end airflow. Light-emitting diode (LED) taillamps are integrated into this edge. Ample storage space is provided in the trunk area of the car.

The aircraft theme is also evident in the interior of the HX3. The rear passenger compartment incorporates lounge-style seating. A retractable corner seat cushion gives passengers flexibility in the seating arrangement.

The front passenger seat can be used in either a forward- or rearward-facing position. The vehicle features an aircraft-style rear side door mounted on a special parallelogram hinge. The door wraps deeply into the roof for easy entry and exit.

The HX3 driver compartment is uncluttered and businesslike. Virtual image instrument displays are designed to place all information at an optimum distance from the driver to minimize scan time and eye fatigue. Driver- and passenger-side air bags are installed. The use of an inflatable knee bolster on the passenger side allows for unprecedented front-seat spaciousness while enhancing occupant safety.

The "bronze" glass roof spans the entire car and also adds to the spacious feeling of the HX3 interior.

HX3 SPECIFICATIONS

Dimensions

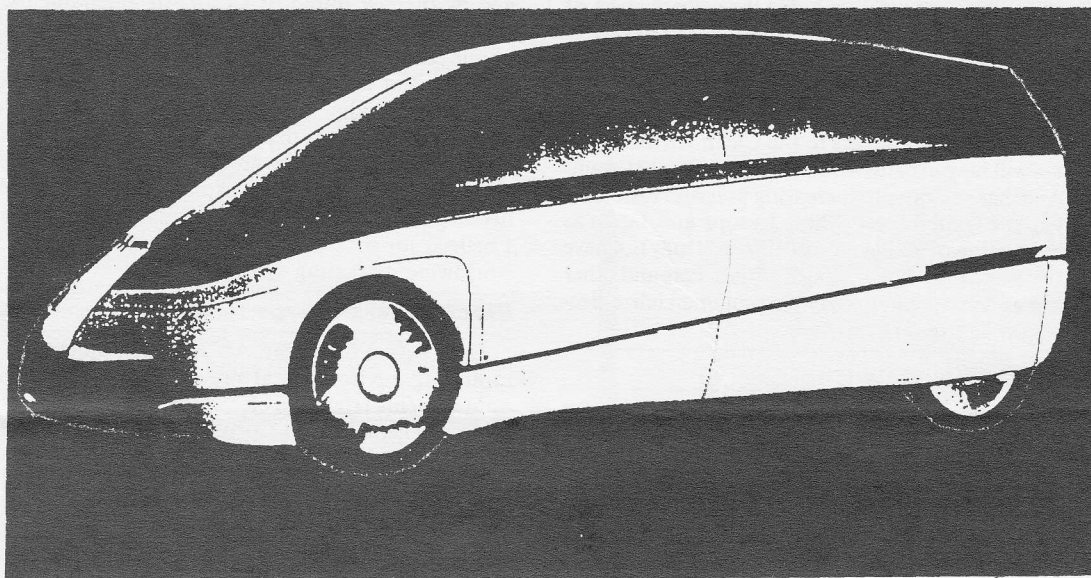
Wheelbase	120.0"	Length	184.2"
Width	73.9"	Height	64.7"
Front track	62.0"	Rear track	54.6"
Weight	3975 lbs.	Cd	0.258

Powertrain

Batteries	32 10-volt Delco Remy gas-recombinant lead-acid batteries
Electric motors	Two 60-hp, AC induction
Final drive	Planetary reduction gearset in motors
Internal combustion engine/ generator set	906-cc SOHC L-3; 40 kw peak
Battery charger	Computer-controlled integrated with inverter package

Chassis

Tires	Goodyear P175/65R/17, ultra-low rolling resistance
Wheels	Forged aluminum
Steering	Electric assist rack-and-pinion
Service brakes	Electro-hydraulic power-assist ABS with regenerative braking



THE HX3 EXPERIMENTAL HYBRID VEHICLE — This is a 3/8 scale model of the HX3, GM's new experimental hybrid vehicle. The HX3 is an innovative look at hybrid technology created especially for the North American International Auto Show in Detroit January 12-20. This gasoline-electric vehicle is nearly pollution free with a range equivalent to today's production vehicles. The HX3 illustrates new ideas in interior ergonomics with innovative seating configurations suitable for family or business use.

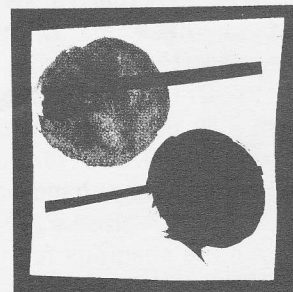
GENERAL MOTORS NEWS RELATIONS

The Electric Auto Association at Pasadena City College

Invites EVA and EAA members to participate on an electric vehicle team that will build two Electrathon race cars and convert motorcycles to electric in the coming year. Pasadena City College has approved a pilot EV program in which EV mechanics will be trained and is requesting the assistance of six to twelve skilled craftsmen. Individuals who are highly skilled in welding, machining and electrical and requested to sign up for courses in which the vehicles will be built starting February 4, 1991. The credit given will lead to EV mechanic certification by the college. This certification will require demonstration of skills and knowledge in all three areas mentioned above. Your participation will not only help the college establish an EV program that will train and certify EV mechanics, but also give you an opportunity to share your knowledge and help younger students get a jump start on EV technology. It is the hope of the Pasadena EAA that this program will lead to widespread conversion centers for electric vehicles.

For more information, please call Axel Axelsson 818/792-3210.

POWER AND ENERGY



Clean Air Act amended
Electric vehicles to the fore
Gulf crisis convulses oil markets
Privatization in the UK

Any lingering doubt that the world's electric power industries are driven primarily by politics was probably dispelled last year.

Global reverberations of the crisis in the Persian Gulf offered the most striking confirmation, causing wide fluctuations in oil prices and prompting utilities all over the world to reconsider energy technologies not taken seriously since the last oil crisis.

In Europe, major developments included the privatization of British electric utilities, the takeover of the antiquated East German power system by three West German utilities, and the Swedish Government's apparent retreat from a plan to abandon its nuclear power program.

In the United States, amendments to the Clean Air Act—the first in 13 years—will have expensive ramifications for that country's utilities. Another response to increasing pressure for cleaner air, not only in the United States but in Europe and Japan as well, was the resurrection of an idea whose time still may not have come: the electric vehicle. Last year, major automakers and other technical firms in all three regions pledged to commercialize electric cars in the near future.

Clean but costly air

Ratified late in October, the amendments to the Clean Air Act could cost industry US \$22 billion over the next decade or so as provisions of the legislation are phased in, according to the Environmental Protection Agency in Washington, D.C. Utilities will be most affected by new regulations related to the control of acid rain; these regulations could cost \$5–\$7 billion over the next 15 years, according to estimates by the Edison Electric Institute (EEI), a Washington, D.C.-based trade group representing U.S. investor-owned utilities.

"Obviously this is a landmark piece of legislation," said Diane Smirollo, an EEI spokesperson. "It's going to affect everybody who buys electricity, whether they're an industrial or residential customer."

The acid-rain controls require utilities to reduce, in two phases, their emissions of nitrogen oxides and sulfur oxides (NO_x and SO₂) by 10 million tons (9 million metric tons) from 1980 emission levels. The first phase of the program begins in 1995, and the second, at the turn of the century. In an interview, Smirollo said EEI expects that some utilities will install smokestack "scrubbers" to reduce their SO₂ emissions, some will switch to fuels with lower sulfur content, and others will build plants around emerging clean-coal technologies, such as fluidized-bed and coal-gasification systems.

Since 1986, the Department of Energy, Washington, D.C., has supported commercialization of these technologies through a \$2.5 billion program of Federal funds, which are shared 50–50 with industry. Currently, however, U.S. industry is contributing roughly two-thirds of the cost of the projects, so the value of the total technology development program may grow to more than \$6 billion, according to C. Lowell Miller, associate deputy assistant Secretary, clean-coal technology.

One of the more intriguing possibilities posed by the Clean Air amendments is an expansion of an existing emissions trading pro-

gram, under which utilities get credits if they manage to reduce emissions below their allotments. These credits can then be sold or traded to other utilities. "It's an interesting concept," said Smirollo. "We hope it works. The key will be how it's implemented."

A similar emissions-credit system was initiated nearly 14 years ago by the last round of Clean Air amendments, noted John Palmisano, president of Aer*x Inc., an environmental and economic consulting firm with offices in Washington, D.C., and Los Angeles. But with the more stringent regulations enacted with the latest amendments, Palmisano said, trading of credits could by August become a daily rather than weekly occurrence, as it is now. "More companies are now affected, and affected in a more rigorous way," Palmisano explained. "We'll have more clients needing more credits. If it's successful, it will be the template, I believe, for controlling greenhouse gases, except you'll have a worldwide marketing system for that."

Electric cars charge forward

Even before the Clean Air Act amendments were approved, mounting environmental pressures had prompted major announcements related to electric vehicles last year. In the United States, General Motors Corp., Detroit, Mich., stole the spotlight with its Impact [THE INSTITUTE, March 1990, p. 6]. The sleek two-seater uses lead-acid batteries to accelerate faster than some conventional sports cars. The 395-kilogram battery provides a range of just under 200 km between charges, and would last for less than 40 000 km, GM projects. Thus the battery would have to be replaced several times over the life of the vehicle, each time at a cost of at least \$1500.

Last April, GM announced that it planned to make the Impact available commercially in the mid-1990s. Some industry observers, however, were skeptical of the claim, noting that such forecasts were made routinely in the 1970s and failed to prove accurate.

Top 10 U.S. utilities in kilowatthour sales

1989 rank	1988 rank	Company	Kilowatthour sales, in U.S. dollar billions (10 ⁹)	Percent change in 1989
1	1	The Southern Co.*	136.9	+4.60
2	2	American Electric Power Co.*	117.5	+12.18
3	3	Texas Utilities Co.*	81.9	+1.51
4	4	Commonwealth Edison Co.	72.2	+0.93
5	6	SCEcorp*	69.1	+1.84
6	7	Duke Power Co.*	66.6	+0.65
7	8	FPL Group Inc.*	64.1	+7.10
8	5	Pacific Gas & Electric Co.	63.8	+2.19
9	11	Allegheny Power System Inc.*	59.1	+4.64
10	9	Middle South Utilities Inc.*	58.9	+1.37

Source: Electric Light & Power
 * Holding companies

Glenn Zorpette Associate Editor

Ford Motor Co., in Dearborn, Mich., and Chrysler Corp., in Highland Park, Mich., also have significant electric vehicle programs under way, and these efforts have for some time involved sodium-sulfur and nickel-iron batteries, which promise much better range and durability than the lead-acid technology. Ford has tested Canadian-made sodium-sulfur batteries in an experimental Aerostar van, and Chrysler has produced an electric version of its Dodge Caravan and Plymouth Voyager minivans, powered by nickel-iron batteries.

With a top speed of about 70 mph (112 km/h), this TEVan is said to get 120 miles (about 190 km) between charges. The second TEVan was delivered to Southern California Edison Co., Rosemead, Calif., in late October, according to Joseph Reeves, Research Manager at Edison. (The first TEVan went to the Electric Power Research Institute in Palo Alto, Calif., which is cosponsoring development of the vehicle with Edison. By 1992 there could be a dozen TEVans on the road, according to current projections.) This year, several North American utilities will take delivery of a "G-Van," powered by lead-acid batteries, now being manufactured by Vehma International Inc. in Markham, Ont., Canada.

Early in November, GM, Ford, and Chrysler agreed on the need to jointly develop advanced batteries suitable for powering electric vehicles. Representatives of the three companies met with officials of various electric-utility and electric-vehicle research organizations. Although specific battery technologies were not selected for further development at the meeting, two lithium cells and one sodium-sulfur battery were reportedly discussed. The costs of the program—which could be in excess of a billion dollars, the automakers estimated—would be split among the Department of Energy, U.S. utilities (through the Electric Power Research Institute), the automakers, and several battery manufacturers.

Interest in electric vehicles is also high among virtually all European automakers. Last June, Fiat Auto SpA in Turin, Italy, launched the Elettra; outfitted with lead-acid batteries and traveling at a constant 48 km/h, the vehicle gets up to 120 kilometers between charges (185 km with the optional nickel-cadmium batteries). Top speed is about 72 km/h. At \$20 000, it costs twice as much as the Panda, the conventional automobile on which it is based.

In Heidelberg, Germany, Asea Brown Boveri Ltd.—one of the main developers of the sodium-sulfur battery—has tested its system in an assortment of electrified vehicles based on Volkswagen, Mercedes, and BMW bodies.

Nippon Steel Corp. in Tokyo, the leading electric vehicle developer in Japan, unveiled its Next Generation Advanced Vehicle (NAV) last year, claiming a range of 240 km between charges and a top speed of 110 km/h. Toyota Motor Corp., in Toyota City, the other leading light of the budding Japanese electric vehicle community, displayed a vehicle with a range of 160 km between charges and a top speed of 85 km/h. Toyota also announced an agreement with Chubu Electric Power Co. in Nagoya to develop three commercial electric vehicles.

Courtesy of S.F. Chronicle, 2/6/91

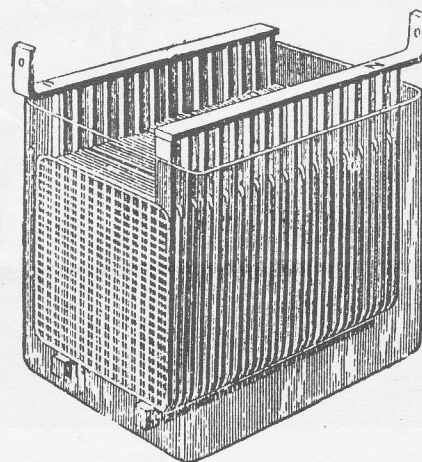
French automotive magazine asked a panel of experts to come up with the car of the century. Their choice was the Volkswagen Beetle, of which more than 20 million have been built since 1939. The Model T Ford was second.

100 JANUARY 1891
YEARS AGO

"The problem of how to save and store up enormous amounts of natural energy which is daily dissipated in producing natural phenomena has long occupied the attention of scientists. The result of experiments has been the development of electrical storage batteries, or accumulators.

"These names for the apparatus are unfortunate. They are the cause of the popular idea that electricity, which is considered as a subtle, indefinite, and intangible something, is stored up in them, as valuables are stored in a vault. The commercial current electricity cannot, in large quantities, be stored and still preserve its character.

"When electricity is employed to



"A modern accumulator." It was the result of experiments in storing quantities of electricity.

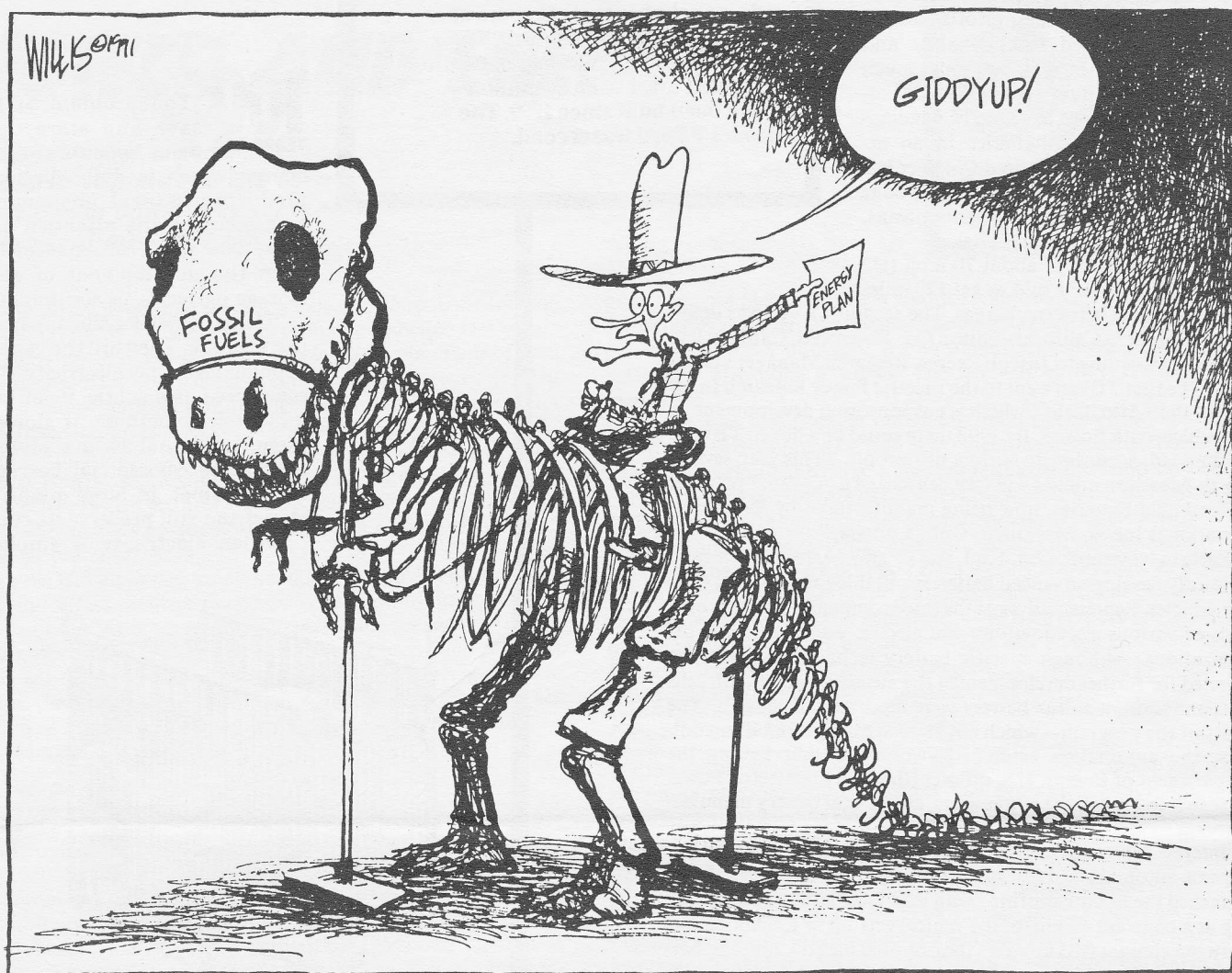
charge a storage battery, only that part which is transformed into chemical energy is used. The rest is dissipated. The battery, then, instead of being a place where electricity is laid away, is a place where chemicals are left by the current, with the expectation that they will in turn produce a current when called upon.

"A more perfect system of storage batteries is much to be desired. Already electricity is a staple article. But its sale is of necessity confined to limited areas. As soon as these can be extended by means of storage, an improvement in our commercial welfare will become apparent, and the fear arising from the predicted loss of our coal supplies will not trouble the minds of our immediate posterity."

• POPULAR SCIENCE JANUARY 1991

ARE YOUR BATTERIES SULFATED???

If so, see **HOME POWER MAGAZINE**, Volumes 20 and 21 for several multi-page articles on the use of EDTA. Subscriptions are available for \$10.00 annually (\$20.00 for first class) to P.O. Box 130, Hornbrook, CA 96044-0130 or call them at 916/475-3179.



Scott Willis — Mercury News

Sacramento Bee, 2/9/91

Mexico City smog spurs oxygen sales

Reuters

MEXICO CITY — A group of ecologists has come up with a possible answer to Mexico City's suffocating smog — oxygen for sale.

Alfonso Cipres Villareal, head of the Mexican Ecologists Movement, said Thursday the group plans to put up 10 booths on street corners around the city.

Thirty-second shots of oxygen will sell to anyone in need of a pick-me-up for \$1.75.

"It could make a magnificent business," he said.

Ecologists say the dirty brown pall of smog that has blanketed Mexico City this winter is probably the worst in the city's history. Some commuters have taken to wearing face masks.

Cipres Villareal said newspaper vendors and traffic police officers, exposed to the worst of the pollution, would be entitled to free oxygen in exchange for watching over the dispensing apparatus.

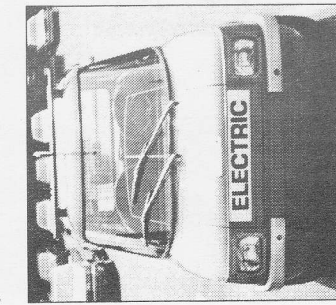
International Electric Vehicle Rally

Vancouver, British Columbia to Victoria, British Columbia, April 16-18, 1991

543 Powell St. Vancouver, B.C. V6A 1G8 604/987-6188

Show the world how things have changed - and are continually changing - in the world of electric powered vehicles.

This invitational event is an opportunity for you to show the world, via the Annual Electric



Energy Forum, just how far things have progressed in the past few years.

From the 1912 Detroit Electric to the latest exciting vehicles, many major developments are expected to be shown

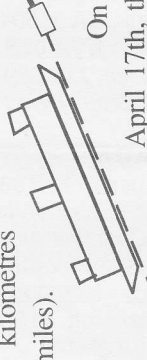
and demonstrated at this exciting event.

With the recent strong encouragement by California on EVs, this is an opportunity to really show what your development can do and where your ideas can lead.

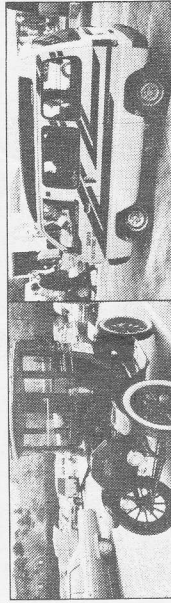


Victoria, B.C.

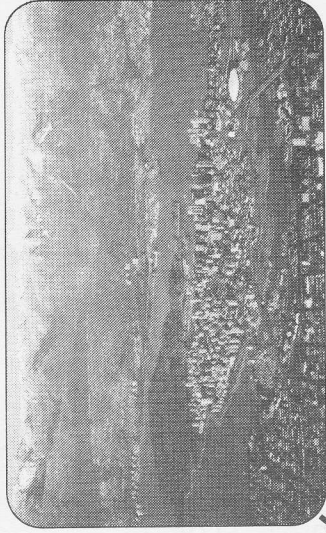
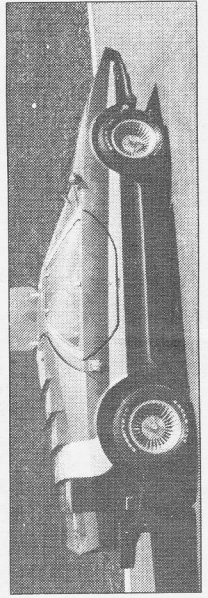
The rally will begin at noon on Tuesday, April 16th, at B.C.Hydro's Vancouver Head Office. It will then proceed through downtown Vancouver and out to the Tsawwassen ferry terminal for a two-hour trip through the scenic waters of Georgia Strait to Swartz Bay on Vancouver Island. The route will then take the vehicles through the Saanich Peninsula to downtown Victoria. Total distance is 64 kilometres (40 miles).



On Wednesday, April 17th, the vehicles in the rally will participate in demonstration laps in downtown Victoria. As well, selected vehicles will be displayed at the Victoria Conference Centre and there will be workshops on electric vehicle development.



Councilman Marvin Braude of the City of Los Angeles, California will start the rally, and will also be one of the speakers at the Electric Energy Forum. He is scheduled to speak at 2:30 pm on April 17th.



Vancouver, B.C.

The Annual Electric Energy Forum is expected to attract 400 delegates, including utility executives, educators, government representatives, environmentalists and consultants, as well as the general public.

The Forum, with its theme of Electricity, Education and the Environment covers a broad range of topics, with emphasis on ideas for the future, a future which has great interest to the development of electric vehicles.

The Electric Vehicle Rally is endorsed by:

- Electric Vehicle Association of Canada
- Vancouver Electric Vehicle Association
- Electric Vehicle Association of the Americas
- International Research Centre for Electric Vehicles (Hong Kong)

Send for your information kit and invitation now, and plan now to participate in this important event, an excellent opportunity to show your ideas to the world and the people who count.

See the sights of Vancouver and Victoria, considered to be two of the most beautiful cities in the world. Enjoy the hospitality that these cities on the Pacific Rim have become famous for.

VANCOUVER ELECTRIC VEHICLE ASSOCIATION

CALENDAR

March 9, 1991 East Bay (CA) EAA mtg; Show and Tell
March 17-22, 1991 Int'l Solar Energy Conference, Reno, NV 212/705-7037

April 5-7, 1991 Solar & Electric 500; SERA, 11811 N. Tatum Bvd #3031, Phoenix, AZ 85028 602/953-6672

April 12-14, 1991 Eco Expo, Los Angeles, CA. 818/906-2700 or 800/334-EXPO

April 13, 1991 East Bay (CA) Chapter meeting, Robert Clark, "New Batteries for EVs"

April 15+, 1991 4th Energy Forum, sponsored by BC Hydro, Victoria, B.C., Canada 604/987-8582

May 20-24, 1991 3rd Annual Tour de Sol, sponsored by Northeast Sustainable Energy Assn. 413/774-6051

June 14-23, 1991 Lightwheels Festival 1991, Trade Show, Ride, Conference; NYC to Washington DC; 49 E. Houston St, NYC, NY 10012; 212/431-0600

August 3-9, 1991 Intersociety Energy Conversion Engineering Conference, Boston, MA 708/352-6611

August 4-5, 1991 Clean Air Revival. Solar Expo and Motor Sports Show. 55 New Montgomery St. San Francisco, CA 94608 415/495-0494

August 18-22, 1991 1991 ASME Int'l Computers in Engineering Conference, Marriott Hotel, Santa Clara CA

Jet Ford Escort PMC Mosfet controller new batteries, gas heater, low milage \$8,500. Percent of charge meters \$45. Lester 96 and 108 volt chargers, \$200 each. Used electric cars wanted. Call evenings 415/388-0838

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Send your chapter news, coming events, articles to the address below

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NEWS

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Mar. 1991

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