F.V.E.A.A. NEWSLETTER

FEBRUARY 1986

MEETING NOTICE

THE NEXT MEETING WILL BE FRIDAY **FEB.** 21st, at MID AMERICA FEDERAL SAVINGS 250 E. ROOSEVELT RD. WHEATON, ILLINOIS. - TIME - 7:30 P.M.

MEMBERSHIP LIST

INCLUDED IN THIS MONTHS NEWSLETTER IS AN UP TO DATE LIST OF PAID MEMBERS. IF YOUR NAME IS NOT ON THE LIST, THIS WILL BE YOUR LAST NEWSLETTER.

NEWSLETTER ITEMS & DEADLINE

ANY CLUB MEMBER WISHING TO SUBMIT ARTICLES, DRAWINGS, WANT ADS, EDITORIAL COMMENTS, SPECIAL NOTICES, ETC. SHOULD MAKE SURE IT REACHES ME NO LATER THAN 2 WEEKS PRIOR TO THE NEXT MEETING (about Mar. 10th) IN ORDER THAT IT BE PUBLISHED IN THE MARCH NEWSLETTER. SEND TO: John Emde FVEAA Editor, 6542 Fairmount Ave. , Downers Grove, Ill. 60516

F.V.E.A.A.

FOX VALLEY ELECTRIC
AUTO ASSOCIATION
624 PERSHING ST. WHEATON, ILL. 60187

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

PRESIDENT'S MESSAGE

FROM THE PRESIDENT

The technical discussion at our February meeting will be devoted an examination of the possible application of INDUCTIVE COUPLING to substitute for the plug-in power cables now used to connect chargers to the utility power for recharging batteries. It is only a slight chore to plug in our cars for recharging as we all know, but inductive coupling might be a better way.

Inductive coupling is the term applied to the technique where a magnetic field is the only electromagnetic link between the vehicle and the garage during recharging. It consists of burying a coil and part of an iron core in a garage floor as one half of a transformer. The other half is located on the vehicle. Figure 1 is a drawing of a car showing the general features. Figure 2 is a schematic elecrical circuit diagram. Figure 3 is an equivalent circuit for the arrangement.

Inductive coupling has additional losses compared to the cable connection. Tests run by Lawrence Livermore Lab have indicated it is possible to transmit 10-30 kW with an 85% efficiency. This is illustrated by the curves of Fig. 4.

There are several perceived advantages for this arrangment. The charging operation is automatic; every time the vehicle is over the coil, charging can be initiated. There are no charging plugs or cables to contend with; no need to worry about driving away with a side of the garage still attached to the charging cable. The vehicle is electrically isolated from the utility service.

I anticipate your discussion of the advantages, drawbacks, and design suggestions for this feature at our February meeting.

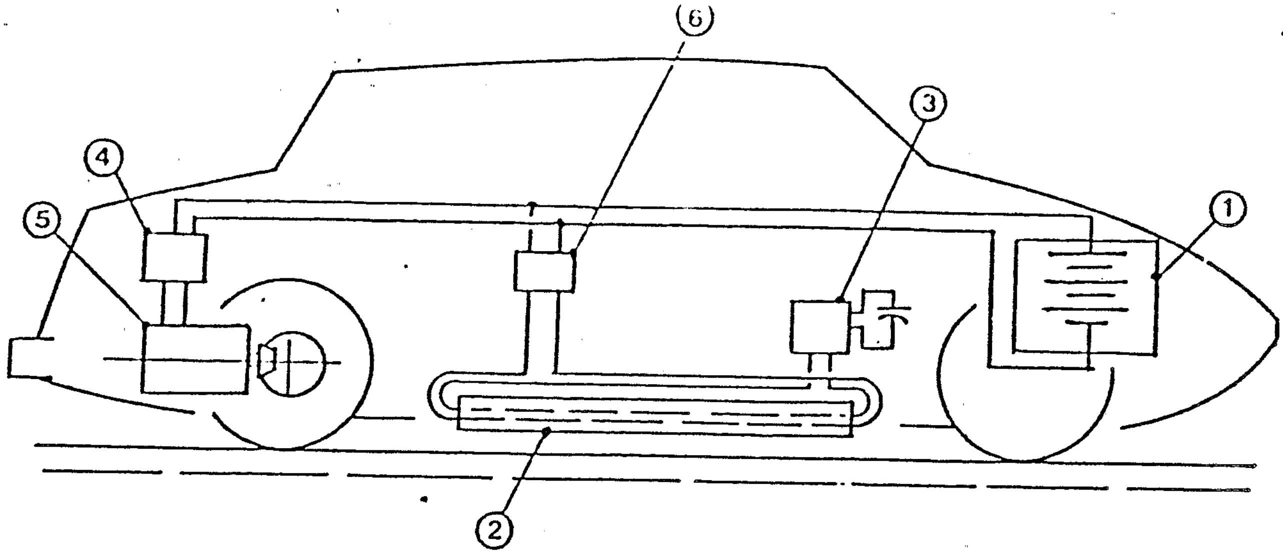
Bill Shafer

MARCH 9TH SUNDAY
"INDIANA HAMFEST"
INDIANA STATE FAIRGROUNDS
1202 E. 38TH ST,
INDIANAPOLIS, IND.
812-339-4446
8:00 A.M.

MARCH 12TH WED.
"SRO AUCTION"
EDGEBROOK FIELD HOUSE
6100 N. CENTRAL AVE.
CHICAGO, ILL.
ELECTRONIC, RADIO AND COMPUTER ITEMS
8:00 P.M.

MARCH 23RD SUNDAY
"LAMARSFEST"
LAKE COUNTY FAIRGROUNDS
GRAYSLAKE, ILL.
RT. 45 + 120
312-255-0642
8:00 A.M.

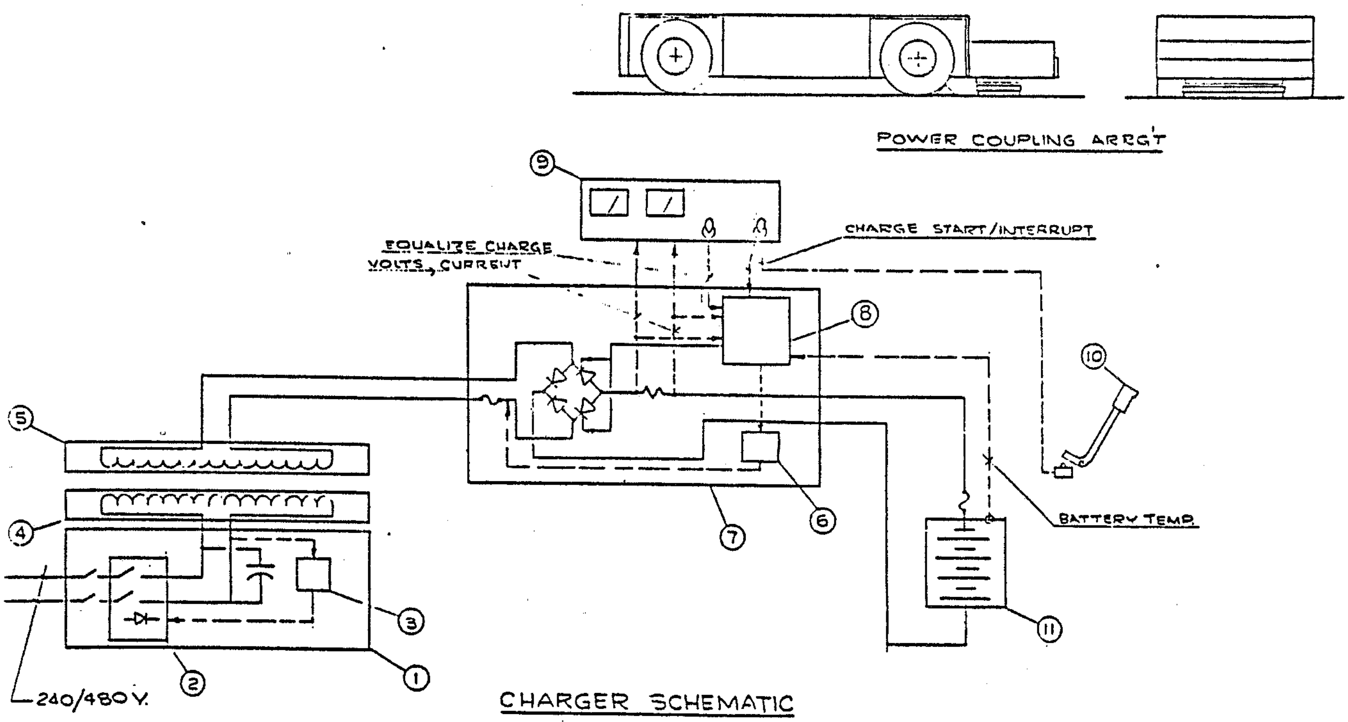
Fig 1



① BATTERY
② POWER PICKUP
③ POWER CONTROLLER
④ MOTOR CONTROLLER
⑤ TRACTION MOTOR
⑥ RECTIFIER

VEHICLE POWER SYSTEM – BLOCK DIAGRAM

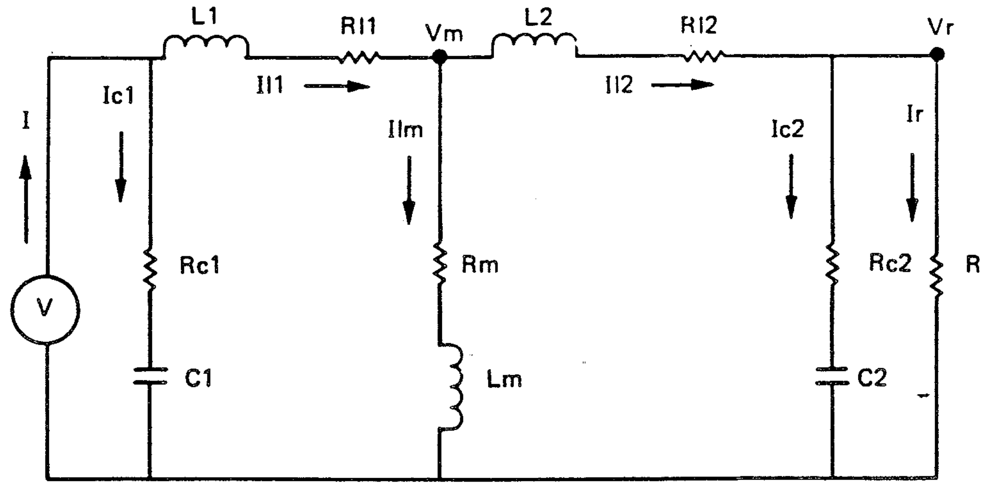
Fig 2



CHARGER SCHEMATIC

① INPUT CHASSIS
② SOLID STATE RELAY
③ RECEIVER/RELAY DRIVER
④ SOURCE INDUCTOR
⑤ PICKUP INDUCTOR
⑥ SIGNAL GENERATOR
⑦ OUTPUT CHASSIS
⑧ LOGIC & CONTROL
⑨ MONITOR PANEL
⑩ PARKING BRAKE
⑪ BATTERY

Fig 3



V	-	Generator voltage
I	-	Generator current
C1	-	Roadway capacitance
Rc1	-	Equivalent loss resistance for C1
Ic1	-	Current in C1
L1	-	Roadway inductance
Rl1	-	Equivalent ac resistance in roadway conductors
Il1	-	Roadway current
Vm	-	Power pickup induced voltage
Lm	-	Mutual inductance between roadway and pickup
Rm	-	Equivalent loss resistance for pickup and coupled roadway cores
Ilm	-	Equivalent current in Lm
L2	-	Leakage inductance of the pickup windings
Rl2	-	Equivalent ac resistance of the pickup windings
Il2	-	Equivalent current in L2
C2	-	Pickup tuning capacitance
Rc2	-	Equivalent loss resistance of C2
Ic2	-	Current in C2
Vc2	-	Voltage of the capacitance winding
Vr	-	Voltage of the load winding, same as Vc2
R	-	Load resistance

Fig 4

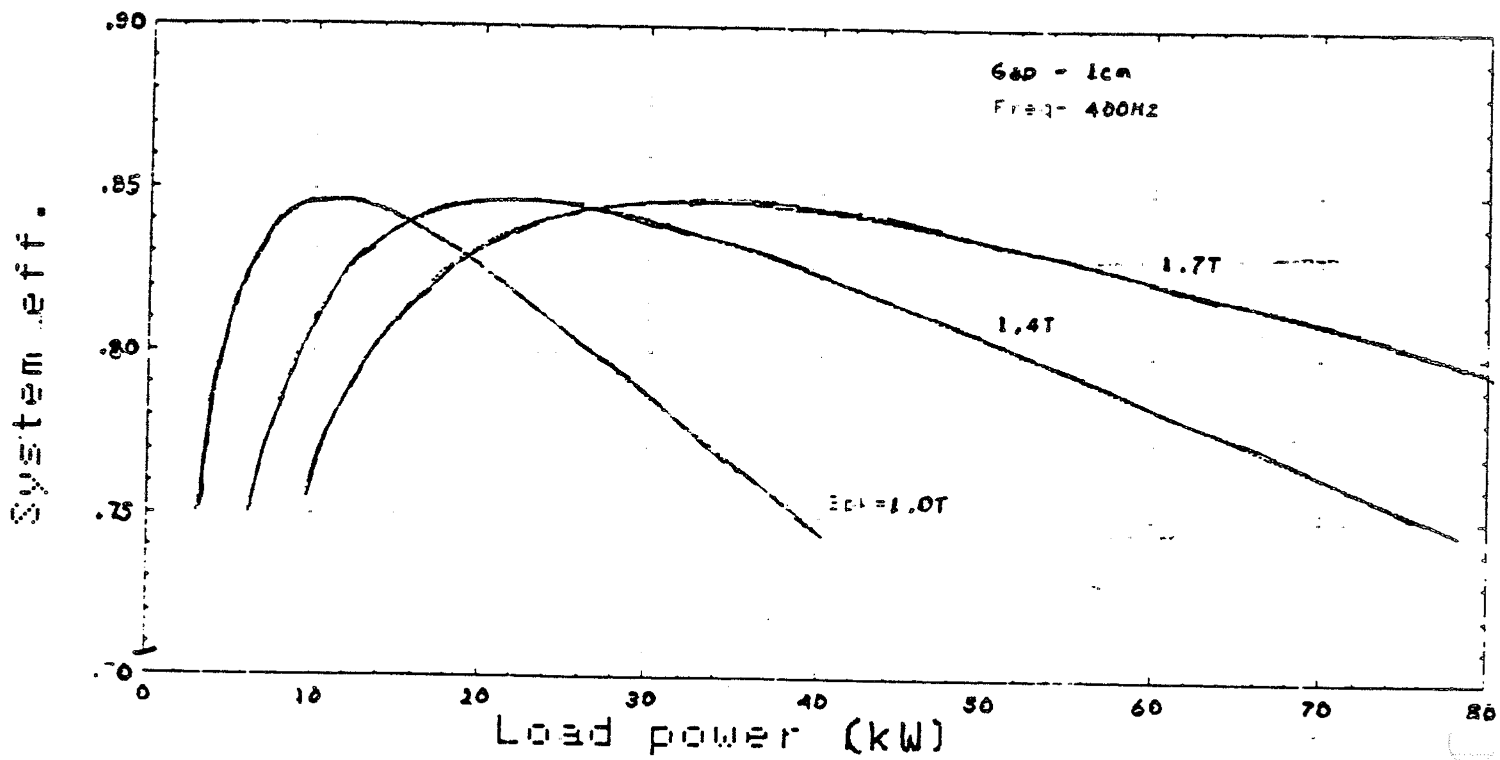


Fig. 16. Test track system efficiency versus pickup load power for three values of core flux density.

Monolith fuel cell has high energy potential

By Jon Van
Science writer

Using a honeycomb array that resembles corrugated cardboard, researchers at Argonne National Laboratory hope to produce an energy source of unprecedented efficiency.

The energy source, called the "monolith," is a fuel cell, a device described as "something like a battery with a fuel tank" that uses electrochemical reactions to produce electricity.

"A lot of researchers around the country are developing fuel cells," said John Ackerman, director of Argonne's electrochemical technology center, "but I'd say the monolith is the most innovative, offering the highest potential."

It also probably is the most difficult technology to put into a working prototype, requiring the placement of diverse ceramic materials only one-thousandth of an inch thick next to each other in precise and unusual configurations. These materials, some very porous and others quite dense, must withstand temperatures of 1,500 to 1,900 degrees Fahrenheit without pulling apart, cracking or otherwise changing shape.

"Our goal is beyond the edge of ceramic science," Ackerman said.

But if it is possible to assemble the appropriate materials as needed, the monolith should produce energy at a rate two or three times greater than existing power sources, operating on any available fuels such as gasoline, gasified coal, jet fuel, alcohol or methane.

If a working monolith were put into a car with a conventional engine that now delivers 30 miles per gallon of gasoline, it would go 60 to 90 miles on a gallon of gas. It would also be quiet and clean running.

"The theory behind this is solid as a rock," said Ackerman. "Putting it into practice is what's hard."

Fuel cell technology has been burdened in the past by weight, volume and cost. A conventional fuel cell producing the same power as a diesel engine, for example, would weigh about three times more than the engine and occupy four times the space.

Costs are high because the conventional fuel cells run on hydrogen or carbon monoxide and require subsystems to convert fuel into those forms, Ackerman said. The monolith can use a wide variety of fuels, it operates at temperatures of 1,500 to 1,900 degrees Fahrenheit and is lightweight.

The corrugated configuration is the key to producing a fuel cell that is lightweight and highly efficient. The cathode, anode, electrolyte and interconnector components of the fuel cell are used to build the structural support for the device itself, creating triangular passages through which air and fuel may flow.

An oxidation reaction is set up, producing electrons at the anode, a negatively charged fuel electrode. These electrons pass through the interconnect material into the cathode, the positively charged air electrode, and there they react with air to form oxide ions.

The ions pass through an electrolyte to a fuel electrode where the process is repeated.

The more fuel cells assembled, the greater the build-up of voltage. After more than two years of research, the Argonne team has built a single fuel cell that can produce about .75 volts of energy.

At present the team, headed by Ackerman and Darrell Fee, is working to put two cells together to prove it is feasible to put these cells into an array and build the amount of energy produced.

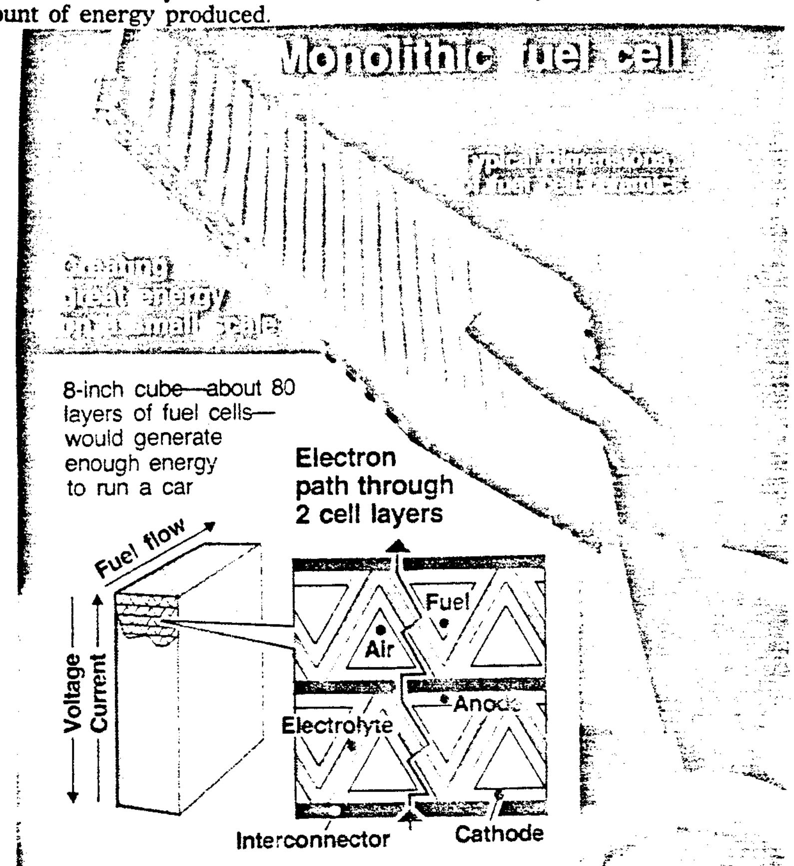
"If we can put all these materials together and generate a few volts of energy, we'll have crossed a big barrier," Ackerman said.

Even if that can be achieved, it may be four or five years before the team will be able to build a prototype capable of powering an automobile. Assuming that it can be built at all, the monolith could replace the internal combustion engine in autos.

"Because it could use gasoline, the monolith wouldn't require any great changes in the economy or in our support systems for automobiles," Ackerman said. "But this isn't a panacea, and putting a monolith into an automobile isn't likely to happen in the immediate future."

If the monolith passes initial tests, its first practical uses are more likely to come in high technology high-cost applications such as in jet aircraft and the utility industry.

It is after fuel cells prove valuable as alternatives to high-cost energy producers that researchers expect to have enough experience with them to bring down costs and boost reliability to the point where they might be used to run the family automobile.



Fuel and air produce electricity by combining across electrolyte at temperatures up to 1,900° F; the more fuel cell layers, the more voltage.

Chicago Tribune Graphic; Source: Argonne National Laboratory

FVEAA

BATTERY RESEARCH UPDATE

News from DOE & LLNL reported by Paul Brasch

Zink/Bromine testing is showing some long life indications although sometimes at lower energy efficiencies than lead/acid. First, a small 500 Watt-hour (Wh) battery is at better than 1100 cycles with stable performance at 68% efficiency. Larger 1.2 kWh and 3.5 kWh units are also being tested with 47 and 67% efficiencies respectivly. But these are experiencing some problems with precipitates and pH. Just starting testing is a large 30kWh EV type battery which has successfully powered an AC drivetrain vehicle at Ford Motor Company.

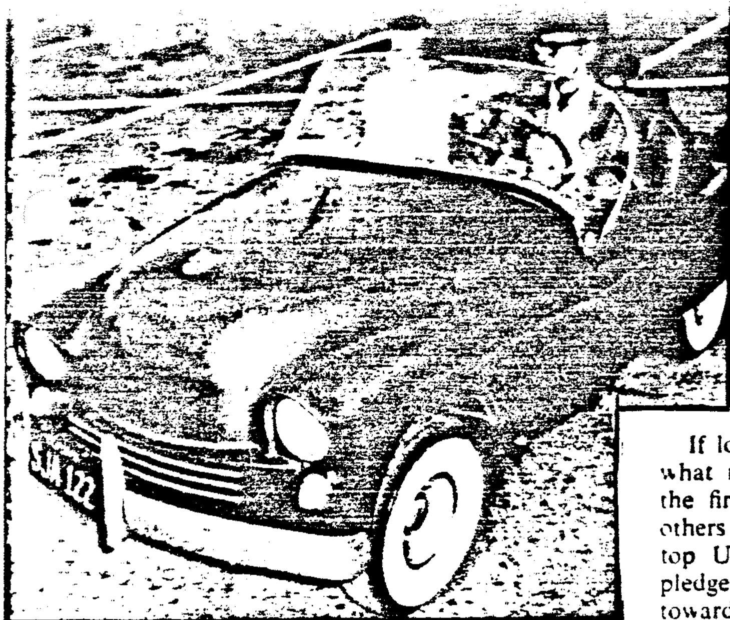
For high-temp "superbatteries" there is good and bad news. Four Ford Sodium Sulfer cells have so far lived through 343 to 674 cycles at slightly above their designed capacity. One cell even increased its capacity from 143 Ah to 160 Ah when constant current/constant voltage charging was tried. The bad news is that the very high energy Lithium/Iron Sulfide cell testing has stopped temporarily due to mechanical problems. The cells seem to bulge and break the bolts holding restraining plates.

Talking about problems Nickel/Zinc still seems to be having them. With only 203 cycles, the capacity of a module under test was already down to 77% of rated when funding ran out.

However, testing of an Easle-Picher Nickel/Iron module has shown a 109 mile projected range using the SAE J227 aD/improved ETV-1 driving profile with regenerative breaking. This is a 15% improvement and the first time Ni/FE has exceeded the 100 mile program goal.

The Aluminum/Air battery (fuel cell/) is still alive. Lawrence Livermore National Laboratory is still working on it, and so is a private company in Ohio. The Canadian Government has also been funding research on it. Art Maimoni of LLNL feels that a 100 cell system, if built, should do very well in a full size EV as their tests of the primary wearout mechanisim has shown a projected cell life of greater than 2500 cycles.

The best news seems to be for Lead/Acid modules of the large load-leveling kind. One module has completed 605 equivalent 80% depth of discharge cycles while retaining 78% capacity. But more important, an Exide module running at 50 o C has completed 1523 cycles (a claimed 4246 equivalent cycles at 25 o C) with 115 % of its 5 hour 30 o C rating. That sounds like progress to me.



PRACTICAL battery-powered electric already is in use on Los Angeles streets. It has eight automobile batteries.

This Cross-Town Car Has an Electrifying Future

FORD'S REVELATION that an electric commuter car is in the works brought a galvanic reaction from the press, but at least one person got a big charge out of all the flap and fanfare. This man is the owner of a here and now commuter electric—a scaled down prototype mayhap, but nevertheless on the road daily. The performance of this car, however, may be short of the giant manufacturing firm's hopes for the future.

The battery-powered commuter is the BMW, no relation to the German car clan of similar name.

Brainchild of its designer-builder, battery vehicle expert Leslie Perhacs, a BMW has been skittling around Los Angeles for nearly a year, virtually unnoticed.

If local folk have been oblivious to what may well be the forerunner of the first practical commuter electric, others have been more cognizant: A top U.S. industrialist reportedly has pledged an initial two million dollars toward production of a compact-sized town car that likely will sell for a modest $2300 or so.

Foreign emissaries, too, have been beating a path to designer Perhacs' door. One group of businessmen from India already has plunked down "earnest money" for the rights to build the BMW.

As for the single car produced, unlike its more highly touted competitors, the BMW is owned and driven daily by Los Angeles City College professor Dorothy A. Stapleton. Mrs. Stapleton's husband, Douglas, a magazine editor, heard of inventor Perhacs' battery-electric system, asked him to fashion a car, paid $1800 for the first model and promptly turned the car over to his wife to drive.

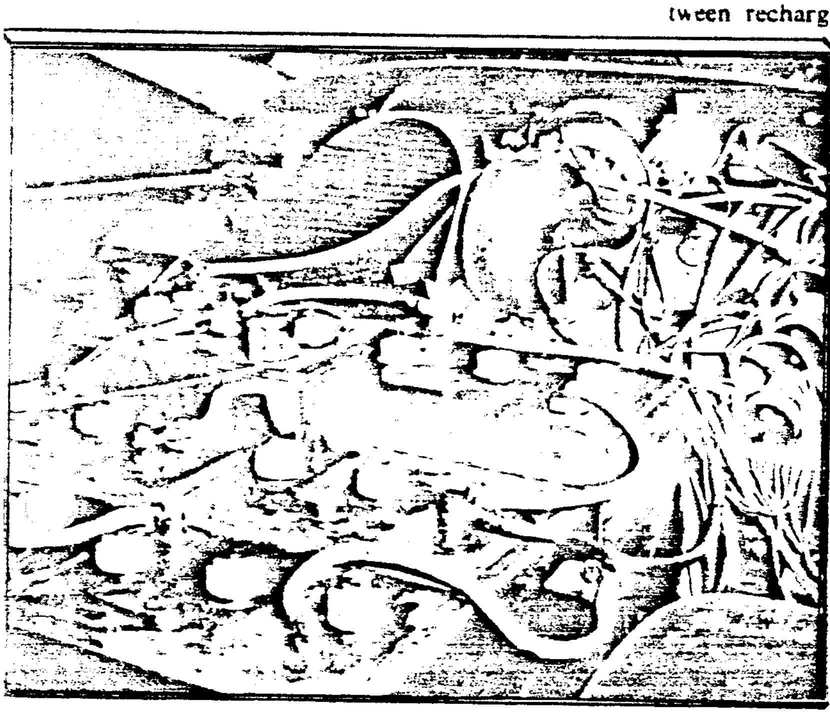
"It handles beautifully," says Mrs. Stapleton, of the 10-ft. long 2-seater.

More significant is the little BMW's town performance. Governed to a top of 45 mph from the 70 mph Perhacs claims it can do and has done in tests, the BMW gets an easy 100 miles between recharges, zips in and around traffic and, in almost year-long daily use, has cost the Stapletons almost nothing to run.

"A couple of times a week," says Mrs. Stapleton. "I plug the dash's pull-out charge cord into my garage's 110-volt electric socket. That's all there is to it."

The Stapletons say they've carefully studied their electric bill every month, but haven't yet detected even a few cents rise, despite those twice-weekly rechargings.

"Maybe," shrugs Stapleton, "we're spending $1 to $1.50 a month for electricity, as the inventor says



can't see it in our electric bills."

The only other cost has been the $10 annual "road tax" the state of California placed on the electric in an attempt to recoup something for road use, because the state wouldn't get it the usual way via gasoline taxes.

Under its something less than sleek fiberglass body, the BMW carries eight lead-acid storage batteries, six forward, two in the rear. Boosted by what Perhacs dubs his "secret formula electrolyte," they produce 195 amperes at 48 V. to power 16 speed solenoids, for four speeds forward and reverse, and two off-the-shelf 2-bhp Baldor electric motors which, through Bendix 2:1 gearing, drive the rear wheels. A built-in recharger also is located forward.

So far, the Stapletons have recharged their battery about 100 times. Inventor Perhacs claims one of his special electrolyte batteries was recycled 3800 times before it expired. Even at a conservative 1000 recharges before no-voltage death, the Stapletons' batteries should produce current for upward of 8–10 years. All eight batteries can be replaced for about $256. As for Perhacs' special electrolyte, each of the batteries requires 1 qt. of the liquid each year. Perhacs supplies the formula at $2 a quart, for an annual cost of about $16.

THERE'S NO doubt that this single-copy midget is a performer. The question remaining to be answered is whether the compact-sized, 4-wheel drive "big car" Perhacs and his backers plan will, given the added weight, perform equally as well as the prototype. Perhacs expects to be turning out 1000 units per month, perhaps by late 1967.

The Stapletons' BMW handles well and has surprising power and acceleration. Yet, given a compact-size production model with equal or better performance, would one plunk down hard cash for a town electric?

That is a question thousands of commuters soon may be asking themselves. Their answers will decide the electric cars' future. —[illegible]

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