

# FVEAA NEWSLETTER

April 1994

President	Vice President & Editor	Secretary	Treasurer & Librarian	Director	Director
<b>Ken Woods</b> 1264 Harvest Court Naperville, IL 60564-8956	<b>Bill Shafer</b> 308 South East Ave Oak Park, IL 60302-3512	<b>Dave Aarvold</b> 915 Oak Street DeKalb, IL 60115-3470	<b>Dale Corel</b> 595 North Gateshead Elk Grove Village, IL 60007-3433	<b>John Emde</b> 6541 Fairmount Downers Grove IL 60516-2919	<b>John Stockberger</b> 2 S 643 Nelson Lake Rd Batavia, IL 60510-9762

## NEXT MEETING - April 15 at 7:30 PM

Will be in Room 1046 in the Student Resource Center at  
the College of DuPage, southeast corner of 22nd Street & Lambert Road

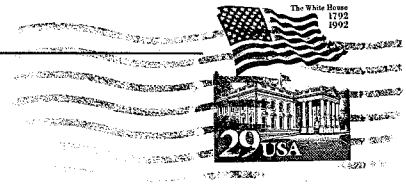
DISCUSSION TOPIC - Approval of ECOSTAR Test Proposal (From March)  
& video of California EV rally provided by Member Cartwright.

### MEMBERSHIP INFORMATION

Any person interested in electric cars is welcome to join the FVEAA. The cost for a full year's dues is \$15 which will entitle the member to receive our monthly Newsletter which contains useful information about electric car components, construction, policies, and events. Dues for new members joining in May will be \$ 7.50

## NEWSLETTER

FOX VALLEY ELECTRIC AUTO ASSOCIATION  
308 South East Avenue  
Oak Park, Illinois 60302



**First Class**

John Emde  
6542 Fairmount Avenue  
Downers Grove IL 60516 -2919

**ADDRESS CORRECTION REQUESTED**

## MINUTES OF FVEAA MARCH 18, 1994 MEETING

The meeting in Room 1046 at the College of DuPage was called to order at 8:40 PM by President Woods. Twenty four members and four guests attended.

The opening was delayed to allow members to test drive the Ford ECOSTAR van which was brought to the meeting by Commonwealth Edison (CECO) Research Engineer Rex Roehl.

Treasurer Corel reported \$ 2106.62 in the savings account and \$ 945.36 in the checking account. His report was approved.

Minutes of the February meeting were approved as published in the Newsletter.

President Woods reported he had been unable to schedule a date for the FVEAA to acquire the "electronic estate" of former member John Newton.

Professor Bohlmann reported on the progress of the VALPO Escort project. It has been driven using 48 volts and using batteries donated by GNB. Top speed at this level was 40 mph. The next step is to raise system voltage to 60 or 72 volts. He reported a problem in obtaining registration from the State of Indiana because it is impossible to obtain an emission test certificate from the State. This matter has been referred to a State legislator for correction of the Statute. (In Illinois EVs are exempted from emission test requirements - Ed).

President Woods reported on the "Ms Wiz" event held at the DuPage Fairgrounds on March 12. Member Vana brought his Audi, the Ford ECOSTAR van was there, and three FVEAA members (Woods, Vana & Helenowska) manned the exhibit. Approximately 4000 persons attended. Copies of the FVEAA 4-page new handout were distributed.

A discussion of the FVEAA proposal covering testing of the ECOSTAR was initiated and cut short after Roehl finished giving test drives. A motion to correct grammatical problems in the text and other suggestions was approved. These were given to President Woods and will be considered by the ad-hoc committee prior to the next meeting.

Roehl then gave a presentation on the ECOSTAR and Commonwealth Edison cooperation with Ford on the testing program.

Ford decided to use as the baseline vehicle a scaled-down van produced by their European affiliate. It met the CECO performance requirements of a 60-mile range car with a 60-mile top speed (60-60). The vehicle is equipped with an extensive data-acquisition system with a laptop computer readout. Information from this is proprietary for Ford.

Ford recognizes the van will not be a commercial product. CECO will acquire 5 vehicles for a 30-month test; two will be assigned to the City of Chicago, two will be used in the Edison fleet, and one will be used for public information purposes.

The van has a 770-pound sodium-sulfur battery, a gross vehicle weight of 4000 pounds with a curb weight to 3500 pounds. It has a 75 HP, 330-volt 3-phase motor coupled to the front-wheel drive system. The battery is in a compartment under the vehicle, isolated from the interior of the car.

The battery operates at about 600 degrees F. To keep it at operating temperature the rated standing time without being recharged is 12 hours. Deep discharge does not affect battery performance which makes it different from the lead-acid type used in FVEAA conversions. Complete recharge time is 30 hours from a 15-amp, 120-volt circuit and 7 hours from a 30-amp, 240-volt circuit.

Vehicle performance achieved is 0-50 mph in about 12 sec. It is governed to have a top speed of 72 mph. In urban driving so far, it has been found to have a 60-mile single-charge range.

Treasurer Corel distributed the current list of members. Shafer's proposal that the next newsletter contain the name, town and state of paid-up members in the next Newsletter was approved.

Member Clark announced he was able to secure a donation to the FVEAA from the Hinsdale Bank.

The meeting was adjourned at 10:48 PM.

Submitted by,

Dave Aarvold  
Secretary

## RECENT EV ARTICLES

### PROTOTYPE EV's

#### COMMUTER CARS TO DEBUT BY '95; Tribune 2/2/93

Electric cars are on their way to a 1995 debut as a part of a nationwide demonstration. The RTA will get 50 cars out of a combined order of 405. Vehicles have an expected range of 45 miles and a projected \$ 20000 cost each. Federal funding will be sought.

#### PANEL REJECTS RTA "STATION CAR" PROPOSAL; Tribune (DuPage) 12/23/93

A federal panel has turned down a request from the RTA for a station car experiment. The panel didn't believe the test would be a valid study and balked at the estimated test of \$ 60-70,000 per car for a "fleet" of 6-12 vehicles. The RTA hopes to prepare a revised proposal in 94. (Sic transit gloria -Ed.)

#### CHARGING AHEAD - ELECTRIC BUSES GET RESULTS ; Tribune 2/20/94

Pardon me boy, is that the Chattanooga electric bus? Two 22-foot battery buses furnished by Electotek, a Downy CA firm were placed in service in May of 92 for a test. A \$ 14-million federal grant will be used to buy 22 vehicles, build three downtown garages, and conduct the testing. Operating costs are projected to be 4.7 cents per mile compared to 18.5 cents for diesels.

#### CURRENT AFFAIRS: Tribune 2/6/94

Japan's Ministry of International Trade and Industry has set a goal for Japanese car companies to produce 200,000 electric vehicles. In the US there is a fierce debate among automakers on the future of electric cars. Each of the US Big 3 automakers has a prototype. Ten programs are underway in Japan. There are nine active programs by European auto companies. This chart summarizing EV developments for commercial sale was part of the article.

### A world of electric vehicles

Here's a chart of the electric vehicles currently under development by carmakers around the world. The chart lists the name of the vehicle; the company that makes it; whether it runs solely on electric power (E) or is an electric-gasoline hybrid (H); the number of passengers it holds, its top speed; its optimum range at city speeds (typically a steady 30 to 50 miles per hour; operation at faster speeds results in a reduction in range range); its output based in kilowatts and horsepower; and the type of battery it uses. Asterisk (\*) indicates the vehicle is in full or limited production. All the others listed are concept vehicles.

	Company	Type	Seats	Speed (m.p.h.)	Range (m.p.h.)	Output (kW)	Output (h.p.)	Battery type	
<b>Europe</b>									
	Cinquecento Elettra*	Fiat	E	4	50	60	9.2	12.5	LA
	AX Electrique*	Citroen	E	4	55	100	11	15	NC
	106 Electrc*	Peugeot	E	4	55	N/A	20	27	NC
	Vision A93	Mercedes	E	4	75	95	40	55	SNC
	E1	BMW	H	4	80 (110)	165	32 (60)	43.5(80)	SNC
	Downtown	Fiat	E	3	60	120	N/A	N/A	SS
	EHV	Ford	H	4	60 (100)	30	40 (60)	55 (80)	SS
	Zoom	Renault	E	2	75	N/A	25	35	NC
	ECC	Volvo	H	4	110	90 (160)	70 (41)	95 (55)	NC
<b>Japan</b>									
	Cednc/Glona*	Nissan	E	4	65	75	30	40	LA
	Alto*	Suzuki	E	2	65	125	10	13.5	NI
	Libero*	Mitsubishi	E	4	80	155	20	27	NC
	Hijet*	Daihatsu	E	4	55	80	14	20	LA
	Townace*	Toyota	E	5	70	100	20	27	LA
	EV-50	Toyota	E	4	70	155	20	27	LA
	EVX	Honda	E	4	80	95	40	55	LA
	EE-10	Suzuki	E	4	N/A	N/A	4.5x2	6x2	SS
	ESR	Mitsubishi	H	4	125	N/A	70 (20)	95 (27)	N/A
	Dash-21	Daihatsu	H	4	75	280	20 (8)	27 (10)	NMH
<b>U.S.</b>									
	Impact*	GM	E	2	80	90	102	140	LA
	Ecostar*	Ford	E	2	70	100	50	68	SS
	TEVan*	Chrysler	E	5	N/A	95	48	65	NI

Abbreviations: **N/A**—Not available; **LA**—Lead acid; **NI**—Nickel iron; **SS**—Sodium sulfur; **NC**—Nickel cadmium; **NMH**—Nickel metal hydride; **SNC**—Sodium nickel chloride.

Source: Manufacturers

## RECENT EV ARTICLES (CONTINUED)

### THE SHOW GOES ON; Tribune 10/31/93

The Tokyo Motor Show unveiled two electric cars. Toyota's EV-50 was considered one of the most-important cars shown because of potential California sales. The EV-50 has a 72-mph top speed and single-charge range of 172 miles under test conditions. Mitsubishi exhibited a hybrid vehicle, the ESR, with a 620-mile range and a top speed of 125 mph.

### VISIONARY HOPES TO PUT A CHARGE IN BEETLES; Tribune 1/24/94

Steve Rodwin from Seattle has a beetle that runs on electricity. His company, Beetles Unlimited, takes VW Beetles, reconditions them like new and sells 12-15 a month for \$6-8000. The repowered electric version sells for \$ 14,448.

## PUBLIC POLICY

### FIRM WIRED TO ELECTRIC CAR DISPUTE: Tribune 12/26/93

American Brown Boveri (ABB) Advanced Battery Systems Division in Mississauga, Ontario is the supplier of the sodium-sulfur batteries used in the ECOSTAR program. **They anticipate public authorities have the will to enforce the 2% zero-emission regulation by 1998.**

### SHORT-CIRCUIT; Forbes 3/29/94

Two years ago Los Angeles held a design competition and awarded Clean Air Transport (CAT), a Swedish company, \$ 7-million for prototype development. In January CAT filed for bankruptcy without producing a single car.

### IS IT TOO SOON TO JUMP-START ELECTRIC CARS? Business Week 3/21/94

Twelve Northeast states are considering adoption of California's zero-emission requirements. If they do, car manufacturers will have little choice but to gear up for electric car mass production. There are questions about the emission reductions from this move since most electric power production in the Northeast is petroleum based. (Not a problem here - Ed) There is also a question of how EVs will perform in the winter climate.

### BIG THREE UNITED IN FIGHT Tribune Section 17- Transportation (From Reuters)

The Big 3 automakers are expected to muster all their lobbying might to thwart proposed regulations that would force them to sell electric vehicles in the Northeast states. If the proposal is adopted there and in California it would force sale of 100,000 EVs a year by 1998.

## Events

### Third Annual SunDay Challenge March 26-27 Universal Studio Center, Orlando FL

Florida Solar Energy Center 300 State Road 401, Cape Canaveral FL 32920 (407) 783-0300 x-133

### 1994 International Electric Grand Prix April 7-11 Long Beach (Disneyland) CA

Contact Peter Hackes (310) 430-9779

### Exide Electric Grand Prix April 16 Long Beach (Part of the International, see above)

### 1994 American Tour de Sol May 19-28 New York City to Philadelphia

Northeast Sustainable Energy Association 23 Ames Street, Greenfield MA 01301 (413) 774-6051

## **EVents (Continued)**

**Saturn HEV Challenge** June 14-20 Southfield MI  
Bob Larson - DOE (708) 252-3735

**Cleveland Electric Formula Classic** July 9  
Contact Kevin Makell (216) 447-3552

**12th International Electric Vehicle Symposium (EVS-12)** December 5-7 Anaheim CA  
World Electric Vehicle Association PO Box 10412 Palo Alto CA 94303 (415) 855-8799

### **FROM OTHER EV NEWSLETTERS**

**The Vancouver Electric Vehicle Association (VEVA)** raised over \$ 18k from a casino night event and will use the funds to sponsor an Electrathon. Their last meeting featured information on a battery charging system called PulsePak, a system that injects a short-duration high voltage DC pulse that is claimed to reduce charging time and destroys sulfation. The system is sold by Pulse Charging Systems, 2011B Ind. Blvd, PO Box 1539, Rockwell TX 75087. They also gave a passing with honors grade to Michael Brown's latest issue of his conversion manual "Convert It". They published a press release from Ballard Power Systems about a \$6-million development contract from Canada and California to build a prototype electric bus that will utilize fuel cells.

**The Australian Electric Vehicle Association (AVEA)** states that Peugeot (France) is planning to incorporate Ni-Cad batteries in their "106" electric car because of the performance this battery will provide. The expected cost will be about \$ 350/kwh - 7 times the cost of lead-acid. The issue also has a final report on the 94 World Solar Challenge that revealed the winning Honda entry achieved a 84.9 km per hour (52.6 mph) average speed and in their best day covered 802 km. (497 miles) The Biel University entry had an impressive 94% efficiency at the rear wheel.

**The Newsletter of American Tour de Sol** notes that the New York State Energy Research Authority has offered the first 10 NY high schools and college teams entering the Tour a grant of \$ 500 to help cover direct expenses for the 1994 event. USDOE and Argonne Labs will have available a \$ 300 testing and data collection package for the 1994 Tour.

**World Electric Transportation** describes American Flywheel Systems AF20 flywheel car built with funding from the Sacramento Utility District. It has 20 flywheel packages and a 136 HP AC propulsion power train giving it a 0-60 mph time of 6.8 seconds. It will sell for \$ 30k. Clarence also attempts to answer the perennial question, "Why not drive a generator from the wheel to keep the batteries charged?"

**New England Electric Auto Association (NEAA)** featured a 1988 Honda CRX conversion by Larry Cassess of Wayland MA. Original weight 1900, converted 2500 pounds. It has a 120-volt system, Advanced DC motor coupled to original clutch. 35-60 mile range and an impressive 0.32 Kwh/mile energy consumption.

FVEAA PAID MEMBERSHIP AS OF APRIL, 1994

NAME	TOWN	STATE
David B Aarvold	DeKalb	IL
Dr Rodney Bohlmann	Chesterton	IN
Paul Bowerchuck	Westmont	IL
Alfred Brinkmeyer	Lisle	IL
Ron Burian	Madison	WI
Jack Cahill	Lombard	IL
Sam V Calvert	St. Cloud	MN
Tom Cartwright	Dixon	IL
Carl R Chapman	Shorewood	IL
Steven F Clark	Downers Grove	IL
Lowell Conrad	Nappanee	IN
Dale Corel	Elk Grove Village	IL
Frank Delmonico	Berkley	IL
John Emde	Downers Grove	IL
Leonard Fisher	Dublin	OH
William T Forde	Everett	WA
Alexander Glowiak	Westmont	IL
Hendley Hall	Loves Park	IL
Everett Harris	Geneva	IL
Paul P Harris	Lincolnshire	IL
J E Helenowska	Chicago	IL
Richard Johnson	Oak Park	IL
Thomas Kaminski	Chicago	IL
Charles Ketchik	Chicago	IL
James E Ketelle	Port Edwards	WI
Fred Kitch	Riverside	IL
Brian Klosterman	Marion	IA
George Krajnovich	Oakbrook Terrace	IL
Donald Kubick	Elk Grove Village	IL
Lad Kucera	Clarendon Hills	IL
Ray Lacek	Hoffman Estates	IL
Patrick Lynch	Kansas City	MO
Charles Maricich	Calumet City	IL
Quintette McDuffie	Gary	IN
Charles Miller	Elgin	IL
Jerry Mitchell	Glemview	IL
Phillip Mullis	Indianapolis	IN
Bob Munroe	Glen Ellen	IL
Kenneth Myers	St Charles	IL
Richard Ness	Chicago	IL
L J Obiala	Weyauwega	WI
Scott Ortiz	Darien	IL
Raymond Oviyach	Oak Forest	IL
Jim Paulsen	La Grange	IL
Edward E Petrik	Wheaton	IL
Frank Pietrolonardo	Arlington Heights	IL
Forrest Salter	Glen Ellen	IL
Ben Schmid	Munster	IN
William H Shafer	Oak Park	IL
Tim Stevens	Cicero	IL
John Stockberger	Batavia	IL
Robert J Sullivan	Aurora	IL
Charles D Test	Minneapolis	MN
Mark Tilton	McHenry	IL
Carl Tipton	Ames	IA
Vladimir Vana	LaGrange	IL
Alan V Wilson	Beloit	WI
Andrew Wohlert	St Charles	IL
Kenneth Woods	Naperville	IL

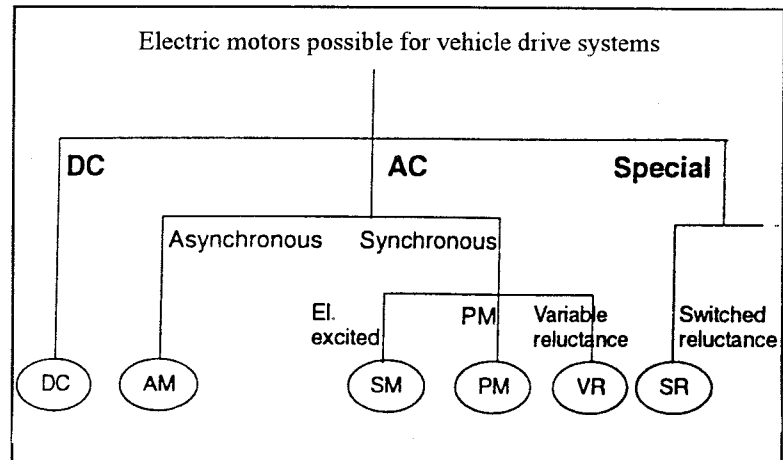
PRESSEZ

Not Available by Publication Deadline (4/5)

## ELECTRIC VEHICLE MOTOR TYPES

Most vehicle conversions made by FVEAA members have utilized aircraft-type generators rated at 28 volts, 300-500 amps. While these were readily available at a reasonable price, the supply has been exhausted. New conversions will require commercially-available motors costing about \$1200-2000 making these the most-expensive item in an EV conversion project.

ASEA BROWN BOVERI (ABB) recently sent the FVEAA a copy of a paper entitled "Drive Systems With Permanent Magnet Synchronous Motors" prepared by Professor Sture Ericksson of that Company. In the paper he presents evidence why this type of motor appears to be the ideal candidate for future electric cars. This article is excerpted from his paper for the information of FVEAA members



Each of these motors has its advantages and disadvantages. The major advantages with DC motors are that they are easy to control and the controllers are fairly inexpensive. The disadvantages are the commutation restrictions, the weight, and relative low efficiency.

AC motors can be grouped under 4 general types. The cost of the DC-AC inverter controller is significantly higher than needed for DC. The familiar squirrel cage AC asynchronous motor is a robust, low cost work horse. It can be operated at high rpm which consequently reduces its size and weight. It has no significant drawbacks except that it requires higher currents.

Three AC motor types are classed as synchronous, meaning the rotor turns at the same rate as the rotation of the applied field. The excited AC motor (Sometimes classed as a wound-rotor motor) has a DC field winding in the rotor which is supplied with slip rings. It has characteristics similar to the AC motor noted in the preceding paragraph. Its major disadvantage is higher cost.

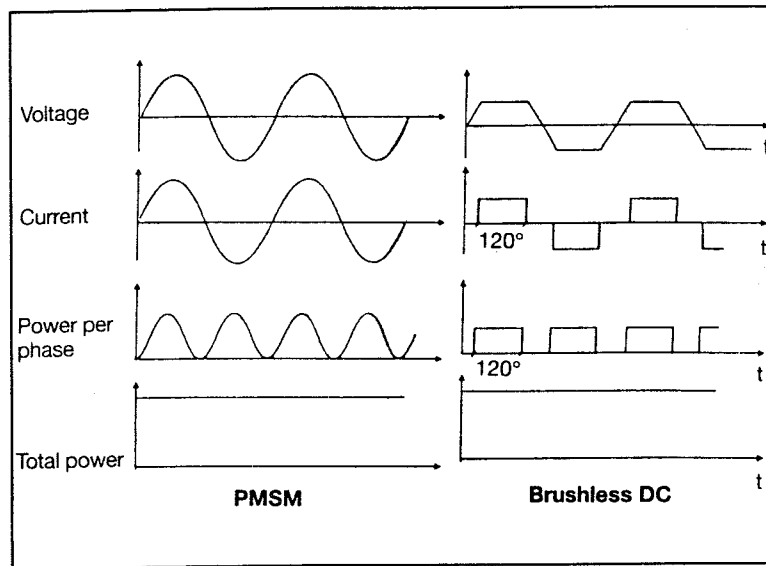
A permanent magnet (PM) motor enjoys high performance; high torque vs weight ratio, and high efficiency. Its major disadvantage has been the high costs for the permanent magnets, but this has been significantly reduced following development of rare earth magnets containing Samarium-Cobalt or Neodymium-Iron-Boron alloys.

The variable reluctance motor is similar to the PM motor. The rotor is fabricated with pole projections that concentrates the magnetic flux to the pole regions allowing torque to be efficiently transferred. It is more efficient than a PM motor. It is somewhat larger and heavier than its PM cousin.

## ELECTRIC VEHICLE MOTOR TYPES (CONTINUED)

The field of a PM motor can be energized with either a sinusoidal or a square wave current. The diagram to the right illustrates the difference between these two waveforms. If a sinusoidal waveform is used the motor is designated as a Permanent magnet Synchronous Motor (PMSM). A square wave is called a Brushless DC motor.

An inverter supplying sinusoidal waveform is more complex and higher cost. The square wave inverter is simpler but the current contains a large amount of harmonic current that produce motor heating, more noise, and a risk of torque pulsation that can affect gear tooth performance.



The size of an electric motor is determined by its rated torque, the magnetic flux density in the airgap space between rotor and stator, and the linear current density in the stator winding. The magnetic flux density is limited by the properties of the iron used while the current density can be higher with forced cooling. Increasing the number of poles can reduce motor diameter and weight.

Field weakening methods have been developed to decrease the flux and increase the torque above a motor base speed. These techniques allow a PM motor to deliver constant max torque from zero to base speed and above this point to deliver constant power until maximum speed is reached. Understanding the principles behind these techniques requires expert knowledge of motor design that is probably beyond the capabilities of most hobbyists and best left to motor design experts.

ABB has participated in the development, manufacture, and application of several types of PM motors. They have cooperated with Unique Mobility and BMW to produce prototype motors that have been tested. These motors are water-cooled and incorporate a reduction gear in a transaxle unit. The motor has a 32 Kw max power, a 140 nanometer max torque, have a 90-91% efficiency, and weigh 38 Kg (84 pounds). Test data indicates a 15% longer driving range with this motor compared with a squirrel cage AC motor. Projected cost for the PM motor with annual production of 20,000 units is 15% higher than an conventional AC motor.

What does this mean to persons who may wish to recycle and convert a car to electric power? Since project cost is a major consideration for the hobbyist a conventional DC motor will continue to be the choice, at least until PM motors are applied in commercial EV's or the hobbyists develop a significant conversion market.