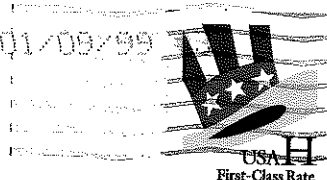


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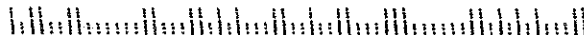


Fox Valley Electric Auto Association  
1522 Clinton Place  
River Forest, IL 60305-1208

**Address Correction Requested**

David B Aarvold  
915 Oak Street  
DeKalb IL 60115 -3470

60115-3470 84



**NEXT MEETING:** <sup>JAN 15</sup> Friday, ~~December 18~~ at 7:30PM in Room K-161 at  
The College of Dupage SW Corner of 22nd Street & Lambert Road in Glen Ellen.

**DISCUSSION TOPICS - 1.** Cindy McFadden from Argonne will present a program on the **FUTURE CAR** Challenge programs sponsored by DOE. **2.** Race Video.

**MEMBERSHIP INFORMATION**

Any person interested in electric cars is welcome to join the FVEAA. The cost for a full year's dues is \$20 which will entitle the member to receive our monthly Newsletter that contains useful information about electric car components, construction, policies and events. Dues for new members joining in December will be \$ 19.

To obtain information about the FVEAA, you may contact either President Woods or Vice President Shafer:

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**JANUARY 1999 PRESSEZ**

1. Cindy McFadden from Argonne National Laboratory will present a program covering the Partnership for a New Generation of Vehicles that is currently under way at the Lab.
2. The 1/4 mile race from a standing start between a V10 Dodge Viper and an electrified Mazda RX7 that was shown recently on cable will be played. The electric Mazda RX7 blew the doors off of the Vipers. This type of racing will bring a new generation to the advantages of electric cars. Race on Sunday; Sell on Monday.

Send in your dues for the coming year, if you haven't already.

Ken

## MINUTES OF DECEMBER MEETING

The meeting at the College of DuPage was called to order by President Woods at 7:35 PM. Sixteen members and eight guests attended.

After a round of introductions, the minutes of the November meeting were approved as published. Treasurer Corel was absent.

Bob Larson from Argonne Laboratory was introduced and gave an informative presentation about the Toyota *Prius* hybrid car. This is the first mass-produced hybrid car for commercial sale. The Lab received two vehicles from the Torrance CA facility; one used for lab testing and one for in-use evaluation.

The general objectives of Toyota in developing the car were:

1. Increased energy efficiency.
2. To meet consumer performance expectations.
3. A 500-600 mile range on a tank of gas.

Increased energy efficiency is achieved by a sophisticated power management system that blends electrical and mechanical power sources in the final drive. A 1.5-liter, 43 kw engine @ 4000 rpm with sequential port fuel injection uses an Atkinson Cycle with variable valve timing. Intake valve opening is delayed during the intake stroke to give 13.5:1 compression ratio and produce a high expansion ratio.

The engine is coupled to an electronically-variable planetary transmission. The output can be split and directed to road power, to a AC permanent magnet motor, or to a generator for battery charging. The overall dimensions of engine-transmission, and generator combination is 30" x 15" x 8".

The 288-volt NiMH battery has 288 cells, weighs 80 lbs and has 2.6 kwh of energy storage. It has a power rating of 21 kw. The state of charge level during operation averages 60% and is managed between 80% and 30%. In-use, the battery capacity is limited to about

15 minutes. There is no provision for battery charging from an outside source.

The generator is rated at 15 kw @ 4800 rpm. The AC motor is rated at 30 kw @ 6000 rpm.

In operation the car starts out on electric power from 0-13 mph. The 30 kw motor is spun to 1000 rpm before fuel is injected to start the engine in about 1/2 second. This significantly reduces cold start hydrocarbon emissions and allows use of a standard catalytic converter.

During running, power management is performed through the functional control of five Engine Control Units (ECU):

1. Hybrid
2. Motor
3. Engine
4. Braking
5. Battery.

Removing sulfur from gasoline fuel is essential to the correct functioning of the system. Presently the *Prius* requires use of specially-blended sulfur-free fuel costing about \$ 5/gallon. In commercial quantities sulfur removal at a refinery would raise the price of gasoline by 2-3 cents/gallon and require significant investments.

The *Prius* presently sells in Japan for about \$ 16,000. Toyota plans to release a US version in about two years that is projected to sell at a break-even price of about \$ 22,000.

After the break, John Emde showed a 120-volt Toastmaster Electric heater Model 2524 that has two parallel 750-watt ceramic heater elements that are easily removable for installation in a conventional car heater. He plans to use it in the conversion of a 1992 Ford RANGER pickup truck he recently purchased. The heater can be bought at Menard's or Wal-Mart for about \$ 17.

Guest George Hamstra described the design features of the drag electric racer the Joliet Group is building. The frame will be completed in the next six weeks. Initially it will be equipped with a modified 9" Advanced DC motor that will develop 1000 ft-lbs of torque.

## MINUTES OF DECEMBER MEETING - Concluded

They will use Hawker Genesis batteries and a Godzilla controller. After testing, they plan to add a second motor and controller for next year's electric drag race competitions.

Member Shafer suggested the FVEAA prepare a program to present at the next meeting of the Clean Cities Fuel Forum at Argonne next spring. Discussion of the proposal was postponed to the January meeting.

The meeting concluded with a discussion of the Clean Cities Rebate program. Two members, Fred Kitsch (Ford Ranger) and George Krajanovich (Dodge Omni) have submitted applications. Several other members are considering an application for a future conversion project.

Submitted by

Secretary Dave Aarvold with meeting notes on the *Prius* taken by Bill Shafer.

## RECENT ARTICLES ABOUT ELECTRIC VEHICLES

**Carmakers vie for electric auto format. Reuters, and Chicago Sun-Times 12/14/98, Page 2A** The conflict between inductive and conductive charging plugs will have to be resolved before electric car sales can take off. GM and Toyota are using an inductive system on their electric cars while Ford, Daimler-Chrysler, and Honda are proponents of conductive charging systems. The two are incompatible.

The situation is similar to the Beta-VHS battle a few years ago for VCR recording formats. While inductive charging may be technically superior and, according to its proponents-safer, it is more expensive. The VCR battle was won by the technically inferior, but less costly VHS system.

The National Electric Vehicle Infrastructure Working Council has initiated a three-year test of conductive systems. Level 2, a 240-volt, 60-amp connection and Level 3, a 500 volt, 400-amp fast-charging system. The SAE has voted to endorse the conductive system. Connector standardization is under way.

(Editor's note) Nothing was mentioned about Level 1, the ubiquitous 20-amp, 120-volt connection used for the vast majority of converted cars. This connection can be readily used for opportunity charging in many locations and does not require a significant investment by either the vehicle owner or utility system. Look for this issue to surface in the coming months when press releases are issued for the coming Detroit, Los Angeles, and Chicago auto shows.

**Honda plans to sell gas-electric hybrid car in 1999. Chicago Sun-Times, December 27, 1998, Page 70B.** (From Associated Press) Honda's "V V" car will get 70 mpg, have a range of 800 miles, and will be suitable for everyday driving. It will unveiled during the Detroit Auto Show. It is equipped with a 1-liter, 3-cylinder, lean-burning engine that will have an electric motor assist during acceleration. It will qualify as a ULEV (Ultra Low Emission Vehicle). It will go on sale simultaneously in Japan, the USA, and Europe.

**At 77, Clintonville woman's hobbies keep her energized. Columbus Dispatch, November 9, 1998.** When 77-year old Emma Soiu drives her bright-yellow "Thunder-volt" electric car along Route 315, passing motorists gape and give her a "thumbs-up" salute. The 1800 pound car can go 60 miles per charge, has a top speed of 75 mph, and is recharged in 3-4 hours from a 240-volt line in her garage. The car has a 120-volt system supplied by ten 12-volt batteries. Some people think it is a golf cart, but it is not. She is a former contract officer for the Department of Defense, took flying lessons at the age of 15, survived three crashes and still wears a back-brace since retiring from flying in 1945.

## RECENT ARTICLES ABOUT ELECTRIC VEHICLES - Continued

**Michigan Sophomore hopes solar car will shine in 1999.** **National Society of Professional Engineers (NSPE) Engineering Times, November 1998, Page 1.** Christian Striffer has been working on the U of M solar car that will be entered in the June *Sunrayce* from Washington DC to Orlando and in the semiannual Solar Challenge to be held in Australia in October. The 950-pound car has an 82-lb, in-hub, axial flux electric motor, lead-acid batteries, and 16%-efficient solar cells. In tests, it has achieved a top speed of 63 mph.

**What customers, (&) automakers say about their electric vehicles.** **NSPE Engineering Times, December, 1998, Page 18.** Driver praise for the Honda EV+ has frequently mentioned the regenerative braking of this vehicle, although improvements; in weight, charging system simplification and less recharging time, and cooling fan noise reduction is still needed. Drivers who have used Toyota's RAV-4, a 5-passenger sports-ute, also report they like the vehicle. Ford Motor Co research on drivers of their *Ranger* have pointed out a need for a 100-mile range pickup without sacrificing comfort accessories - including air conditioning, heating and a sound system. All driver emphasize the current EV price of about \$ 30-45,000 must be reduced.

A related article on the same page states that delivery fleets offer the best prospects for electric vehicles. Ten years of testing electric cars by the Energy Department's National Laboratories have noted an increase in energy storage capability. Many utility companies and governmental agencies are testing electric vehicles in their fleets.

**MAKING THE LEAP** China enters the *Hypercar* race. **Rocky Mountain Institute (RMI) Newsletter Fall/Winter 1998, Page 6.** Huatong Motors will begin producing the world's first commercial-volume vehicle that has a composite/plastic chassis, body, and hybrid drive. The four-door *Paradigm* weighs 1793 pounds, and gets 60 miles per gallon. The company plans to sell 5000 of these vehicles this year and hopes the Chinese government to make it a national car.

**THE VIRTUAL HYPERCAR CENTER.** **RMI Newsletter, Fall/Winter, 1998, Page 7.** Information about the *Hypercar* that was conceived and trademarked by RMI may be found at their Website, [www.hypercar.com](http://www.hypercar.com) The concept is a new type of vehicle that will achieve very high mileage, incorporate a radically different design, use new materials and manufacturing concepts, and has many environmental implications. A full description is under "What's a Hypercar". Other sites include "Hypercars of the future", "Where to buy a Hypercar", and a free bumper sticker if you correctly answer a simple question. Those with a professional interest in the concept should consult the "About the Hypercar" area on the Website.

**Back to the future.** **(Chicago Suburban) LIFE Newspapers, November, 1998, Page 12.** A battery powered tricycle was built in 1890. A six-passenger electric car appeared at the 1893 World's Fair. The *Electrobat*, designed to run on Philadelphia's unpaved streets was introduced in 1894. The *Electrobat* could travel 100 miles @ 15 mph. A later version had a 20 mph top speed and 30-mile range. Even Henry Ford drove one. Customers started to switch to petrol fueled cars in 1912 with the introduction of the Cadillac with an electric starter.

Every auto manufacturer now has an electric vehicle under development.

## RECENT ARTICLES ABOUT ELECTRIC VEHICLES - Concluded

**Ford purchase of electric car company announced.** Chicago SUN-TIMES, January 7, 1999, Page 48. Ford announced at the Detroit Auto Show that it had purchased a 51% interest in PIVCO, the Company that furnished experimental Station Cars for the California trial and developed the *THINK*.

**Chicago Transit Authority (CTA) sells stake in bus technology firm.** Chicago Sun-Times, January 4, 1999, Page 9. When the CTA decided to test three fuel cell buses manufactured by Canadian Ballard Power Systems they received warrants to purchase 200,000 shares of Ballard at \$ 16/share. The CTA board decided there was a conflict between this arrangement and a straightforward analysis of the bus performance so it sold the warrants. Sale price was \$ 58/share so the CTA made a profit. The sale was made just before the three buses were removed from test service.

**Small but Smart. (Chicago) Sun Publications. October 11, 1998, Page 4.** Written by Dutch Mandel of Autoweek. Is the world about to become Smart? Mercedes Micro Compact car developed in cooperation with Swiss watchmaker Swatch is something more than a Lilliputan commuterbox a cute smile, and narrow tires. It may become the answer to our future mobility needs.

About 20,000 SMART vehicles were built in Hambach France in its first year. If it plays in France, can a left-hand drive version be far behind in the US? Space in the two-passenger vehicle is on a par with the front seat of a Mercedes E-Class sedan. The overall length of the Smart is just 5.95 feet and it has a height of 5.02 feet. It has a turbocharged 600 cc, three-cylinder engine that requires 18.2 seconds to propel the vehicle 0-62 mph. The front suspension is a reinforced plastic leaf spring. Tires are a narrow 135/70R-15 that don't produce a limousine- type ride. The car sells for \$ 10,000- 13,000 now.

### FROM OTHER EV NEWSLETTERS

**AVEA, the Australian Group** in their Sept/Oct Newsletter featured a story about electric bus trials in Sidney. Two buses, named the Olymbus after their possible use for the 2000 Olympics) from a New Zealand manufacturer have been tested since February of last year. Rigorous testing procedures included acceleration, speed, duration in zero emission mode (ZEV), noise gradient climb and route timing. The tests have been very encouraging. Top speed loaded have been 30 kph (48 mph), 39% of the route in ZEV mode, and a 20% gradient climb fully loaded. More info on this effort can be obtained from the website <http://www.designline.co.nz>.

The issue has an informative article about building an Electric Vehicle Infrastructure written by John J. Nowicki associated with GM's Advanced Technology Drive Division. There is also a nine-page article written by Tom Gage, business manager for AC Propulsion, describing the history of that company's development of an AC Drive system. The paper was presented at the 1998 meeting of the Electric Vehicle Association of Southern California (EVAOSC).

The AVEA Nov/Dec Newsletter was devoted to coverage of EVS-15 held in Brussels last October. The issue has photos and reports on the electric vehicles appearing at that event. Also included in the issue is an article about the conversion of a Camira that emphasizes the close tolerances necessary when fabricating an adapter coupling between the electric motor and transmission. A mere 1.0 millimeter excess length in the coupling prevented proper shifting of the transmission. They ground 1.5 mm off after disassembly.

## FROM OTHER EV NEWSLETTERS - Continued

The issue also has a six-page article about using the EV for Environmental positioning written by two members of CALSTART. Also included is an analysis of Lead-Acid EV Batteries and an article noting that the Formula 1 governing body has ruled out any electric assist for Formula 1 racers in the future. Their Regulation 5.2 states, "The use of any device, other than the 3-liter, four-stroke engine to power the car, whether directly or indirectly, is prohibited. This means that the Panoz vehicle cannot compete.

**The EEVC December Newsletter, published by the Eastern Group, had another chapter in the Cinnamonsen High School saga of the effort to get the car qualified to compete in the 1998 Tour de Sol competition. Of particular interest was the effort required to obtain a vehicle title for the base Escort.**

The issue notes that Unique Mobility has started volume production of a gearless-brushless motor for wheelchair applications. Dr Paul McReady of AeroVironment was honored by the American Society of Mechanical Engineers for his significant technical innovations that resulted in a better public understanding of the engineer's worth to contemporary society. (Aerovironment did the prototype work on the IMPACT that eventually became GM's EV-1.)

**EV Circuit, published by the Ottawa CA Group, in their Nov/Dec Newsletter had an article written by the innovative Earl Wallingford on a watt-hourmeter for EV use that displays five voltages in a series-connected battery, the elapsed time, the energy used, and motor current. Solid-state components costing an estimated \$ 200 are used and requires software development to implement the displays. There was also an interesting account of how Rick Lane acquired a 1915 Milburn Light Electric.**

**EV News, December Executive Edition from Larry Dussalt's Organization reported on the National Association for Electric Vehicle Infrastructure (NAVEI) meeting in Phoenix. The event drew 500 participants and 50 exhibitors. Daimler-Chrysler's EPIC minivan is now equipped with a NiMH battery that can be charged in less than 30 minutes from a 90 kw on-board charger. Ford's future RANGER pickups will have a NiMH battery that will increase range from 50 to 65-85 miles. GM's EV1 will also be offered with an optional NiMH battery pack that extends the range from 65-95 miles to 75-150. Solectria has an agreement with GM to receive gliders for their electrified Geo Metro which they call the FORCE.**

Paddles or Plugs was the subject of a spirited discussion. So also was the discussion about fuel cells that have a 28% efficiency, twice that of present IC engines but require sulfur removal from gasoline fuel to avoid "Poisoning" the catalyst.

The issue also reports the following US Government funding (In millions) for fiscal 1999 for EVs: Advanced Battery Consortium- \$ 6; Hybrid Propulsion System Development - \$ 23; Fuel Cell Technology - \$ 34; Vehicle Field Testing & Evaluation - \$ 3; Advanced Transportation Technology Consortia - \$ 14.

**Future Drive, the Argonne Lab publication about DOE-Industry Competitions Advancing Automotive Technology, in their Fall 1998 Issue reported that Lawrence Tech's 1998 parallel Hybrid (Diesel) system achieved 75 mpg equivalent using a biodiesel fuel. The 1999-2000 Graduate Automotive Technology Education (GATE) competition will include 10 universities. The DOE Grant is for \$ 200 k to institutions for establishing graduate programs in the areas of fuel cells, direct-injection engines, lightweight material use, hybrid vehicles, and advanced energy storage.**

## FROM OTHER EV NEWSLETTERS - Concluded

An additional \$ 100 k per year is available to each school for fellowships. Information about GATE is available on the web at [www.ipd.anl.gov:80/gate/](http://www.ipd.anl.gov:80/gate/)

Another 1999 Program involves the Ethanol Vehicle Challenge. GM is donating 14 1999 Chevrolet Silvered pickup trucks to universities who will convert the cars to run on A85, a blend of 85% ethanol and 15% hydrocarbon primer.

Further information on the Ethanol Vehicle Challenge can be obtained via e-mail to Cynthia McFadden [cmcfadden@anl.gov](mailto:cmcfadden@anl.gov) or webside [www.transportation.anl.gov/ttrdc/research](http://www.transportation.anl.gov/ttrdc/research). Information about the Future Car Challenge can be obtained at the same e-mail and website.

The experience gained by engineering graduates participating the past Challenges has been an asset. A survey found that 64% of these persons have accepted jobs in the automotive industry.

**EV Update published by the Sacramento Group** in their December Newsletter reviewed their 1998 activities. They note that persons interested in EVs are now opting to lease a commercial vehicle instead of the less-expensive, but more demanding, process of a conversion.

**VEVA, the Vancouver Group** in their December Newsletter reported on improvements in GM's EV1 for 1999. Included is an NiMH battery, a \$ 500/month lease that includes a 240-volt inductive charger, better electronics at about 1/2 the cost of the original equipment, and other revisions.

### REFLECTIONS ON ELECTRIC CAR USEFULNESS WHILE GAZING OUT THE WINDOW LOOKING AT THE WINTER SNOWDRIFTS

January 8, 1999

Chicago got 22 inches of snow over the New Year's Holiday. My contractor has cleared the driveway from my garage to the street that has been plowed. There are piles of snow about 3-feet high on both sides of the driveway.

I'm not about to take my converted Mazda RX-7 out for a drive and risk a motor failure due to salt-laden snow entering the motor compartment, even though I have a belly pan underneath the compartment. The Chicago Transit Authority experienced failure of 300 rapid-transit cars because their open-frame, 600-volt DC motors were shorted out by infiltrating salt-snow accumulations. The people who wrote the specs for these cars are the same ones who bought new transit cars 20 years ago with no air conditioning. I have taken my Honda for a few essential trips.

The extra time gave me an opportunity to update operating statistics for the RX-7 last year. In 1998, I used the EV for 171 trips, each averaging 6.175 miles, for a total annual driving of 1056 miles. My total energy use for the year was 698 kwh, averaging 0.661 kwh/mile. I live in a near-suburban area of Chicago where everything I need can be found within a five-mile radius from my home in River Forest. Within that area there are two major malls, four shopping centers and a host of other businesses. Two grocery stores are within two miles, the post office is 3.7 miles, the drive-in bank just 1.7 mile, and the copy shop that reproduces the FVEAA monthly newsletter is an 11.8 mile round trip.

## EV REFLECTIONS - Concluded

Is the EV economically justified, or merely an expensive plaything? Here's an update on the costs. The Mazda was first converted in 1992. It had a 48-volt system consisting of twelve 6-volt batteries and a aircraft surplus, shunt wound motor that was given to me. Total initial conversion cost was \$ 4225.87.

The acceleration provided by the motor was unsatisfactory for my driving mode so the system was upgraded in 1996. The motor was changed for an Advanced DC 8" series-wound unit. The cost for this upgrade was \$ 2079.63.

A second upgrade was made in 1998 when it was time to replace the original battery pack after six years in service. System voltage was increased to 96 volts using Trojan's 8-volt units and the original 48-volt Curtis controller was replaced with a 120-volt unit. The cost for this upgrade was \$ 987.36. This did not include the cost of the new battery because it is amortized during use @ 11 cents/mile.

The total project cost for initial conversion and two upgrades was \$ 7292.86. It is now time to redo the economic analysis that was published in the FVEAA December, 1998 Newsletter:

Conversion + Upgrade Cost	Annual Cost	Battery Amortization @ 11 cents/mile	Electricity 698 kwh @ @ 9 cents/kwh	Maintenance Costs	Operating Costs Cols 3 + 4 + 5	Annual Fixed Costs (See Note A)
\$ 7292	\$ 1533	\$ 116	\$ 63	\$ 19	\$ 198	\$ 1335

**Note A. Fixed charges:**

Annual depreciation = project cost/15 years of expected life	= \$ 486
Finance charge = 8% of project cost = (.08)(7292)	= 583
Insurance	= 217
License & local vehicle taxes	= <u>49</u>
<b>Total Annual Fixed Costs</b>	<b>\$ 1335</b>

Is my electric car economic? The total annual cost is about one-third the comparable costs for a Ford Escort - and I am extending the expected life of my petrol-fueled Honda by not using it for the short, local trips.

William H. Shafer