JANUARY 1987

MEETING NOTICE

The next meeting will be friday JANUARY 16th, at *CRAGIN FEDERAL SAVINGS & LOAN* 333 W. Wesley St. Wheaton, Illinois. - Time - 7:30 P.M. *sharp.* Guests are welcome and need not be members to attend the meeting.

THE PRES SAYS

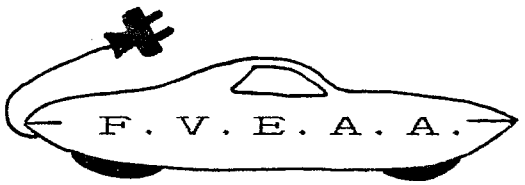
JANUARY MEETING

We will begin the promised Hybrid vehicle (Hereafter called by it's more descriptive name, PETRO-ELECTRIC VEHICLE or PEV) study by discussing the first draft of a paper proposed for the Alternative Energy in the Midwest Conference to be held March 18-20. Ken Woods and I are co-authors.

I also hope at the meeting to discuss further the assignment some of the members have accepted to produce a videotape about our activities.

RAFFLE CAR

I suppose I should stop calling the FVEAA Fiat by this name since it was decided in the December meeting to assign car use to members for their familiarization. Old habits die hard. Property Custodian Mock is in charge of assignments. Member Vana called me on Tuesday to report the front end had rusted out and collapsed. A quick resuce call to Member Meyers with his trusty welding torch corrected the problem and it is back in service. Thanks Ken.



FOX VALLEY ELECTRIC
AUTO ASSOCIATION
624 Pershing St. Wheaton, Il 60187

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

Minutes FVEAA Meeting 12/19/86 at Cragin Federal Savings & Loan Office, Wheaton, IL

President W. H. Shafer called the meeting to order at 7:42PM

There were 24 members present.

Treasurer V. Vana read the report of the club funds. There is a 925.93 balance in the NOW account and 761.53 in the savings account. The discussion following the treasurer's report included a request of the treasurer for the club's ID no. This is to be provided by the president.

A motion was made ,seconded and passed unanimously to appropriate $10.00 of the club's funds for "Cliff", the night watchman and doorman at Cragin as a Christmas gift from the club.

The certificate of title for the club's 1975 Fiat converted to electric drive is now in the president's possession. He has volunteered to correct the title with the Secretary of States office.

Dana Mock, our property custodian, has asked about putting a value on a 25 HP electric motor that had been donated to the club. A discussion as to the value of the motor ran from 10 $/HP or 250.00 to $0.50/lb or $75.00.

John Ahern moved and Ken Woods seconded that John Stockberger be authorized to spend up to $150.00 for a blanket insurance policy for the club with an auto rider.

John Stockberger presented a videotape of the annual electric vehicle rally held by the Electric Auto Association in California. (They were organized in the mid 60's and have approximately 2,000 members.)

John reported that 30 or more electric vehicles participated. The rally was held in an industrial park adjacent to an expressway. The short runs were a total of 5 miles in the industrial park with a 15 mile run on the expressway. The rally was held on Saturday Sept. 20, 1986. The longest drive to the rally by an electric vehicle was an electric pick up truck from Nevada.

The most interesting battery at the rally was an Aluminum-air battery that was said to give the electric motor converted Toyota Starlet a range of 200 miles. (John reported that the developers of the battery were understandably close mouthed about battery details.)

The treasurer reported that we now have 29 renewals out of 45 members. The club year for renewals runs from Nov. to Nov. Please get your renewals in to provide a solid financial base from which your club can build.

Your president and secretary volunteered to prepare a paper at the conference "Alternative Energy in the Midwest" sponsored by the Illinois Department of Energy and Natural Resources to be held March 18 to 20 at Ramada-O'Hare in Rosemont. This paper is in conjunction with the club's study of the Hybrid vehicle.

The meeting was adjourned at 9:38 PM.

Respectfully submitted,
Kenneth R. Woods
Kenneth R Woods, Secretary

THE PETRO-ELECTRIC VEHICLE
(A LOGICAL STEP TOWARDS ENERGY INDEPENDENCE)

William H. Shafer, President; and
Kenneth R. Woods, Secretary of the
Fox Valley Electric Auto Association

ABSTRACT

Twenty five percent of all US energy use is for transportation purposes. Recent fuel economy gains have come from vehicle weight reduction allowing use of smaller, more-efficient engines. The Hubble curve and later models of world petroleum production indicate a serious decline within the next two decades. It is important to begin now to develop non-petroleum sources for transportation purposes.

This paper describes a proposed R&D project which will utilize an internal combustion engine operated in its most-efficient steady state mode, combined with the high-torque, on-off operation of an efficient electric drive system. Vehicle use pattern in urban areas may allow up to 70% of the energy used by a petro-electric vehicle to be supplied by nuclear and coal-based electric power with petroleum providing the remainder.

The history and performance of past electric vehicles and current status of battery energy storage are covered in this paper. General features of the petro-electric vehicle proposed by the Fox Valley Electric Auto Association are described and projected performance presented.

Submitted By

William H. Shafer
President, FVEAA
31 December, 1986

PS

If this paper is accepted, we would appreciate the opportunity to also display the electric car owned by the FVEAA at the Conference.

1ST DRAFT

THE PETRO-ELECTRIC VEHICLE
(A LOGICAL STEP TOWARDS ENERGY INDEPENDENCE)

William H. Shafer, President; and
Kenneth R. Woods, Secretary of the
Fox Valley Electric Auto Association

A lot of electric car construction and operating experience has been accumulated since the passage in 1976 of the Electric and Hybrid Vehicle Development Act. Table I shows test results for a representative sample of passenger electric vehicles (EV), The last line is a composite for 8 EV's built by members of the Fox Valley Electric Auto Association since 1973.

Table I

Vehicle Identification	Year	Vehicle Weight (Lb)	Accel. 0-30 (Sec)	Top Speed (MPH)	Single Charge Range (Miles)	Energy Economy (Kwh/Mi)
Ford Commuta (1)	1967	1200	12+	40	40	--
Ford E-Car (2)	1969	3086	8.5	60+	20	.36-.42
Waterman DAF (3)	1973	3010	30	35	35	.33-.51
EVA (Pacer) (3)	1976	4600	20	50	35	.60-.87
GE ETV-1 (4)	1981	3350	8.6	60	60	.294

FVEAA

The tested performance of each vehicle in some way falls below marketplace demands. Acceleration is sluggish, top speed is limited, and single-charge urban driving range is severely restricted. These factors are due to the limitations of the on-board battery. Table II lists the characteristics of presently-available energy-storage systems.

TABLE II

ENERGY-STORAGE SYSTEMS

Type	Energy Density (Wh/Lb)	Power Density (W/Lb)	Efficiency %	80% DOD Cycle Life
Pb-Acid	18	50	75	500
Ni-Fe	20-23	45	50	1000+
Gasoline	5000	--	10	---

The shortcomings of battery systems compared to gasoline are evident. Gasoline has an energy storage ability 200 times greater than presently-available battery systems for EV's. The owner of an electric car has about the same range as a conventional car with a 1-gallon gas tank. It is unlikely that even the advanced batteries being developed which have expected energy-storage abilities 50-times greater than presently-available systems will allow development of a competetive EV.

The rising cost of electrical energy has demolished the earlier "cheap to operate" arguments for EV's. The typical EV passenger car requires about 0.5 Kwh of electrical energy to travel one mile. Residential electric rates in metropolitan areas where EVs are expected to be most-useful are currently 7-12 cents per Kwh. EV energy cost ranges from 4-7 cents per mile. The difference is greater in Commonwealth Edison's service area where the Illinois Commerce Commission has structured very high summer electric rates.

Periodic battery replacements add to EV operating costs. Life cycle tests on lead-acid batteries indicate about 400 discharge-charge cycles until failure. (5) Tests on experimental units have achieved 500 cycles.(6) EV batteries will require replacement about every 18 months when daily use results in an 80% discharge depth. Today's market price for commercially-available EV batteries is about $50 for each of these units. An EV contains 12-20 of these units. This results in a battery amortization of about 10 cents per mile.

The total "fuel" cost for an EV is the sum of electrical energy and battery amortization costs. It is currently 15-22 cents per mile, much higher than 4-7 cents per mile fuel cost for a conventional cars which achieve 20-30 miles per gallon, and assuming a gasoline selling price of $1.10 per gallon. Gasoline prices would have to double while electric rates and battery prices remain unchanged for an EV to become competetive.

Costs, however, are not the only consideration. (Insert here a section covering why it is important to develop systems which will conserve an ever-dwindling supply of petroleum. Include a discussion of present oil imports and our dependency on these. This section by Woods)

A realistic assessment of passenger car technology indicates a petroleum-electric hybrid vehicle (PEV) is one area where electrical-energy using cars may have promise. PEV's can overcome the performance shortcomings of EV's, yet use a non-petroleum energy source. They can provide the range that marketplace perceptions require, passenger heat without an auxiliary fuel-fired device, and power for amenities such as air conditioning which consumers demand.

The PEV is not a new concept. Development started in 1987 as a way to overcome the low peak torque of early gasoline engine cars. A US patent was issued for a PEV in 1909. (7) DOE has itemized 81 different attempts to build a PEV. (8)

The FVEAA has initiated a study of PEV. Based on our considerable construction and operating experience with EV's which were converted from conventional cars using "surplus" materials, we have concluded that satisfactory acceleration of a car is an important marketplace demand. Acceleration requires power levels up to 5 times that required for steady-state operation at modes speeds. Because an internal-combustion (IC) engine can provide high torque at high engine rpm, a manual or automatic transmission is required. The small engines used in many cars to achieve good gasoline mileage provide poor acceleration, unless the engine is turbocharged.

An electric drive system can provide accelerating power. The electric drive motor can be operated above its rating on a short-time basis during accelerating periods without damage. An electric motor rated for 25 HP (19 Kw) continuously can easily deliver 40 HP (54 Kw) for accelerating a 2500-pound car from 0-30 MPH in 6 seconds.

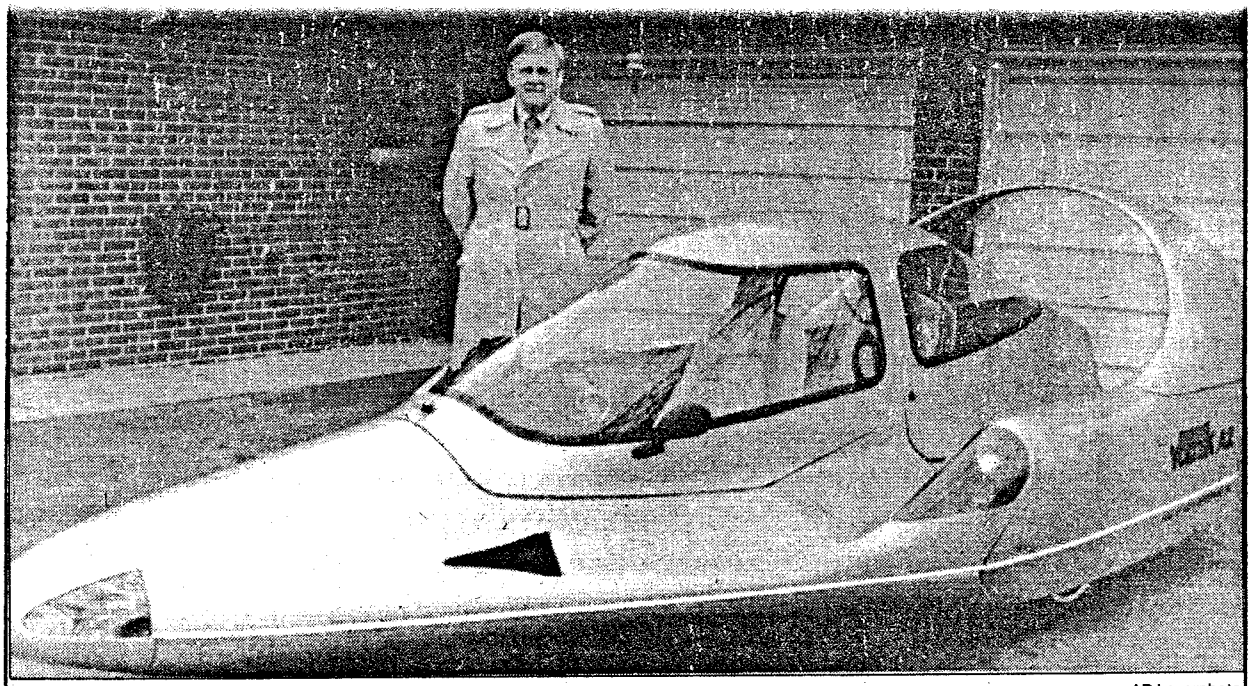
Steady-state cruising power can be supplied by a relatively small IC engine, operating at its most-efficient level. Our studies have indicated that a 2500-pound car requires only 25 horsepower (19Kw) to sustain a steady 60 mph speed. It can also reduce battery discharge levels which would increase cycle life and reduce battery amortization cost.

A properly-selected lead acid battery having low internal impedance can also deliver the power required for acceleration. The newly-developed lead acid batteries with immobilized electrolyte seems to have many of the characteristics required by a PEV.

For short trips. a PEV can be operated in an all-electric mode. Studies have indicated that over 25% of car use if for trips of less than 10 miles, a range within the ability of a PEV electric system.(9) These short trips are particularly hard on a conventional car since it involves a cold start and operation in a relatively inefficient manner. A computer simulation of various PEV types indicate that up to 70% of the gasoline used for urban driving can be displaced by utility-generated electricity.(10)

Although there have been numerous studies of PEVs, verification of their characteristics, performance, and economics will require the design and construction of anumber of experimental vehicles. The DOE funded one project, a 5-passenger car with a parallel power train that had full performance with either the electric or engine drive. We believe other types will prove more useful.

The test evidence to us is persuasive. It is apparent that EVs will probably be restricted to a specialized market. Resources would be redirected to a PEV program which can draw on a considerable EV research effort and use many of the components developed. A variety of PEVs need to be designed, built and tested. This is a good time to begin PEV development. The american automobile industry needs to emerge from its dismal past and offer consumers a new type of car, a PEV that can offer its owner a choice of electrical or petroleum energy. A lot of persons may buy the car because it is new, economical, and banish the memories of the 1973 and 1979 gasoline lines.



AP Laserphoto

A powerful idea

Gordon R. Stone of Belleville, Ill., displays a three-wheel car he developed. The power source is 10 aluminum batteries that are located in the rear of the vehicle.

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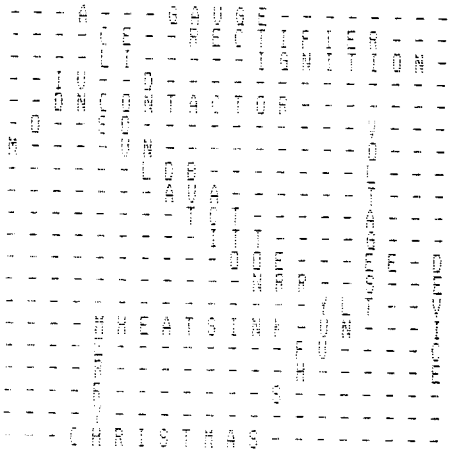

HAMFEST

SUN. - **FEB. 1ST** - 1989

BY - WHEATON COMMUNITY RADIO AMATEURS

AT - ODEUM - MIDWEST STADIUM
1033 N. VILLA AVE.
VILLA PARK, ILL.

ADVANCE TICKETS MAY BE AVAILABLE
AT OUR JAN. MEETING.

FVEAA CLUB ITEMS FOR SALE

QTY.	DESCRIPTION OF ITEM	PRICE EACH
456	SOLID BRASS BATTERY CONNECTORS 00 & 000 POS. OR NEG.	.75
18	STEEL LAMINATED CHOKE CORE FOR SHUNT MOTORS	5.00
10'	HEAT SHRINK TUBING 3/4" SHRINKS TO APPROX 1/2" PER FOOT	.50
2	200 AMP RELAY 24-28 VOLT COIL	15.00
6	400 AMP RELAY 12 VOLT COIL	45.00
1	2/0 BATTERY CABLE 5'	4.00
1	6 VOLT BATTERY WET 7" X 16"	5.00
1	6 VOLT BATTERY DRY (NEW) 7" X 12"	10.00
3	25 AMP CONTACTOR	3.00
1	400 AMP 28 VOLT CONTACTOR	10.00
1	200 AMP CONTACTOR	5.00
2	200 AMP 28 VOLT CONTACTOR	5.00
1	3AG CHASSIS MOUNT FUSE HOLDER	.50
2	IN-LINE 40 AMP FUSE HOLDER	1.00
2	IN-LINE 20 AMP FUSE HOLDER	.50
1	MJ10021 MOTOROLA TRANSISTOR	1.00
1	2N3791 TRANSISTOR	1.00
1	MR862(7620) MOTOROLA DIODE	1.00
1	1N3934B DIODE	1.00
1	Y10 OR 80063-SM-A-749148 DIODE	5.00
2	JOY MFG MOD. AV-3.5-2.75-120D 28 VOLT 60 CFM BLOWER	5.00
6	HEINEMAN CB279 28 VOLT TOGGLE RESET 3HP	1.00
3	CONVENTIONAL SIZE BATTERY HYDRACAP	3.00
2	LARGE (ABOUT 5000 WATTS) RESISTORS	15.00
4	LIKE NEW TIRES P155-80-R13 ON '69 TOYOTA RIMS	10.00
1	36 VOLT LESTER-MATIC BATTERY CHARGER	50.00
1	30 VOLT SERIES GE 400 AMP 3-8000 RPM MOTOR	150.00
12'	#12 STRANDED WIRE	1.00
2	1/0 BATTERY CABLE W/TERMINALS 2'9"	3.00
1	1/0 BATTERY CABLE W/TERMINALS 3'6"	3.50
1	1/0 BATTERY CABLE W/TERMINALS 4'	4.00
1	1/0 BATTERY CABLE W/TERMINALS 5'	5.00
1	1/0 BATTERY CABLE W/TERMINALS 6'	6.00
2	2/0 BATTERY CABLE W/TERMINALS 12'	10.00
2	0/0 BATTERY CABLE W/TERMINALS	1.00

Above items may be obtained by contacting - DANA MOCK 759-0033

OTHER ITEMS FOR SALE

1 2CM76 MOTOR $125.00
10 250 AMP DIODES $6.00 ea
5 24 VOLT 400 AMP CONTACTORS $30.00 ea
1 48 VOLT TRANSFORMER (*HEAVY DUTY*) FOR CHARGER $20.00
8 6 VOLT EXIDE GOLF CART BATTERIES (*BRAND NEW*) $40.00 ea

CALL - DON CONDGON 553-9543 *eve & wk ends*