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F. V. E. A. A. NEWSLETTER

JANUARY 1991

DEADLINE for newsletter *STUFF* - in my hands the friday before the next meeting. Editor

MEETING NOTICE

The next FVEAA meeting will be JANUARY 18th at College of DuPage Building K 22nd & Lambert Rd. Glen Ellyn Time Meeting 7:30 P.M. sharp. We can arrive at 7:00. Guests are welcome and need not be members to attend the meeting. NOTE: Enter at EAST entrance. We meet in room # K-157

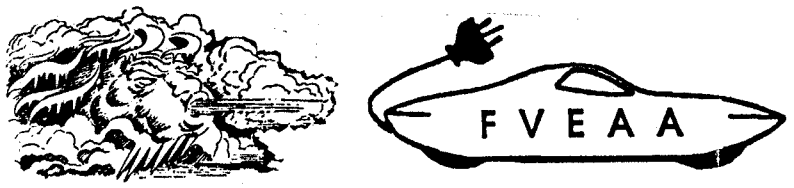
THE PREZSEZ

At the time of newsletter preparation, it is uncertain how middle-east developments will affect petroleum supplies. Your electric car could suddenly become a valuable possession. Hooray for energy independence !

This will be the last newsletter mailed to members who have not renewed their membership. Most have "re-upped" for another year.

It has been some time since we have had an open agenda so the January 18th meeting will give members an opportunity to speak their minds, after a few pending matters are concluded.

Bill



FOX VALLEY ELECTRIC AUTO ASSOCIATION
6542 Fairmount Downers Grove Il 60516

FIRST CLASS

ADDRESS CORRECTION REQUESTED

Minutes of Fox Valley Electric Auto Association October 19, 1990

The meeting was called to order by President Bill Shafer at 7:35 P.M.
There were 26 members and 2 guests present. Treasurer V. Vana gave the following report....Balances..checking now account $1,388.60...savings account $917.13... total $2,305.73.

Pres. Shafer announced that Bill Ehlers of California is printing up the new Electric Vehicle calenders and will be sold for $3.00...the club is ordering 10. November is renewal date for membership John Newton made a motion to prorate dues at $1.25 month with renewal in November. The motion was seconded by Ray Oviyach. passed unanimous. Pres. Shafer commented that as Gas prices go up.the economics of electric vehicles looks better and better.

Future plans and topics:
What to look for in buying a used vehicle to electrify.
Ways of basic electonics and circuits.
Full explanation of how a controller works.
How to determine what your own desing package should be according to your needs.
Spell out in laymans terms instead of highly technical language.
How to design and incorporate heater and air conditioning system.
" " " "" battery charger.
" " " "" regeneration system.

Dana Mock who finished converting his Dodge and dropped out of meetings for a little while will soon come back to regular meetings, and give his experience and knowledge about a controller he was working on....Ken Myers will also be giving a talk on controllers at a future meeting.

The election of officers will be held at the November meeting so a slate was nominated at this time.

A coffee break was held and followed by a discussion by our 2 guests, Bill Bilecki and Dan Mackecich on a 140 amp. alternator that they are designing and passed out literature on their company. more info in the future.

The meeting was adjourned by Pres. Sahfer at 9:45 P.M.

Respectfully submitted,

Paul P. Harris, Secretary.

Fox Valley Electric Automobile Association...Meeting...November 16, 1990

The Meeting was called to order by Pres. Shafer at 7:30 P.M.
There were 17 members and 2 guests present. Treasurer V. Vana gave the following report...Balances..checking Now account $1,444.24..savings account $921.42 for a total of $2,365.66.

Pres. Shafer reported that we had received 6 inquiries from out of state people asking for general information and some specific items and he answered all.

A general discussion followed about getting started with your own electric vehicle...planning your budget and picking out your car. The opinion was that it should be a recyclable car..look for a lightweight type with a blown engine probably about $400.to $600....look in local want ads....for a front wheel drive type...decent body...The usage requirements of each individual were to be discussed after a coffee break....it should be a 96 volt system.

The election of officers took place without any formality...and the same rules as usual applied...you're stuck with the job..
V. Vana, now retired said he could not accept for lack of time, however George Krajnovich motioned to have Mr. Vana elected as Treasurer for an additional year. Jack Cahill seconded the motion and Mr. Vana graciously accepted with ...."Now remember next year"...Thomas Kaminski made a motion to close nominations for treasurer, seconded by Richard Johnson.
Jack Cahill motioned to keep all existing officers for another year, which was unanimously seconded.
Dick Minard made a motion to close all nominations for all officers, and it was seconded by Richard Johnson.
The nominations were over and all officers were promptly re-elected

New member Richard Sachtschale is to help John Emde wit the bulletin.

The membership dues are to be paid as of November renewal time and they can be sent into our on-going Treasurer V. Vana.

Ken Woods commented on the 3 solar powered races held..Australia, France and New England.

Our next meeting will be December 21, 1990 in room # 157.

The meeting was adjourned at 9:31 P.M.

Respectfully submitted,

Paul P. Harris, Secretary

FVEAA ELECTRIC CAR CONVERSION MANUAL
PART I, GETTING STARTED - BUDGETING AND CAR SELECTION

This series of papers is intended for the person who wishes to enjoy the benefits of electric car ownership but is unwilling to await the time when they may be purchased commercially, or who wishes to recycle a conventional car at a modest cost. Since its founding in 1975, over 20 FVEAA members have converted various conventional cars to electric power and have 15 years of construction and operating experience to share with persons who have recently become interested.

The first step in the project is to establish a budget so you will not be surprised midway thru the work. The major components in a conversion are listed below:

Item	Cost Range
Recyclable Car	$ 200-600
Electric Motor	200-500
Speed Controller	300-900
Batteries (Assume a 60 volt system)	600-700
Battery Charger	200-400
Power Cables & Connectors	200
Control Wire, Relays,Meters & Other Miscelleaneous Material	200
Machine Shop Work	200
Welding Shop Work	100
Total	$ 2,200-3800

The car selected will have a major effect on the final outcome of the project. The best conversions have used a lighweight subcompact car, preferably one that has an inoperative engine. These can usually be purchased from a salvage yard or disgruntled owner for a few hundred dollars. Scan your local newspaper ads. If you buy the car from a salvage yard and receive a salvage title, be prepared for some extra work to get it licensed by the Secretary of State. The better shopper you are, the less your project will cost.

Remember that RUST is the single item that will eventually send your electric car to the crusher. The drivetrain components may in good operating shape and reinstalled in another vehicle, but rust will not only cause you a lot of extra work initially but it will also impair your enjoyment of the car. Select a car with a body in good shape.

Avoid cars where replacement parts for brakes, shocks, steering components, suspension members, and accessories such as taillight lenses will be are hard to find and expensive. Select a car where these components will be available at reasonable cost. It can be a frustrating experience to search for some small, but vital component that needs replacing.

The car you select will determine what you can do with a conversion. Table I lists representative subcompact cars with their original specifications:

TABLE I
CARS SUITABLE FOR CONVERSION TO ELECTRIC POWER

Car	Weight	F/R %	Net HP @ RPM	Ratio	RPM/Mile	0-30 MPH
Geo Metro (88)	1640	47/53	55 5700	3.95		4.5
Honda Civic (1300)	1760	62/38	63 5000	3.30	3060	4.1
(88)	2138	60/40	92 6000	4.16		3.6
Ford Festiva (87)	1713	-	58 5000	3.78		4.1
Fiesta	1800	63/37	66 5000	3.15	3070	4.1
Dodge Colt	1800	62/38	70 5200	2.97	2750	
Renault LeCar	1830	59/41	60 6000	3.72	3480	
Yugo (87)	1832	64/36	54 5200	3.76		4.8
Chevy Spectrum (86)	1874	63/38	70 5400	3.58	3.58	3.9
VW Rabbit (84)	1930	63/37	71 5800	3.78	3455	3.0
Alliance (86)	1960	-	77 5000	3.56		3.8
Mazda GLC	1980	55/45	65 5000	3.73	3405	
Datsun 310	2000	62/38	65 5600	3.46	3170	
Subaru (84)	2050	64/36	67 5200	3.81	3480	
Audi Fox (87)	2070	61/39	78 5500	3.70	3380	3.6
Ford Escort (86)	2080	62/38	80 5400	3.73		
Chevette	2110	53/47	70 5200	3.70	3390	
Hundai Excel (87)	2150	63/37	68 5500	3.47		4.2
VW Dasher	2160	61/39	78 5500	3.74	3420	
Dodge Omni (85)	2200	62/38	70 5200	3.37	3105	
Toyota Corolla (88)	2242	60/40	90 6000	3.72	3645	3.8
Honda Accord	2240	59/41	72 4500	3.05	2785	
Nissan Sentra (84)	1855	55/45	67 5600	3.36		
(87)	2326	-	70 5000	3.89		5.4

The original curb weight listed in Column 2 will determine how many batteries you can expect to put into the car. You will remove 2-300 pounds of engine-related parts from the car. Each golf-cart type deep discharge battery you install will weigh about 70 pounds, including rack. Motor weight will add about another 100 pounds. To stay within the original car specifications, the pasenger load must be reduced. You will be in for extensive modifications if you exceed the gross vehicle limit (GVW) for your car. Check this parameter carefully. Table I DOES NOT list GVW.

The third column lists the weight distribution between the front and rear wheels of the car. This will determine WHERE you can locate batteries. The ideal ratio of 50-50 is seldom found in front-wheel drive cars. Too much weight in the front may cause difficult steering. Too much weight in the rear may cause difficulty with emergency braking. Your converted car should keep the same weight distribution as the original spec. Battery placement requires individual attention and ingenuity.

The fourth column lists the horsepower developed by the original car engine and the rpm at which it is achieved. The performance of your converted car will probably not match this number but it is a factor to be considered.

Motor selection will be influenced by the data in the sixth and seventh columns which show the final drive ratio and the RPM per mile of travel. This will be covered in a later paper.

The 0-30 mph acceleration performance is listed for reference.

The battery weight ratio is one of the early and most important EV decisions. A converted car realistically will end up with 25-30% of its curb weight made up of batteries. The curb weight of the EV will probably be 20-30% above the original value listed in Table I.

Early in the project you should define how you intend to use the car. An electric can be tailored to your expected use. The factors to be considered are:

1. What is the desired acceleration rate?
2. Top speed?
3. Single-charge operating range?

You must set realistic expectations. Faster acceleration will require additional batteries or sacrifice of battery life and less effficient. Higher top speed will increase battery weight. The further you want to go before recharging the more batteries will be needed. Based on FVEAA experience, a converted car can accelerate from 0-30 in 6 seconds, have a top speed of 50 MPH, and go up to 30 miles without recharging. An EV with this performance will be a useful urban transportation tool.

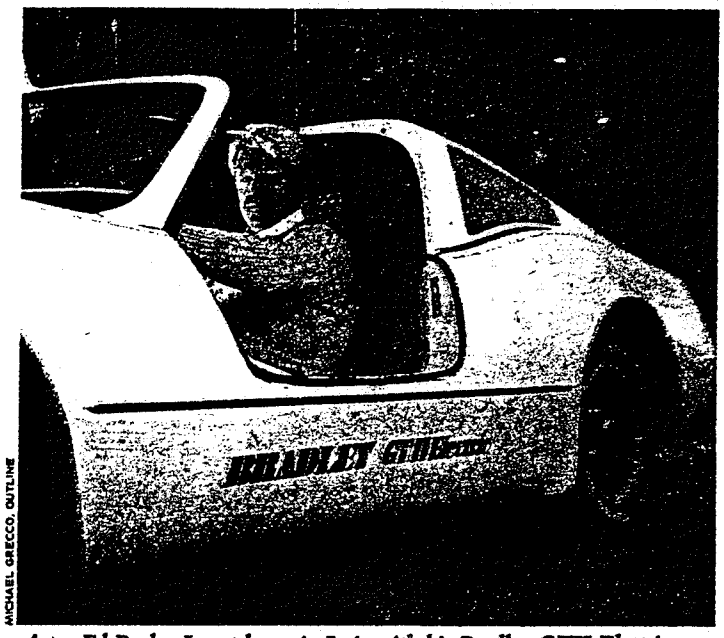
A VW Rabbit will be used to illustrate how the prceeding information can be utilized. A passenger weight of 150 lbs each will be assumed. The curb weight listed in Table I is 1930 lbs. The GWV for this 4-passenger car would be 1930 + (4)(150) = 2530 lbs. The net weight after engine removal would be 1930-300 = 1630 lbs. Carrying 1 passenger makes the pre-conversion car net weight 1780 lbs. Subtracting this from the GWV yields a conversion parts weight of 750 lbs.

When the 100 lbs of motor weight is subtracted, we find that 9.28 batteries can be accomodated. Rounding up to the next integer would say that based on these assumptions, a 60-volt system with 10 deep discharge batteries can considered. At 700 pounds, the power batteries would make up 27 % of the EV curb weight. The 63/37 weight distribution requires 6 of the power batteries be located in the front and the remaining 4 in the rear of the car. Fitting them in poses an interesting challenge. The curb weight of the converted car is 2430 lbs.

In the next paper, the performance of the VW Rabbit conversion will be calculated.

W H Shafer (11/21/1990)

USA WEEKEND DEC 7-9, 1990
(NEWS - WHO'S)



MICHAEL GRECCO, OUTLINE

Actor Ed Begley Jr., at home in L.A. with his Bradley GTII Electric car

Q *Ed Begley Jr., of "Parenthood" on NBC, has said he owns two electric cars. Where did he get them? And how much did they cost?*

Denver Bolster, Colorado Springs

Begley, an avid environmentalist, has owned electric cars since 1970. Today he has a $6,000 two-seater Bradley (made domestically and available from the USA's few Bradley dealers) and a $1,700 converted Subaru. Begley says that his earlier electric cars were not unlike golf carts — small and slow — but that his current models are almost as quick as cars fueled by gasoline or diesel. Of course, every night Begley has to plug in his cars for a charge (they get 40-50 miles per charge in the city, 70 on the highway). But producing the required electricity uses up just one-fifth the petroleum consumed by a non-electric car. The 41-year-old actor says of his cars: "I use them solely for the environment. They don't make life any quicker." As a child, he says, "I used to wonder where all the garbage that we created went. When I realized it just piles up in a dump, I couldn't believe it." Begley's home in the Studio City area of L.A. is a model of ecological conscientiousness.

FVEAA cars don't die, they are sold to Californians. The Bradley featured in the above article was formerly owned by John Stockberger. It and Henry Setton's Suburau both ended up in Ed Begley's garage.

Chicago Tribune, Tuesday, January 8, 1991

GM takes another clean route with plans for a dual-fuel van

By Jim Mateja
Auto writer

DETROIT—General Motors Corp. has taken another jump forward in the race to develop vehicles that can be powered with alternate fuels, with a hybrid mini-van that runs on gasoline and battery power.

Dubbed the HX3, the mini-van is the second step in GM's program to produce, for the middle to late 1990s, cleaner-burning, more fuel-efficient vehicles using alternate fuels. A year ago, GM brought out the Impact battery-powered concept car.

The automaker plans to unveil details of the dual-fuel HX3 later this week at the Detroit Auto Show, but a film depicting the mini-van at a GM exhibit was spotted during a media preview of the show.

While Impact has been designated a production program and a vehicle that GM plans to produce, the HX3 is still in prototype status.

The van is under development in response to those who favor the clean operation of a battery-powered car, but are concerned because of its limited range of 100 to 125 miles before the batteries need an 8- to 10-hour recharging.

Equally important, the Impact seats only two and is basically a commuter vehicle, while the HX3 will seat five, making it a practical family machine.

Like Impact, the HX3 would have a battery pack to provide electric power. The van goes a step further by also offering a 0.9-liter, 3-cylinder gasoline engine and a 10-gallon fuel tank.

The mini-van could be operated on batteries in congested urban areas, switching to gasoline in rural areas or on long-distance travel.

With battery-only power, once the batteries discharge after 100 to 125 miles, the motorist needs to stop for a lengthy recharge.

With a hybrid dual-fuel vehicle, the motorist has the gasoline engine to fall back on when the batteries need recharging.

With gasoline in reserve, the fear of being stranded 20 miles from home with a pack of dead batteries is eliminated.

Another advantage of a hybrid is that with a gasoline engine, battery life is extended.

Using only electricity, it is estimated that at roughly 25,000 miles the entire battery pack would need replacing, at a heavy cost.

The van, developed especially for dual-fuel power, is a bit primitive in that the gears include only a forward and reverse lever, like a golf cart. However, GM sources emphasized that the HX3 is still in the early stages of development.

Chicago Tribune, Saturday, January 5, 1991

Deadline drives race for electric vehicles

LOS ANGELES (Reuters)—Spurred by California's tough emission standards, automakers are scrambling to develop electric-powered vehicles, but high costs and a limited driving range are proving tough hurdles.

"No one has yet found the breakthrough to produce a high-energy, long-range, low-weight and low-cost battery," said Francois Castaing, vice president of vehicle engineering for Chrysler Corp. He was attending the Los Angeles auto show.

Friday, Castaing said the No. 3 U.S. automaker, in conjunction with the California-based Electric Power Research Institute, plans to develop an electric mini-van.

Automakers face a 1998 deadline in California for commercial output of electric vehicles.

California enacted strict automobile emission standards in September that require the sale of vehicles that do not emit pollutants.

The tough standards will be phased in, starting in 1998.

Electric vehicles are the only current technology that can meet the zero-emission standard, industry officials said.

"By 1998, 2 percent of the vehicles that we sell in California have to be zero emission," said Roberta Nichols, manager of the alternate fuels department at Ford Motor Co., the No. 2 U.S. automaker.

That 2 percent amounts to about 40,000 vehicles. The California requirement expands to 10 percent, or about 200,000 vehicles, in 2003.

The state is a crucial market for the auto industry. California has about 11 percent of the U.S. population and about 12 percent of its vehicles, according to General Motors Corp. spokesman Bill Ott.

Chrysler unveiled a prototype electric mini-van Friday. The vehicle, called the TE Van, uses nickel-iron batteries and has a range of about 120 miles.

Ford, meanwhile, displayed an electric van that uses sodium-sulphur batteries and has a range of about 100 miles.

While Ford and Chrysler are focusing on vans, No. 1 U.S. automaker GM is working on a two-seat electric sports car with a range of 120 miles. The car was unveiled a year ago.

Castaing said the nickel-iron battery's long life give the Chrysler van an edge. The batteries last about 100,000 miles, but have a projected cost of about $6,000 to $10,000, he said. By comparison, the sodium-sulfur batteries in Ford's van last about 30,000 miles and cost about $3,000 to replace.

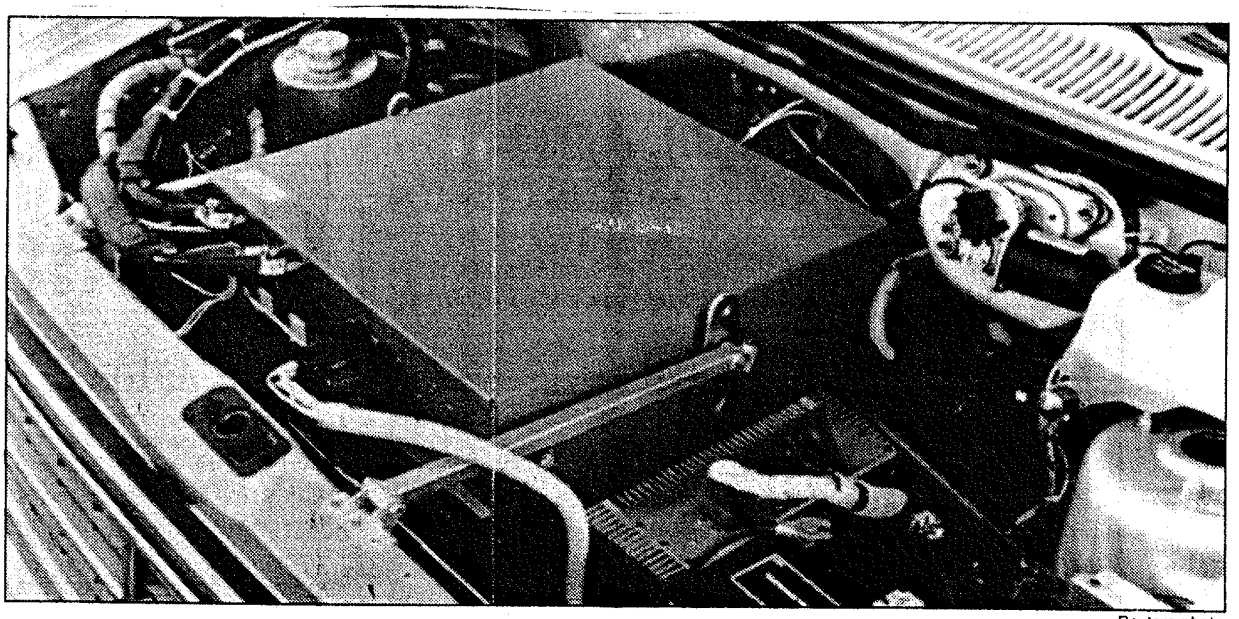
Ford and Chrysler said the long time needed to recharge batteries—about eight hours—and the limited range make the commercial delivery truck market a prime target. "That's probably the first commercial market," Castaing said.

The weight of the batteries also poses challenges.

The batteries add about 1,800 pounds to the weight of Chrysler's mini-van. "That's like saying the mini-van has to carry an extra 10 people all the time," Castaing said.

Chrysler said if the necessary breakthroughs in battery technology are found, the mini-van's development could be completed as early as 1995.

GM said last year that its electric car would require three to five years to develop.



Reuters photo

Chrysler Corp. said Friday it's developing an electric mini-van powered by iron-nickel batteries that last for about 100,000 miles. The van could go about 120 miles before recharging.

BUSINESS WEEK/DECEMBER 24, 1990

PUTTING A 10-KILOWATT ENGINE UNDER A PONTIAC'S HOOD

Fuel cells help power the space shuttle, they're showing up at utilities, and they may be in homes someday. But to Harold E. Helms, chief of vehicular-systems development at General Motors Corp.'s Allison Gas Turbine Division, their real potential lies in charging up electric cars. Helms is heading a two-year, $14 million project to develop a 10-kilowatt fuel cell for just that purpose. "They are the wave of the future," he says.

Longevity is one of the things Helms likes about fuel cells. The batteries in electric-car prototypes can go for, at most, 50,000 miles before they need to be replaced. They also need to be recharged after only 120 miles or so. But fuel cells powered by methanol could go for 200,000 miles with only minimal maintenance, says Helms. And they would use only half the fuel of internal combustion engines. Best of all, fuel cells emit none of the noxious fumes and only half the carbon dioxide of today's engines.

SAFE ACID. For safety reasons, fuel cells designed for spacecraft and industry can't be put in cars. They operate at high temperatures using extremely corrosive electrolytes. Molten-carbonate fuel cells, for example, run at 1,200F and "the acid could eat the skin off bones," says Helms. He is experimenting with a so-called proton-exchange fuel cell that operates at a modest 212F. Its electrolyte is sulfonic acid, which scientists at Du Pont Co. have learned to bond with a Teflon-like material to form a membrane. This membrane "locks up" the acid so it can be handled safely.

Still, there are lots of hurdles. "Today, the fuel cell is not practical from a cost standpoint," concedes Helms. The membrane alone costs about $1,000 a square foot, partly because it is made in such low volumes and partly because platinum is sprinkled on its exterior to help conduct electricity.

To get the cost down, GM has hooked up with Dow Chemical Co., which is making a cheaper form of the membrane. Helms is hoping the cost will drop to about $5 a square foot in mass-production volumes. He's also trying to reduce the amount of platinum to the level used in catalytic converters. The goal: Get the cost of the fuel-cell system down to about $2,000—competitive with an internal combustion engine.

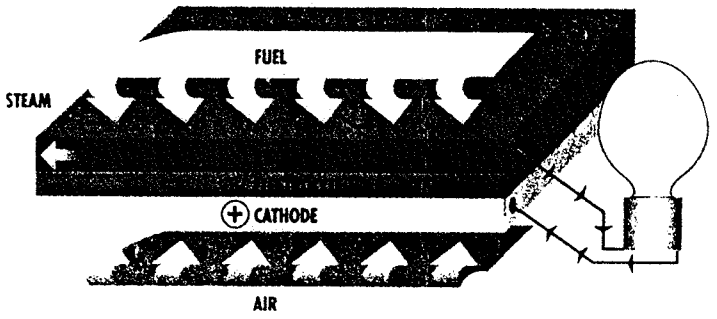
Another obstacle is that, at 700 pounds, the fuel-cell unit is nearly twice as heavy as a typical four-cylinder engine. And it would have to be teamed with weighty batteries to give a car enough reserve power for rapid acceleration and hill-climbing.

Still, Helms is optimistic. By 1996, after a second phase of research, he plans to have a prototype car with an 80-kw fuel cell. The next question: Can he make it roar like a Corvette?

By David Woodruff in Detroit

HOW A FUEL CELL WORKS...

Hydrogen atoms from a fuel such as natural gas diffuse through an anode. The anode strips off electrons, producing an electric current. The circuit is completed when electrons return to the cathode, where they are picked up by oxygen atoms from air. Hydrogen and oxygen meet and combine in the electrolyte to form steam



FUEL ECONOMY AND ELECTRIC VEHICLES

For 1990, the Department of Transportation has raised the Corporate Average Fuel Economy, or CAFE to 27.5 mpg. In other words, the average mile/gal figure for each motor, transmission, and model combination offered by an automobile manufacturer must be 27.5 mpg to avoid fines.

Electric vehicles complicate CAFE a bit because they do not directly consume fossil fuels, the resources CAFE is meant to help preserve. Through a complicated formula that includes factors such as electricity produced from petroleum sources and vehicle efficiency, electric vehicles are included in the average by crediting them with about 200 mpg for an automobile and 150 mpg for a van.

Different organizations suggest that CAFE requirements for the year 2000 will be 40 mpg. If 10% of 14-million new cars sold that year are electrics, then a CAFE of 40 mpg is possible with 1989 technology.