



LETTER FROM THE PRESIDENT

DEAR FELLOW MEMBERS:

We are now attempting to obtain engineering drawings of the Gates C.V.T. and will have the opportunity to study its design before we go to Denver to see it.

If time permits, Vana will tell us about the E.V. rally he attended in California last month. Otherwise he will talk next time.

The nominating committee has been unable to obtain a member to run for President. As an interim solution, the Board of Directors has agreed that various persons will share the responsibility until such time that Bill Shafer can assume the duties. At that time I have agreed to serve as Vice President. This proposal of the Board will be voted on at the next meeting. See you there!

Sincerely,

DANA MOCK

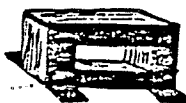
"FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE"

SOLID BRASS BATTERY CONNECTORS
solder on type fits # 00 & 000
can be used on either pos. or neg. terms.



75 ¢ each

STEEL LAMINATED CHOKE CORE
can be wound with 10 turns of # 00
cable. (approx. 12 ft.)



\$5.00

200 AMP. RELAY



24-28 Volts D.C. U.S.A.F.

\$15.00

ONLY A FEW LEFT

BLACK HEAT SHRINK TUBING
use to finish end of battery cables,
shrinks from 3/4" to less than 1/2"
using a gas flame or heat gun.



50 ¢ per foot

400 AMP. RELAY

\$45.00



12 V COIL

Single Post
Single Terminal

Overall Dimensions
1 5/8" L., 2 1/2" W.

LIMITED SUPPLY



ALSO
SOME HEAVY
BATT. CABLE
+ FACE TUBING

ITEMS AVAILABLE AT CWB MEETINGS



Sarco Valley Electric and Communication Inc.

Ratified - July, 1982

ARTICLE II: OFFICERS AND BOARD OF DIRECTORS

- A. **OFFICERS** There shall be five officers of the Corporation: President, Vice President, Secretary, Treasurer, and Property Custodian. Their duties shall be those normally performed by those officers and as outlined in these By-Laws.
- B. **BOARD OF DIRECTORS** The five officers of the Corporation and one additional officer elected by the Board shall comprise the Board of Directors. The President of the Corporation shall also be the Chairman of the Board. The Board of Directors shall meet as necessary to transact any and all business that comes before it as set forth by these By-Laws and amendments thereto.
- C. **ELECTION PROCESS** The four officers and additional board member shall be duly elected by a majority vote of the members present at the annual meeting and shall serve a term of one year from the date of election or until their successors are elected.
- D. **VACANCIES** Vacancies in elective offices shall be filled by a majority vote of the Board of Directors for the interim between the time the action is taken and the next annual meeting, at which time the officers shall be filled as specified in Paragraph C, above.
- E. **REMOVAL FROM OFFICE** A proposal for removal from office of any officer of the Corporation shall be discussed at the meeting such proposal is made, but action can not take place until the next regular meeting. A two-thirds affirmative vote of the membership present shall be required to remove an officer from office.

ARTICLE III: COMMITTEES

- A. **STANDING COMMITTEES** This organization shall have the following standing committees:
 - 1. **LIBRARY COMMITTEE** This committee shall be composed of three appointed members, one of whom shall be appointed as chairman. It shall be the duty of this committee to keep a file of all articles and literature relative to electric vehicle construction and maintain an index of material available to the membership.
 - 2. **PUBLIC RELATIONS COMMITTEE** This committee shall be composed of the Secretary and two appointed members. The Secretary shall serve as chairman. The committee shall publicize the meetings, programs, public exhibits and other work of the Corporation to help keep the members and the public aware of Corporation activities. One appointed member of this committee shall serve as Association Historian.
- B. **SPECIAL COMMITTEES** The President shall appoint special committees and their chairmen as needs arise.
- C. **COMMITTEE VACANCIES** Vacancies on committees (except for the Chairman of the Public Relations Committee) shall be filled immediately by presidential appointment.

ARTICLE III: MEETINGS

- A. **ANNUAL MEETING** The annual meeting shall be held on the third Friday of September.
- B. **REGULAR MEETINGS** Regular meetings shall be held on the third Friday of each month unless changed by the Board of Directors.
- C. **SPECIAL MEETINGS** Special meetings may be called by the Board of Directors as necessary. In addition, any five members may request a special meeting which the President shall call as soon thereafter as possible.
- D. **NOTIFICATION** All current members shall be notified by mail of each Annual, Regular and Special Meeting by the Secretary at least one week prior to the meeting.

ARTICLE IV: MEETING PROCEDURE AND QUORUM

- A. **PROCEDURE** Standard parliamentary procedure shall be the normal authority for action by the Association except in those cases covered specifically by these By-Laws.
- B. **QUORUM**
 - 1. **ANNUAL MEETING AND REGULAR MEETINGS** All matters shall be decided by a majority of those members present and voting except for any matter for which a different requirement is specifically set forth in these articles.
 - 2. **SPECIAL MEETING** A quorum for a special meeting shall be fifty percent of the full membership of the Corporation.

ARTICLE V: MEMBERSHIP

- A. **DUES** Dues shall be \$15.00 per year payable at the regular November meeting. New members joining after November shall pay \$1.25 for each month remaining before the following November.
- B. **MEMBERSHIP-IN-GOOD-STANDING** A member shall be in good standing if his dues have been paid for the current year. Members in good standing shall have voting rights at the annual meeting and at all other meetings.
- C. **FORFEITURE OF MEMBERSHIP** A member may be dropped from membership if:
 - 1. A written resignation is submitted.
 - 2. He fails to abide by the Articles of Incorporation, By-Laws (including amendments thereto) or the policies of the Corporation. Such a case is to be judged by the Board of Directors and is subject to a majority vote of the membership at the next regular meeting if the member in question so requests.
 - 3. Annual dues are not current. The Board of Directors may defer dropping a member for non-payment of dues if it so elects.

ARTICLE VI: CORPORATION PROPERTY AND FUNDS

- A. **OFFICIAL BOOKS** The official books of the Corporation, including the official copy of the Articles of Incorporation and By-Laws as amended, minutes and other similar records, shall be maintained by the Secretary.
- B. **FUNDS** All funds in excess of \$ 50.00 shall be kept by the Treasurer in a bank account. Signatures authorizing the withdrawal of funds shall be those of President or Vice-President and the Treasurer.
- C. **OTHER PROPERTY** All other property shall be under the control and responsibility of the Property Custodian. The Property Custodian shall keep control and cost data on all Corporation owned equipment in a permanently bound book provided by the Corporation for that purpose. Such equipment shall be loaned to and used by Corporation members only, and only for stated periods of time. A member borrowing equipment shall sign for it in the record book. Members shall be required to return equipment to the Property Custodian at the time specified, and shall not lend it to other members for non-members. It shall be the responsibility of the Property Custodian to keep the equipment in good working condition, requesting any assistance needed from Corporation members. Where amounts greater than \$10.00 are required to repair equipment, authorization must be secured from the Board of Directors.

ARTICLE VII: AMENDMENTS TO THE BY-LAWS

- Amendments to these By-Laws may be proposed and discussed at any regular meeting. Proposed amendments may not be voted upon until the next regular meeting. Prior to the next regular meeting, the secretary shall notify the entire membership of the proposed amendment along with the notification of that meeting.
- Adoption of an amendment shall require a two-thirds affirmative vote of the entire membership. Members may vote on an amendment to the By-Laws by proxy.

ARTICLE VIII: DISSOLUTION

- In the event of dissolution of the Corporation, all donated property and funds shall be returned to the donors. All assets shall be sold and the resulting funds along with any other funds the Corporation has shall be used to pay any liabilities the Corporation may have accrued. Any residue shall be divided among the members-in-good-standing.

Independent Power Plants Pick Up Steam

While the utility giants cancel projects, entrepreneurs are cashing in on the need for more electricity.

It's no secret that big utility companies, caught in a financial and regulatory morass, have virtually ceased building new electric-generating plants. Almost unnoticed is the fact that construction of new power projects in the United States is booming.

The answer to this apparent contradiction lies in the spectacular growth of independent power production, a new industry dominated by entrepreneurs

is sold to local utilities, which are required by federal law to buy it at favorable rates. Independents also get generous federal-and-state-tax subsidies. Examples—

■ Synergics, an Annapolis, Md., company, is constructing small hydroelectric projects in New Jersey, Virginia, Maryland and Maine. The four plants, which will cost a total of 24 million dollars, will produce 14.2 megawatts of electricity—enough to light about 4,000 households.

■ Fayette Manufacturing, a firm that builds, installs and operates wind-power generators, has 1,400 wind turbines producing electricity in California's Altamont Pass. The machines produce an average of 300 megawatt hours daily, enough to supply a city of 30,000.

■ Applied Energy Services of Arlington Va., is constructing a 250-million-dollar co-generating plant in Houston. The unit will burn coke from a nearby Atlantic Richfield refinery to produce steam and electricity. The steam will

Natural-gas producers and pipeline companies see electric generation as a way to sell off excessive fuel supplies. Northern Natural Resources plans to construct a 43-megawatt co-generation plant adjacent to Union Carbide's Texas City petrochemical complex. Union Carbide will buy steam and about 30 megawatts of electricity from the plant. The rest will go to a local utility.

The growth of these independent power producers began with the 1978 Public Utility Regulatory Policies Act (PURPA). The federal law requires utilities to buy power from independent generators at "avoided costs"—usually the highest price the buyer would have spent to produce the same amount of power.

At first, the utilities bitterly opposed PURPA, maintaining that electricity produced by independents was unreliable and too costly to consumers. But some companies are beginning to view independent power as a way of keeping up with the growing demand for electricity without the financial risk involved in building huge nuclear or coal-fired plants.

Fluctuating demand. Financial and regulatory problems forced utilities to cancel at least 180 projects in the past decade. Meanwhile, demand for electricity has grown at an estimated 3.5 percent annual rate since the economic expansion began in 1983.

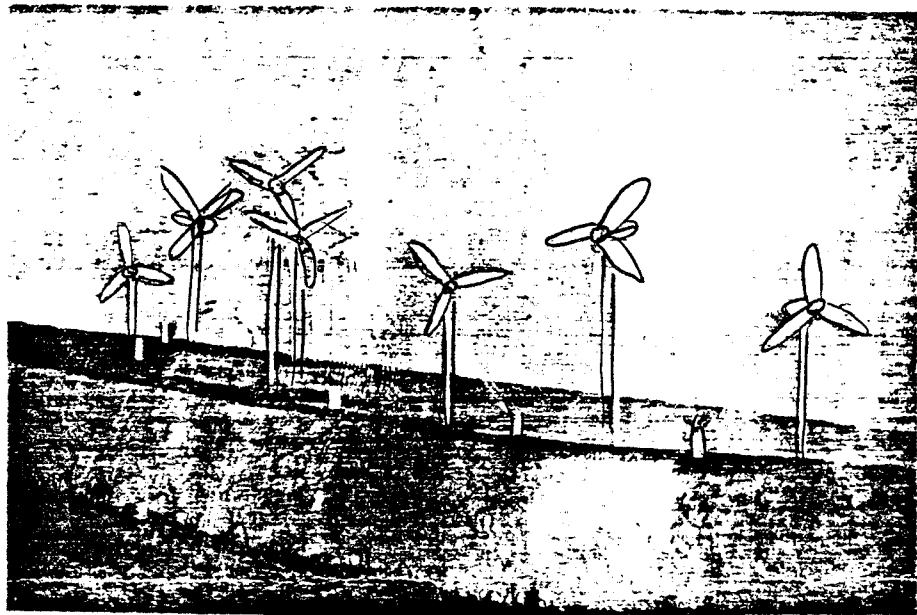
Nevertheless, the utility industry views independents with skepticism. One big question is reliability. Asks David Owens, an analyst with the Edison Electric Institute in Washington, D.C., trade association for investor-owned utilities: "Will they fold three or four years down the road if tax laws change or the favorable regulatory climate changes?"

California, which has done more than any state in the nation to foster independent power producers, wants to slow down their growth. State utility regulators complain that the "avoided cost" formula is too generous and costs California consumers more than they would pay otherwise.

Even some independents admit that they are not the solution to the nation's long-range electrical needs. "At best, we can buy another 10 years—from the mid-1990s to 2005—before the problem becomes critical," says Roger Naill, vice president of Applied Energy Services.

If Naill is right, utilities will have to resume building huge nuclear and coal-fired plants. But independents have demonstrated they have a place in an industry once run just by the giants. □

By KENNETH R. SHEETS



California windmill complex—part of a growing independent power industry.

who raise money from investors and construct small power plants that harness the sun, wind and water or burn trash. Others use coal, oil or natural gas to produce both electricity and steam—a process known as co-generation.

Almost nonexistent 10 years ago, independent power generators now supply an estimated 5 to 7 percent of the nation's electricity and could help the U.S. muddle through a potential electrical-energy crisis in the mid-1990s. "The entrepreneurial spirit is beginning to blossom in the electricity market," says Richard Munson, an activist on consumer electric issues.

Output of these small plants usually

be sold back to the refinery, the electricity to Houston Lighting & Power.

Large companies are getting in on the action. R. J. Reynolds Tobacco Company recently opened an 80-megawatt, coal-fired power unit at its cigarette plant in Tobaccolville, N.C. Half the power will be used by Reynolds. The rest will be sold to Duke Power.

Amoco Chemicals is constructing a 36-megawatt unit at its Chocolate Bayou petrochemical plant on the Gulf Coast of Texas. The natural-gas-fired generator will produce electricity and steam, enabling Amoco to reduce its power purchases by 70 percent, saving 8 million dollars a year.



IDEAS TO THINK ABOUT IF YOU'RE BUILDING AN ELECTRIC CAR.

1. How is the car going to be used ?
2. What kind of terrain do you plan to drive in ?
3. Rate your skills at tackling this project and plan to take classes, read books, and seek technical help from the club.
4. Figure out and set aside expenses for the project.
5. Do you have a place to work on the car ?
6. Don't overestimate the range and top speed of the car. Choose your maximum range and divide it by 2 for every day travel. Plan this estimate around the speed you plan to travel and if it's over 50 MPH cut your estimate in half again. It's much better to under estimate the performance than to be disappointed when you complete the car.
7. Distribute the battery weight evenly front to back and side to side. The car will handle better and be much safer.
8. Don't exceed the maximum rated suspension weight, otherwise you will have to beef up the suspension and brakes.
9. Design in an excess of safety features and emergency cut-off devices.
10. Decide early on the following :
 - A. Conversion - or from the ground up.
 - B. Number of batteries.
 - C. Type of motor.
 - D. Type of transmission.
 - E. If a clutch is going to be used.
 - F. Type of control system.
 - G. Number of passengers you plan to carry.
11. Don't do a conversion on a car that has not been registered for a number of years. (could be tough to re-register)

Simple Windshield De-icer

Hair blow-dryers do a wonderful job of de-icing windshields and keeping feet warm. They draw from .5 Amps to 3 Amps, depending on brand and work on 48-130V DC. At least all that I tested have a 12V blower motor with resistor drop and full bridge rectifier. They do need a fly-back diode or the AC switch will arc and burn out quickly

Diode should have slightly higher amp capacity and over twice the voltage rating, unless appliance has spikes; 3 Amps at 72V for two minutes is nothing to the 400 Amps at 72V your traction motor draws for safety and visibility.

(submitted by Lou MacMillan)



DIRECTIONS

THE EVOLUTION OF THE AFFORDABLE CONTROLLER

Frank G. Willey

In the early days of the E.A.A., commercially available electronic controllers were heavy and expensive, while surplus aircraft relays were cheap, hence many electric car buffs used step-type battery switching controllers. In 1971, an E.A.A. task force, known as "Project X", was commissioned to study and propose an "optimum" car design for our membership, using parts and technology available to the amateur electric car builder. The author's assignment on the committee pertained to motors and controls.

Among the proposed specifications reached were: (1) Gross weight of car about 2500 lb., (2) Battery weight, up to 40% of gross weight, (3) Battery type, deep discharge lead-acid (for price reasons), (4) Car body of low drag coefficient, (5) Low rolling resistance tires, such as smooth wheel-inflated steel radials, and (6) Electronic controller for efficient operation at any required traffic speed.

In 1977, the author started development of a solid-state electronic controller with specified objectives as follows:

- (a) Cost under \$300 (down from over \$250 for others on the market.)
- (b) weight 15 lb. (down from 20 lb. or more).
- (c) Current rating 400 amperes.
- (d) High efficiency at all speeds.
- (e) Usable with either the then available aircraft generators or other traction motors.
- (f) Usable on 36 to 72 volt systems (later extended to 120 volts).
- (g) Constructable by the hobbyist from a complete kit or parts and manual, in the manner of a Heatkit TM, and
- (h) Should serve as an inspiration to other E.A.A. members to produce and sell useful items for electric car builders.

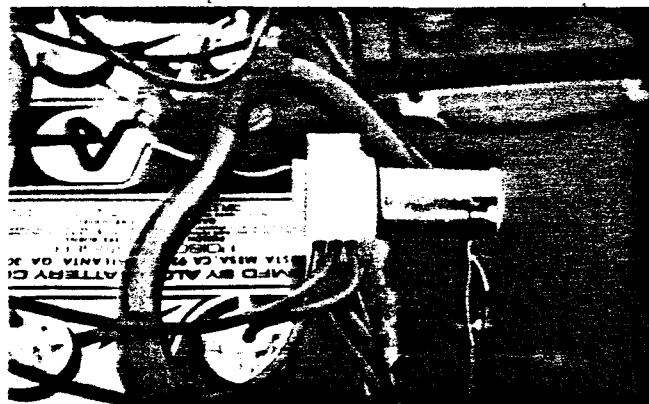
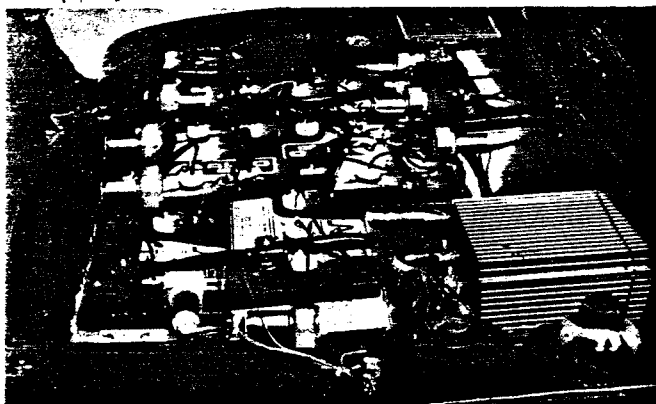
Over the next five years, the author built six prototype controllers, thoroughly testing out alternative circuits, locally available components, and packaging designs. By 1976, the cost of power transistors was becoming competitive with SCR's and in 1977 he offered the light-weight "Model 7" controller to the membership as a complete kit of parts with 66-page instruction manual for \$350 (or \$435 with shunt field controller included).

Earlier, in 1975, the shunt field controller had been offered as a separate product, as a kit or assembled. The controller was designed as a mating printed circuit and heat sink on which all parts were mounted, and an enclosing steel case. The kits included all parts and hardware down to the last nut and lockwasher. The manual gave complete directions for assembly, test, and installation.

The Model 8 followed in 1980, using improved transistors. It was 3" shorter than but externally interchangeable with the Model 7. Preparation and sales of kits and finished controllers were now handled by licensees.

In 1982, the Model 9 raised the maximum current rating to 450 amperes, shortened the housing another 3", and introduced higher-rated, more reliable transistors. By this time, several hundred controllers and kits had been sold, and up to a third of the entries in the Sunnyvale Electric Car Rally were carrying Willey controllers. The I.E.E.E. Society on Controls Systems had recognized the "design and realization of (this) electric car controller" with an Achievement Award. All of the 1972 objectives have been met and surpassed, and others (including former licensees and customers) have been inspired to manufacture controllers and other items useful to the electric car builder.

The Electric Auto Association has proven its leadership in the development of the practical electric car by encouraging these and many other activities, by sponsorship of rallies, and by promotion to increase public awareness of electric vehicles. It is no coincidence that the world records for speed (175- mph, Roger Hedlund 1974) and distance-on-one-charge (215 miles, Saied Motaei 1984) are held by E.A.A. members.



RECIRCULATED ELECTROLYTE UPS ELECTRIC CAR RANGE

Tiny pumps prevent stratification of electrolyte, thereby increasing vehicle's range and halving battery charge time

Lyle H. McCarty, Western Editor

Cupertino, CA—The name of the game with electric vehicles is improved battery performance. But, because engineers have been working battery technology for decades, performance gains are usually accomplished in small, hard to achieve increments.

That is why the work done by Saied Motaei of Cupertino, CA, is important. By recirculating the elec-

trolyte in each of the 96 battery cells in his electric automobile, he has realized an increase of 30 to 40% in the vehicle's range, setting the world's distance record for electric cars. The technique has a further benefit—it reduces recharge cycle time from nine to five hours.

The reason for recirculation is simple enough; it destratifies the electrolyte. Without the pumping, the

Installation under hood consists of pulse-width, modulator-speed control and nine batteries, (above left) each with electrolyte recirculation pump. (Design News photo)

Pump-motor assembly contains three separate pump modules, (above right) one for each battery cell. 1½-inch-dia by 3-inch-long unit circulates ½ gal/min in each cell. (Design News photo)

Saied Motaei and his record holding electric vehicle. Batteries and dynamic braking switchgear can be seen in trunk compartment. (Design News photo)



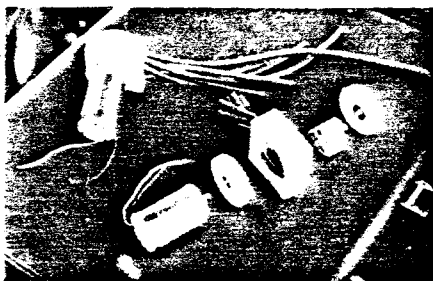
acid in proximity to the plates becomes less concentrated during battery discharge; later the solution slowly equalizes while the battery is idle. It is this phenomenon that causes a car battery, depleted from excessive starter cranking, to have regained some life when the starter is activated a couple of hours later. Electrolyte recirculation makes more of the battery's stored energy available at the time it is needed, and permits the battery to absorb recharge energy more quickly as well.

Recirculation is accomplished by means of a small motor driven pump mounted on each battery. Each pump is driven by a 12V, 450 mA motor at a speed of 30 to 40 rpm. The electrolyte is contained in neoprene tubes; rollers that form the pump rotor squeeze each tube and cause the electrolyte to flow. One tube services each cell, and the total pump capacity is about 1½ gal/min—½ gal/min for each cell. The electrolyte is pumped from the bottom of the battery to the top; destratification is enhanced by an internal baffle that forces the acid to circulate freely about the battery plates.

Motaei, a member of the Santa Clara (CA) Chapter of the Electric Auto Association, constructed the vehicle in 1982 by modifying a 1974 Fiat 128 to accommodate a 20-hp, Prestolyte series electric motor and 32 Alco 6V, three cell batteries. A solid-state, pulse-width modulator speed control provides smooth acceleration through the four gears of the stock transmission. Dynamic braking, accomplished by a switching control down to low vehicle speeds, affords a 12 to 15% savings in battery energy.

Other modifications to the car include high-pressure tires, near elimination of the flywheel, and an additional leaf in the rear springs. The steel hood and trunk lid were replaced with fiberglass; for rallies, the doors and seats are also replaced with fiberglass components. These

Holes are drilled at bottom of each cell and polypropylene tray is welded to battery. Electrolyte is pumped from tray and discharged at top; internal baffle encourages circulation around plates.



Pump uses triple roller rotor to squeeze electrolyte through tubing. Materials are aluminum and nylon. (Design News photo)

measures reduce car weight by 300 lb.

The vehicle, which carries a driver and one passenger, accelerates from zero to 30 mph in about 8 sec, cruises comfortably at 60 mph, and has a top speed of about 80 mph. Its curb weight, as modified, is 3400 lb. Used almost daily since 1982, it has chalked up an operating cost of 1 to 1½ cents per mile including electricity and battery replacement. Battery life is 3½ to 4 years.

Prior to adding the electrolyte recirculation system, the automobile demonstrated a range of 168 miles, all at city speeds of 30 to 35 mph, in a September 1983 rally. In September 1984, with the recirculation system installed, range was increased to 215 miles (a world record) with half the distance traversed at 55 to 60 mph. Equivalent percentage range increase between the two rallies is estimated to be 49%. Besides the record for range, the car set a record in September 1984 by travelling 147 miles in 2½ hours—an average of 59 miles per hour.

Additional details . . . Contact Saied Motaei, 6427 Windsor La., San Jose, CA 95129, 408-725-0849.

Did you find this article interesting? If so, let us know. Circle No. 852

