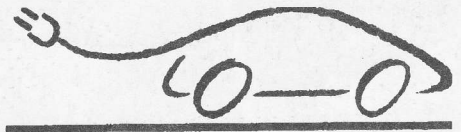


CURRENT EVENTS



September '95

Promoting the use of electric vehicles since 1967

Vol 27 No. 9

Sunrise!

by Clare Bell

The Tour-del-Sol-winning Solectria Sunrise has been a long time a-dawning. Since high school, James Worden and Solectria's co-founder, Anita Rajan, have dreamed of building a highly efficient composite-bodied mass-market EV. The idea incubated throughout their years with the MIT Solar Race Team and during Solectria's early development.

Now the Sunrise has emerged, fulfilling its creators' hopes. Its Ovonics nickel metal hydride pack, built-from-the-ground-up aerodynamic chassis and efficient AC drivetrain made one charge deliver 238 miles in the recent Tour de Sol. They were comfortable miles too. Though Sunrise is no larger than the Honda Accord and at 1600 lbs, weighs less than any car on the US market, it is as roomy inside as a Ford Taurus or Pontiac Bonneville.

During the Tour de Sol, Boston Edison utility employee David Diltz shared the driving with James Worden. He enjoyed the Sunrise's 75 mph cruising and snappy gas-car-equivalent acceleration. Due to the car's light weight, "it has tremendous agility on the road," he said. Sunrise

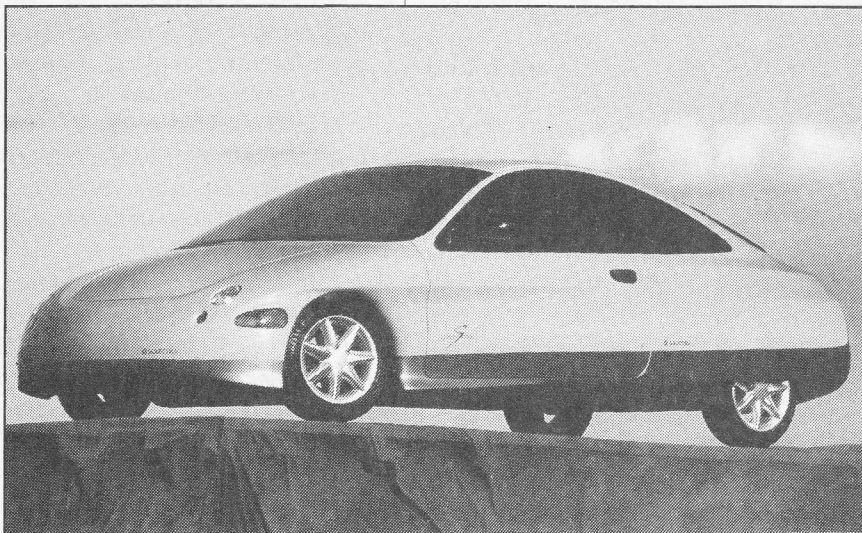
topped all other vehicles in nearly every category, dropping from the leading spot only once when the driver's enthusiasm and the car's performance carried him away — they drew a penalty for speeding.

Driving Sunrise had some other perks as well. Youngsters crowded around the Sunrise as it finished the final leg, asking for his autograph as if he were a tennis or football star. With a delighted grin, the Boston Edison employee admitted that this had never happened to him before.

Spirit of Solectria

In a recent telephone interview with Solectria's media contact, Karl Thidemann and Sunrise project engineer Wayne Kirk, CE learned what inspired and influenced the birth of the new EV.

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Bad News from NY Times

by Clare Bell

had a widespread and damaging effect on public perception of EVs.

On the front page of the 5/9/95 New York Times, Carnegie Mellon researchers claimed that "[EVs] do not deliver the promised environmental

benefits". Study authors Lave, Hendrickson and McMichael argued that lead pollution from EV batteries would damage the environment more than continued use of fossil fuel.

Every EV owner or advocate will soon hear the question, "Well, what about Carnegie Mellon?" Here's the answer.

1. The study is inaccurate and sloppy. In their haste to discredit the EV movement, the authors published a seriously flawed, error-ridden document.

2. Far from being an unbiased independent investigation, the study was commissioned and carried out to mislead the public and dishearten the proponents of EVs.

3. Publicly available information shows that the study received petroleum and auto industry money.

Such a document should have never been published in a reputable journal such as Science, much less picked up and run on the front page of the New York Times. That it was suggests that pressure from established interests forced its publication.

Inaccuracy

The primary point and the one that should receive emphasis is the study's sheer inaccuracy.

In his letter to Science, David Goldstein examines and rejects the

study's arguments, pointing out where mistaken assumptions and mathematical errors have caused mistaken conclusions. The study's errors are numerous, fatally undercutting its credibility:

a. It overstates the battery mass of an "Available Technology" EV by a factor of three. The authors assume a battery mass of 1378 kg (3,032 lb), ignoring the fact that the entire weight of the GM Impact, including batteries, is 1350 kg (2970 lb). Even the 17-year old EVT-1 has a total weight of only 1509 kg (3320 lbs).

Impact's battery pack (derived from the capacity times energy density) is approximately 420 kg or 925 lb

b. It is wrong about the energy density of lead-acid batteries. By confusing kilograms with pounds, the authors mistakenly state that the value is 18 watt-hrs/kg. The correct value is 40 wh/kg or 18.18 wh/lb.

c. It is wrong about the energy capacity of the Impact's battery pack, deriving a capacity figure of 25kWh from the incorrect battery mass times the incorrect energy density. The Impact's battery pack is 16.8 kWhr.

d. It overstates the car's energy consumption as 310 wh/km when the figure is closer to 100 whr/kg. If one takes the car's average range of 80 km times x 310 whr/km, energy required would be 24.8 kWh, greater than the capacity of the battery pack!

e. It uses data from the ETV-1, a 17-year old test vehicle as an example of current technology. EV technology has moved far beyond the ETV-1. As Goldstein states, "it is rather like

Continued on next page

CE's July editorial ("Petro\$\$\$ Fund CM") commented on the funding of a recent anti-EV study by Carnegie Mellon University that appeared in Science Magazine and was summarized on the front page of the New York Times. CE asked concerned readers to ask Science to print a rebuttal letter sent to them by David Goldstein, president of Program Development Associates in Gaithersburg MD. As of CE's press time, they have not done so. In fact, they are holding all comment letters for review by Lave and company before they answer anyone!

Since Goldstein's excellent letter is too long to print here in its entirety, I have, with the author's permission, condensed the essential points and added some introductory and supporting material, including Goldstein's revision of the study's data table. Some text may be a repeat of what I have said before, however, I feel it bears repeating. This is in no way beating a dead horse; this beast is very much alive and still kicking!

Another EV publication, Electrifying Times, asked CE for permission to reprint the July piece and it will appear as a letter in their next issue.

"Environmental Implications of Electric Cars", a battery hazard study published in Science by researchers from Carnegie Mellon University, has

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Bad News

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comparing a Model T Ford with a Chevrolet Corvette." ETV-1 acceleration performance was 0-30 mph in 9 seconds; Impact does 0-60 in 8.5.

f. It underestimates battery cycle life, using the 450 cycle value from the 17 year-old ETV-1, ignoring the 500-600 cycle lifetime of today's sealed lead-acids and the projected 900 cycle lifetime of the new Electrosource Horizon. Goldstein points out that "this factor alone would cut the calculated lead "emissions" by half."

Bias

The authors seize upon factors that support their conclusion and ignore those that don't. Clearly the conclusion was written first and the data selected to validate it. For example:

The authors use their own estimate of environmental lead discharges, based on a Bureau of Mines study that happened before environmental regulations were implemented. They use guesses to estimate current discharges instead of attempting to obtain exact data. To quote Goldstein, "In view of the the authors' careless mistakes throughout the study, one can hardly view these guestimates with any degree of credibility."

"Even if we accept the authors highly questionable percentages," says Goldstein, "the worst-case senario for lead-based waste products would be no more than approximately 3 times (not "60 times") the amount of lead released from leaded gasoline."

However, most of this material would be in a locally-controlled solid waste form - not the air emissions associated with gasoline."

He then points out that it will take two decades for EVs to reach 5 % of the total US vehicle population. Within 5

years these EVs will use advanced battery technologies that offer increased range and greater environmental advantages over ICEs.

According to Goldstein, the study also:

- ❖ Ignores findings by the Union of Concerned Scientists. UCS found that introducing EVs in northern states would reduce CO emissions by 99.8 percent, VOCs by 90 percent, NOx by 80 percent and CO2 by 60 percent. UCS also determined that EVs were significantly cleaner than the even the proposed ULEV gasoline vehicles.
- ❖ Ignores the presence of hundreds of millions of automotive lead batteries already IN the environment. Compared to those, EV batteries will be a negligible addition. Furthermore, despite the increase in vehicle population, data from the Federal Center for Disease Control show that blood lead levels in the US are actually declining.
- ❖ Ignores the percentage of lead recycled in battery manufacturing (97 percent for flooded lead-acids).
- ❖ Ignores the changes in manufacturing facilities for sealed lead acids (cleanroom versus factory floor).
- ❖ Does not consider the positive environmental effect of displacing 10 million ICE cars with EVs over the next two decades.
- ❖ Ignores the damage done by toxic oil spills in rivers, lakes and oceans.
- ❖ Does not discriminate between airborne lead emissions and solid waste slag, which can be easily controlled at the origin point.

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The deadline for articles is the 1st of the month. Articles submitted after the 1st of each month will be retained for future issues of Current Events. Contact Clare Bell, Managing Editor for further information.

If you would like to submit an article for Current Events, the preferred format is on a floppy disk, along with a printed copy of the article. Include camera-ready photos or graphics in TIFF or EPS. Please specify PC or MAC and identify software and version number.

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Sunrise

Continued from page 1

Sunrise is the latest expression of the spirit of Solectria, a vision and design philosophy that seeks efficiency by analyzing and improving every system in the car. All Solectria's vehicles — the solar racers, the Flash and the Force, line up along a common thread — solutions for improved efficiency. Solectria's innovative AC (brushless DC) drivetrain eliminated the energy-stealing transmission. Going from the two-motor toothed-belt drive to a single motor reduced energy loss further. Solectria Forces displayed at EVS-12 gave the driver a choice of three economy versus performance settings via dashboard controls. The cars can be a long-rangers while keeping a bit of pep, mid-performance grocery-getters or outright tire-squealers.

Blue Skies, Hard Reality

Proposals for developing the Sunrise had been out since 1990. Worden and his Solectria team realized, however, that the dream would have to be deferred until their company generated substantial R & D resources.

To turn heads, test out concepts and attract investors, Solectria built the attention-getting Flash, a highly successful and competitive EV racer. It regularly swept the solar and lightweight divisions of the Arizona Public Service Phoenix Solar/Electric 500.

The Flash, the production Force and others became testbeds for components that would be used later in Sunrise. Solectria drivetrains sold to customers and used in solar/EV road and race vehicles provided another testing/proving ground.

Continued on page 5

Technical Specifications

TYPE: 2-door 4-passenger sedan

BODY: Monocoque, composite

DRIVE SYSTEM: 42 kW nominal / 50 kW peak AC Induction Direct Drive with regenerative braking, cruise control and Power Saver (TM) on-dash power level selector.

BATTERY: Sealed Lead Acid or Ovonic Nickel Metal Hydride with battery thermal management for winter driving and onboard battery monitoring and charge control system.

CURB WEIGHT: 770 kg (1694 lb)

PAYLOAD: 310 kg (682 lb)

GROSS VEHICLE WEIGHT: 1080 kg (2376 lb)

WHEELBASE: 277 cm (109 inches)

TRACK FRONT/REAR: 152 cm (60 in) / 132 cm (52 in)

LENGTH: 467 cm (184 in)

WIDTH: 188 cm (74 in)

GROUND CLEARANCE: 18 cm (7 in)

BRAKES: Front and rear power assisted hydraulic disk

TIRES: Low rolling resistance

CABIN HEIGHT: 112 cm (44 in)

OCCUPANT SAFETY: dual airbags, seatbelts

PASSENGER COMFORT: air conditioning, am/fm stereo

HEAT/DEFROST: Maintains 20-25 degrees C (68-77 degrees F) at -10 to 35 degrees C (14 to 95 degrees) ambient temperature

PERFORMANCE SPECIFICATIONS:

Gradability: 20%

RANGE AT 85 KM/ (53 MPH) WITH:

- Sealed Lead Acid Batteries - 200 km (120 mi)
- Ovonic Nickel Metal Hydride Batteries - 330 km

ACCELERATION (FULLY LOADED):

- 0-48 km/hr (0-30 mph) 6 sec
- 0-95 km/hr (0-60 mph) 17 sec

Sunrise

Continued from page 4

Early Light

The opportunity to actually build Sunrise came when the Northeast Alternative Vehicle Consortium organized funding from the Advanced Projects Research Agency (ARPA) and Boston Edison, a Northeast utility. ARPA provided half of the cash while Boston Edison ponied up the rest to develop an EV for its fleets.

Even as the funding wheels started to turn, Solectria moved carefully. According to Wayne Kirk, there was no project kick-off meeting for Sunrise. Instead the task of designing and building the prototype was quietly integrated into the bread-and-butter activities of the company; making, selling and improving the Solectria Force and E-10 pickup.

This was in keeping with Solectria's evolutionary design philosophy and practice. Small advances in all vehicle systems can add up to a car that generates as much excitement as one that incorporates a big breakthrough.

When the money finally rolled in, Worden and his team celebrated energetically, then began bringing the long-held dream to life.

Shaping a Sunrise

Several considerations guided the car's development. Boston Edison wanted a four-seater for its company fleets. Perception of a limited market for a 2-seater combined with a desire to get away from the sportscar/ small-car image of EVs led to the decision. Since the composite body took up much less space than the conventional soundproofed and insulated metal unibody, Sunrise could have a spacious interior without sacrificing aerodynamic efficiency.

Drawings and artist's impressions became full-size mockups at the hands of a new and talented young stylist. The first composite body emerged from the mold. Mechanical and electrical engineers fitted in components and integrated systems, preparing rantically for the car's scheduled debut at the December 1994 EVS 12 conference.

It was time. EVS-12 show attendees crowded into the tent for the one event they couldn't miss. The mystery car's lights began to flash behind the show curtain as the display pedestal turned, but the dimness behind the curtain veiled the car's shape. Then the lights came up, the veil slid away, and there she was: sunny, sweet, smooth and lovely.

Styling does not mate easily with aerodynamic requirements, as was shown in the battle over the exterior design of the GM Impact. In the simplest and best automotive designs, form should follow function, not be grafted on afterwards. In practice, an EV's appearance is often a difficult compromise between aesthetics, space requirements, and aerodynamics.

Happily this is not so with Sunrise. The car's shape has enough of the teardrop or airfoil to slip between the air molecules, yet not enough to turn the vehicle into an anonymous squashed blob. Sunrise's designer must know — and love — the interaction of material and motion. It comes through in every line and curve.

The car's nose with its cab-forward windshield, simple squared-U hood, snub snout and little round headlights, reduces front-end drag. It also gives Sunrise the same approachability and appeal as the Chrysler Neon ("Hi!") or the VW beetle.

(Perhaps Solectria should repeat the classic VW experiment of placing the car in a public parking lot with a hidden camera and seeing how many people come up to pet it! Might make an interesting and inexpensive commercial.).

An unobtrusive but very functional air dam shunts flow past the front wheels while the underpan borrows subtly from the double-hull shape of hydroplaning speedboat. The pan arches toward the car's tail, letting accumulated air out the back. At the sides the underpan blends into the wheelskirts to form farings at the front and rear of each wheel, directing the airstream around them. From the side, the skirting reveals enough of the seven-spoked star hub wheel to keep the rear from looking ponderous (often an aesthetic problem in wheelskirted cars).

Light flattening and creasing sculpts the rear quarter panel without disrupting airflow. The dark gold accent strip visually cuts the panel, making this beastie's hindquarters look jaunty and athletic.

Even the paint — a cheery yellow trimmed in a soft metal-flake bronze — has an essential job to do in creating an impression of swiftness while at rest. The Sunrise borrows the old Porsche 914 trick of looking lower and longer than she really is by use of a dark lower contrast stripe. The black mirror and dark-tinted windows up the coolness quotient by making the car look like she's wearing shades. And the crimson Zorro slash-"S" through the logo adds a nice touch of flash and dash. In some lights or photos (one of mine) it takes on a sort of unearthly neon-pink glow.

Continued on page 8

Bad News

Continued from page 3

Revised Data for Table 1,

Environmental Implications of Electric Vehicles

	C-M Values	Corrected Values
Energy Density of Batt., Wh/kg	18	40
# of Driving Cycles/Batt., #	450	550
Vehicle Energy Req., Wh/kg	310	100
Avg. Distance/Driving Cycle, km	80	73
Energy/Driving Cycle, kwh	25	7.3
Batt. Mass/Driving Cycle, kg	1378	420
Batt. Life Cycle Mileage, km	36000	40000
Lead % of Batt. Mass, %	70	68
Batt. Lead Mass, kg	964	286
Batt. Lead/Life Cycle Distance, g/km	27	7

Using the following percentages, as estimated by Lave-Hendrickson-McMichael, but disputed by the EVIA:

"Pb Releases per Life-Cycle Kilometer"

a. Virgin Prod. (4%), mg/km	1072	286
b. Recycling Prod. (2%), mg/km	536	143
c. Batt. Manufacture (1%), mg/km	268	72
Worst-Case Scenario (note 1), Total mg/km	1340 (note 2)	216.5

Notes:

1. Note that battery manufacturing must use either "virgin" or recycled lead. The two figures can only be combined in proportion to the amounts used from each category. According to latest EPA data (Report to Congress: Metal Recovery, Environmental Regulation on Hazardous Wastes, 1991) battery manufacturing uses 96.8 percent recycled lead. Thus the C-M calculations in the text of "1340 Mg of lead per km", based upon "virgin" lead, are highly biased and inaccurate. The correct percentages for "lead release" are unknown and are also believed to be highly exaggerated in the examples given above.

2. In order for this figure to equal "60 times" the emissions from 1972 leaded gasoline (2.1 g Pb/gallon) as the authors assert, it would first be necessary to compare 1972 corporate average fuel economy (approximately 18.5 mpg or 30 km/gal). The author's figures, however, equate to 60 mpg (97 km/gal), another highly exaggerated figure. Nor is the assertion that "25 percent of the lead remains inside the engine and exhaust" sufficient reason to reduce the gas mileage figures by 25 percent, as the authors propose, since the lead remains in the environment and is released when the vehicle is recycled. Furthermore, a Geo Metro (at 900 kg) is not "comparable" to a GM Impact (at 1350 kg) which carries 50 percent greater mass, and the Geo would not operate properly on leaded gasoline in any event.

Bad News

Continued from page 6

- ❖ Ignores sources of lead such as the heavy accumulation of old paint on bridges (EPA cites this as a major source) and flaking paint on older houses.

There are other points in addition to Goldstein's. Metallic lead enters the environment through various paths. Lead sources include:

Lead weights for tire and wheel balancing. How many tons of these get thrown to the side of the road each year?

Lead shot and lead sinkers used by hunters and fishermen. These are a significant enough source that some states have outlawed their use.

Batteries in industrial trucks and golf carts, which presently outnumber road-going EVs.

Small disposable batteries from consumer electronics, toys, etc. How many AA, C and D cells end up in landfill?

Although metallic lead is fairly inert, interaction with acids or oxidizing agents turns it into water-soluble toxic compounds. This is the process called leaching. Lead ingested by or shot into an organism encounters strong organic acids that transform it. Birds will eat fine lead shot. The pH of their stomachs is 1-2. The toxin kills the bird and is released to do more damage when the carcass decays. Humic acids in soil and acid rain work more slowly (but in much larger quantities) on discarded lead weights.

Study Funding

(Summarized from CE's July 95 editorial) The Carnegie Mellon Science article footnote 19 acknowledges two research grants for their study.

The first, National Science Foundation grant EEC-8943164, for \$13,571,655 is through the Green Design Consortium of the Carnegie Mellon's

Engineering Research Center. Publicly available information on the Internet states that EDRC's goal is "to provide the research and educational base for the development and integration of design methodologies that will make US industry preeminent in design practice." This includes evaluating "marketability (or user acceptability)".

The EDRC's directory lists industry affiliates. Among them are BP America, Exxon Research and Engineering, Mobil R and D, and Shell Development. GRDC Membership is on the order of \$10-20K yearly. Benefits include:

"The opportunity to provide input on research direction and suggest specific research programs"

"Access to: Carnegie Mellon University laboratories and researchers, Green Design research data, working papers, and government research grants through cooperative university proposals."

My personal opinion is that the "Green Design Consortium" is no more "green" than the oil that smears it or the smog that veils it. This is a prime example of industry greenwashing and must be exposed.

The second grant, NSF 9319731, totals \$450,000. The investigator is Lester B. Lave, for a Management of Technology program.

This grant is for a system to measure the environmental consequences of alternative products or designs. It is to be implemented in the the design of printers for a large computer company, however, it also states that "The Ford Motor Company will work with us in transferring the research results...to quite a different setting."

Say, perhaps the (incorrect) "environmental consequences" of EVs and the negative effect of that on their "marketability (user acceptability)"?

What to DO about Carnegie Mellon

1. Write, call, email or fax Science Magazine, requesting that David Goldstein's rebuttal letter be printed in the Technical Forum section, including his revised data for Table 1.

The contact is: Managing Editor Monica Bradford, Science Magazine, Washington, DC. Tel: 202-326-6500, fax 202-289-7562. Science can also be reached by email at science_letters@aaas.org or science_editors@aaas.org.

2. Email Professor Hendrickson at Carnegie Mellon, pointing out the mistakes in the study and requesting a retraction. He can be reached at cth@cmu.edu.

3. Contact the New York Times and let them know your displeasure with their brand of journalism. Their phone number is (212)556-1234.

4. Use this article to counter those who dispute your EV advocacy or ownership. Distribute it to local media, especially to reporters who have previously shown an open mind toward EVs. Ask those who printed the NYT story or derivations from that to give equal time to the pro-EV side of the issue.

My deepest gratitude to David Goldstein for the research in the July 95 CE editorial and for continuing to expose the oil and auto industry's attempts to conceal their attacks on EVs. He is also a member of the Society of Automotive Engineers (SAE) and president of the Electric Vehicle Association of Greater Washington DC.

Make Connections!

by Lee Hart

I spoke with Dr. Robert Mroczkowski, a connector expert at AMP Inc. (the largest connector manufacturer) about battery connectors. To summarize: Connection resistance consists of 3 parts: - wire-to-connector (crimp, screw, or solder joint resistance) - bulk connector resistance (depends on base metal, length, and area) - actual contact resistance (depends on pressure and surface condition)

Wire-to-connector: The key here is to keep the acid out. There are almost certainly dissimilar metals between the copper or aluminum wire and the tinned copper, lead, bronze, or brass terminal. The usual strategy is to use high pressures to crush the metals together, forming a gas-tight acid-proof bond. Or you can depend on some kind of sealer, though he felt they are less reliable.

Note that different metals expand at different rates, so the pressure changes with temperature. That's why for instance, an aluminum wire under a screw, or an aluminum wire crimped into a non-aluminum terminal is no good. The aluminum expands more with temperature, so it gets so tight when it's hot that the metal flows, and THEN gets loose when it cools.

When different metals are involved, you need a spring to maintain pressure despite expansion and contraction. In a crimp terminal, this is usually achieved by making the terminal out of a springy alloy like brass.

Bulk resistance: Most of your voltage drop will probably be in the terminal. A copper terminal is best. Silver would be better, but isn't practical around sulfuric acid because it reacts vigorously. Copper alloys like brass and bronze have 1/2 to 1/4 the conductivity of copper. Lead is worse yet, so you need a huge (=heavy) cross section to compensate.

Contact resistance: The actual contact resistance is only 1% to 10% of the other two, but is the most variable; therefore it gets all the attention.

Two things determine contact resistance; pressure and surface condition (smoothness, and presence of oxides or other contaminants). No matter how smooth you think the surfaces are, they are actually rough at some microscopic level. Shove them together with inadequate pressure, and only the peaks touch. Current has to constrict to flow through these points of contact. As you apply more pressure, the peaks mash down to increase the area. At some point, the metals are in as intimate a contact as they can get. Therefore, contact pressure determines contact resistance. It falls exponentially as pressure is increased, then flattens out so further increases have little effect. Every metal has a characteristic pressure where this occurs.

Tin, lead, gold, and aluminum have high rates of cold flow; that is, they flow under pressure. Therefore you can't make high pressure connectors with these materials; they are usually used only as platings over more stable base metals. So over time, a lead-to-lead connector that depends on pressure (a typical battery connector) will suffer from a gradually increasing contact resistance until it fails. Metals also develop corrosion products on their surface that increase contact resistance.

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Sunrise

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Scarcely six months later, Solectria's team had transformed a rolling prototype into a vehicle reliable and efficient enough to break records at the Tour de Sol. It must have been a scramble from the word go, but the car's performance shows that it was built with care as well as speed.

Costs

Solectria did not forget, however, that even a work of art must be affordable. They projected that Sunrise would cost less to build than Detroit's cars because it has far fewer parts and uses easily manufacturable plastics. It can also be built at small regional factories without heavily automated assembly lines and thus low overhead. If Solectria receives orders for 20,000 Sunrises, the company says they will sell for \$20,000 each.

Carl Gustin, senior VP at Boston Edison, pointed out that companies and government agencies are mandated to increase the percentage of alternative-fuelled vehicles in their fleets. This alone will create a significant niche market in New England for more than 80,000 electrics.

Sunrise's backers envision the new EV as a way to give Massachusetts and the rest of New England an economic boost. The region could become a leader in a new high technology auto industry. No cars have been manufactured in New England since GM closed its Framingham plant in 1989. Solectria is now eyeing that facility as a possible Sunrise production site.

Future Roads

Sunrise will be traveling in company with its stablemates, the Force and the E-10 pickup. In the same way that

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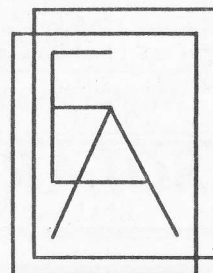
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Announcements

Chapter Listings

Bruce Brooks has the master database for the chapter listings. To be sure your info gets in correctly, PLEASE SEND ALL UPDATES TO HIM!

Elections

Nominations for EAA Board candidates will close 8/26/95. So far we have received only one (Peter Barnes, San Carlos, CA). We need more, especially from members and chapters outside California.

Candidate bios will appear in the Oct. 95 issue of CE and ballots will be inserted and postmarked to increase returns.

Chapters! CE urges you to collect ballots during Oct. chapter meetings and send them in as a batch. That is the most effective way to increase the number of members voting.

Please return ballots by Oct. 31, 1995 so that the Election Committee can present the results to the Board for review and certification.

Annual Meeting

The Board voted to decouple the elections from the annual meeting and instead combine it with a technical symposium (organized by Lee Hemstreet and Stan Skokan) to increase attendance. The annual meeting will be held in early 1996. The Board has authorized travel expenses for out-of-area Board members.

Awards

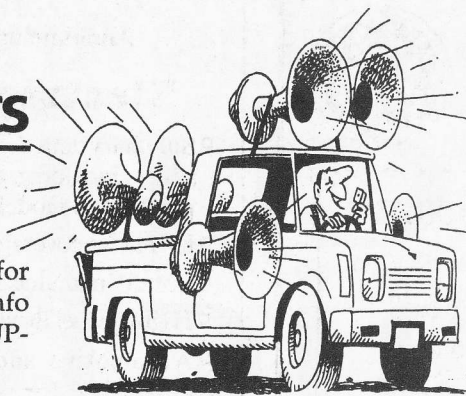
Corporations who install EV charging stations will be eligible for the new EAA Corporate Award. Charging station signs will also be available to individuals and companies through EAA. A pilot run of signs is being set up. Contact Mike Slominski for details.

Event Planning

Sacramento Chapter is starting up its own EV rally. Remember, CE will print chapter rally announcements and forms to help support chapter events. Send them in but keep them short (1/2 or 3/4 page suggested).

Buyers' Guide Available to Chapters

200 copies of the EV Buyers' Guide are available from Don Gillis at \$2 in bulk to chapters.



Sunrise

Continued from page 8

experience with the present production EVs contributed to Sunrise, improvements in components and systems gained with Sunrise will enhance them.

Solectria Vice President Arvind Rajan points out that Solectria designed Sunrise's battery compartment to accommodate both conventional lead-acids, and the advanced Ovonic nickel-metal hydrides that were used during Tour de Sol. Solectria gained familiarity with the Ovonic batteries by running them in the racing Force RS during the 1994 APS Phoenix Solar and Electric 500.

The company has already pioneered numerous EV innovations such as the high-performance AC drive plus vehicle pre-heating and automatic thermal battery management for cold climates.

Predictably, not everyone is viewing the Sunrise with open enthusiasm. John Heywood, director of the Sloane Automotive Lab, is among the those who doubt the practicality of EVs. Interestingly enough, Sloane is part of MIT. Another part of MIT is in the process of proving him wrong; former MIT solar racers James Worden and Anita Rajan. — CB.

Access: Solectria Corporation, 68 Industrial Way, Wilmington, MA 01887, USA Tel: 508-658-2231, fax 508-658-3224. Tour de Sol is organized annually by the Northeast Sustainable Energy Association (NESEA), Greenfield, MA, 413-774-6051. References: James R. Healy "Firm Promises Electric Car with More Juice", USA Today, 12/2/94. David Chandler, "Electric Car Could Give State a Boost" The Boston Globe, 12/2/94. Jerry Harkavy, "Electric Vehicle Rally Ends in Maine", Associated Press, appearing in Record-Journal, Meriden, Connecticut, 5/27/95. Thanks to Solectria media maven Karl Thidemann and Sunrise Project Engineer Wayne Kirk.

Tomorrow Has Arrived... Electric Vehicles

Their Impact on International Business and the Global Environment

A Major Summit Meeting and Conference

Nov. 29-Dec. 1, 1995

Crystal Gateway Marriott, Arlington, VA

Electric vehicles are once again grabbing the spotlight for the fourth time in as many decades, but this time they're causing a much bigger stir. Smog-smothered California already has passed legislation mandating that a percentage of the cars and trucks each major manufacturer sells in that state emits zero pollutants, beginning with 2% in 1998 and rising to 10% in 2003.

And automakers are deeply involved in EV technology. Never before have the governments of the major auto-producing countries had so much input. Never before have the world's automakers around the globe banded together with their closest competitors to achieve a common goal. And never before has there been a sense of urgency.

America's electric utility industry is nearing the launch stage for what promises to be its biggest bonanza since air conditioning became a necessity of life. All across the United States utilities are convinced that volume sales of electric cars soon will be a reality.

With this in mind, INTERTEC® Publishing Corp., publishers of *Transmission & Distribution*, *Ward's Auto World*, *Fleet Owner*, *EC&M*, *CEE News* and *Grounds Maintenance*, is pleased to announce a major new conference and summit meeting focusing on the future of electric vehicles and their impact on international business and the global environment.

To reserve your seat for this important event or for additional information, complete this information card or call JoAnne Romanek at (610) 566-7080 or Betsy Norberg at (913) 967-1865.

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Cocktail Reception, Nov. 28, 1995, 7-9 pm.

Note: All registration fees include attendance at daily sessions, luncheons, coffee breaks and continental breakfast each day and an evening reception.

* Group discounts of 10% apply for companies registering 3 or more people.

Order forms can be mailed to: Betsy Norberg, *Transmission & Distribution* magazine, 9800 Metcalf Ave., Overland Park, KS 66212-2215 or JoAnne Romanek, *Transmission & Distribution* magazine, 1400 N. Providence Rd., Bldg. 2, Suite 1040, Media, PA 19063

* Room reservations should be made directly with the Crystal Gateway Marriott, 1700 Jefferson Davis Highway, Arlington, VA 22202 • Phone: 703-920-3230, FAX: 703-979-6332.

Global Electric Vehicles Conference and Summit Meeting — Program Speakers

TUESDAY - NOVEMBER 28, 1995

- 7:00 p.m. - 9:30 p.m. ● Conference Registration
● Reception ● Exhibits Open

WEDNESDAY - NOVEMBER 29, 1995

- 7:00 a.m. - 8:30 a.m. ● Conference Registration
● Continental Breakfast ● Exhibits Open
- 8:30 a.m. - 9:15 a.m. **Keynote Speaker**
The Future of Electric Transportation
The Honorable **Albert Gore Jr.**,
Vice President of The United States
(Invited)
- 9:15 a.m. - 9:45 a.m. *Impact of Clean Air Act on Electric
Vehicle Development*
Mary Nichols, Administrator, Air/Radiation,
U.S. Environmental Protection Agency
- 9:45 a.m. - 10:30 a.m. *Federal Government & Electric Vehicle
Program Development: Advanced Research
Projects Agency (ARPA) and Partnership for
New Generation Vehicles (PNGV)*
John Gully, Program Manager for EV/Hybrid
Vehicle Program, Advanced Research Projects
Agency, Department of Defense
- 10:30 a.m. - 11:00 a.m. ● Coffee Break ● Exhibits Open
- 11:00 a.m. - 12:15 p.m. *1998 and Zero Emission Vehicles -
California and the Northeast Legislation*
John Dunlap, III, Chairman, California Air
Resources Board
Sheila Lynch, Executive Director,
Northeast Alternative Vehicle Consortium
- 12:15 p.m. - 1:30 p.m. **Luncheon & Guest Speaker**
*Automakers' Viewpoint: California
LEV Program*
Andrew H. Card Jr., President & C.E.O.,
American Automobile Manufacturers Assn.
- 1:30 p.m. - 2:15 p.m. *The Consumer & Fleet Markets
For Electric Vehicles*
Prof. Daniel Sperling, Director,
University of California - Davis, Institute of
Transportation Studies
- 2:15 p.m. - 3:15 p.m. *Battery Development*
Dr. Robert B. Swaroop, Manager Battery
Systems, Electric Power Research Institute (EPRI)
Sam Smith, Vice President, Customer
Support & Marketing, Electrosources, Inc.
- 3:15 p.m. - 3:45 p.m. ● Coffee Break ● Exhibits Open
- 3:45 p.m. - 5:30 p.m. *International Electric Vehicle Design,
Manufacturing & Development*
Michael T. McCabe, EV Marketing and
Sales Manager, Ford Motor Co.
John Schutz, Director & General Manager,
Nissan Research & Development
L. Joe Ferguson, President, Advanced
Vehicle Systems Inc.
Ted Morgan, President & CEO, U.S. Electricar
(Invited)
Joseph G. Baker Jr., Vice Chairman,
Baker Equipment Engineering Co.

THURSDAY - November 30, 1995

- 7:00 a.m. - 8:30 a.m. ● Continental Breakfast ● Exhibits Open
8:30 a.m. - 9:15 a.m. *Electric Vehicle Infrastructure
Development - Role of Electric Power
Research Institute*
Lawrence O'Connell, Manager, Technical
Support, Customer Systems Group, EPRI
- 9:15 a.m. - 10:15 a.m. *Designing an Infrastructure for Today's
& Tomorrow's Electric Vehicles*
Michael E. Docherty, Director, Product
Development Services, Sundberg - Ferar, Inc.
- 10:15 a.m. - 10:45 a.m. ● Coffee Break ● Exhibits Open
- 10:45 a.m. - 11:45 a.m. *Development of EV Charging Systems*
Karen A. Robinson, President,
Electronic Power Technology, Inc.
- 11:45 a.m. - 12:30 p.m. *The Electric Utility Role as Fuel Supplier
for EVs*
Thomas D. Morron, Vice President,
Customer Service & Marketing, Edison
Electric Institute
- 12:30 p.m. - 2:00 p.m. **Luncheon & Guest Speaker**
*Electric Vehicle Technology Competitions,
Racing into the Future*
Don Karner, CEO, & Kevon Makell,
Executive Vice President, Electric Vehicle
Technology Competitions
- 2:00 p.m. - 3:00 p.m. *EVs and Their Impact on the Electric
Utility System*
Ernest T. Morales Jr., Manager of
Infrastructure, Southern California Edison
- 3:00 p.m. - 3:45 p.m. *Electric Transportation Projects - Electric
Fuel Limited and the German Postal
Authority, Deutsche Bundesposte
Postdienst*
Binyamin Koretz, Director, Strategic
Planning, Electric Fuel Ltd., Israel
- 3:45 p.m. - 4:15 p.m. ● Coffee Break ● Exhibits Open
- 4:15 p.m. - 5:00 p.m. *Federal Law and Vehicle Fleets -
Understanding and Integrating Federal
Requirements*
James J. Winebrake, Transportation
Technologies Program Manager,
U.S. Department of Energy
- 5:00 p.m. - 5:45 p.m. *EV America Program Update*
Brad Johnson, Manager, Corporate
Planning, Potomac Electric Power Co., and
Program Manager, EV America

FRIDAY - DECEMBER 1, 1995

- 7:00 a.m. - 9:00 a.m. **Breakfast & Guest Speaker**
EVs in France — The Future Is Now
Jean-Pierre Bourdier, Vice President,
Environment & Communications,
Electricite de France
- 9:00 a.m. - 9:30 a.m. ● Coffee Break ● Exhibits Open
- 9:30 a.m. - 10:15 a.m. *Electric Transportation Projects
at Boston Edison*
James Hogarth, Manager, Electric
Transportation Development, Boston Edison
- 10:15 a.m. - 11:00 a.m. *Electric Transportation Projects
at Virginia Power*
David Roop, Manager, Conservation,
Virginia Power
- 11:00 a.m. - Noon *Preparing the Market for Electric Vehicles:
A Policy Framework for Success*
Kateri Callahan, Executive Director, Electric
Transportation Coalition

CARB Workshop Report (Part 2)

by Bob Muller

At 5:00 P.M., I was called up to present, along with several other auto associations, some supporting the CARB ZEV mandate, some against it.

I decided not to give the whole of my planned speech, since lot of what I was going to say had already been said by others. What I did say was brief.

I pointed out that government that protected the HEALTH of the PEOPLE was the only counterbalance to industries seeking only the WEALTH OF CORPORATIONS. I said how thrilling it was to see democracy in action. How the for-profit-only automakers were doing what good business people should be doing; protecting their bottom lines. And I commended California Air Resources Board for doing what good government reps should be doing; protecting the people under their care.

The audience had some questions for our mixed panel and I answered several. After our panel was done, the 'tax defenders' came up, each one getting applause at just the right moments from their well-fed supporters.

One notable presenter I think of as the 'shark lady'. Her arguments were so good that she was able to hurt everyone who was pro-mandate. She must have been highly paid, because her speech was art. Deadly art, but art just the same. It was revealed during the hearings that the group she represented was financed by WSPA (pronounced 'whisper?'), the Western States Petroleum Association. And I thought the oil companies weren't there!

My friend Tim Carmichael asked this 'tax defenders' panel some very good questions. He asked the 'shark lady' if she objected to the oil companies' tax subsidies as much as she opposed the mandate's costs. She couldn't give a straight answer (of course). She deftly weaseled out by sug-

gesting that if Tim was worried about oil subsidies, he, as a citizen, should act, in the same way that she was acting to oppose the mandate.

There was more, but I was losing energy fast. People often came to the microphones to make speeches instead of asking questions. I remember one pro-mandate guy that was so emotional he could hardly restrain himself.

Although he was on the pro-EV side, his pontificating became wearying as the day dragged on. I even once yelled 'Question?' to try to cut off his speech.

Tim kindly left earlier than he wanted because I needed to be at the airport by 7:45 P.M. As we left I shook hands with the Solectria rep next to his Geo Metro. An individual from the tax fighter group took a picture of our farewell, for what purpose, I don't know. Tim said they would probably use it for some kind of propaganda.

Tim and I had a great talk about the day's events on the way back to the airport. I was so jazzed that I often dominated the conversation, though Tim was courteous as always. On top of all his other work, Tim educates children about environmental issues. This type of work will probably reap the highest and most lasting rewards in the future.

Tim was absolutely right when he said I would get an education that day. I think the EV marketing issue must be dealt with by all of us who want to clean up the air. The automakers brought up valid, 'reality check' areas for us R&D and idealists to ponder and act upon. We have to do more than just educate people about EV's now.

We need to think about the practical aspects of EV ownership. Delivery, financing, maintenance, Marketing.

The Need for EV Marketing

If non-technical people are going to drive these babies, they need to trust this new technology. Constant innovation leads to constant technical difficulties that leads to our perennial 'not ready for prime time' state. I mentioned to B.A.T.'s Bill

Wasson that if we keep trying to make EVs new and better, we'll constantly be in a new technology debugging mode! We need to produce basic, 1960's-Volkswagen type EV's that are as cheap and reliable as we can make them. The KISS Principle, right?

The initial buyers will be idealists, people who aren't afraid to get back to basics, people who add social conscience to their budget decisions. People who are not afraid to be minimalists if the cause is right and the basic functions are ...functioning!

Let's forget about air conditioning, power-whatever's. [Let's stop trying to match the utility level of the ICE cars, that just drives up the complication, problems, and price.] Let's take the basic functionality we have and sell a reliable and cheap vehicle.

My '82 Renault Le Car has no heater, radio or on-board charger, but it gives me 40-50 honest miles per charge. [Since, it was offered at a good price, I jumped at the chance to own and drive an EV.] It fulfills 99% of my commuting needs and my driving conscience is clear.

I'm not saying sell cars with no heaters or radios, but I am saying let's limit the accessories to those two basics. People don't expect an EV to be 'loaded'. Our market is short-distance drivers, anyway. — BM

Bob mueller (rgerard@aol.com) San Jose, CA USAWork - 408-922-6627 fax- 408-923-8049 mci id : 648-9760

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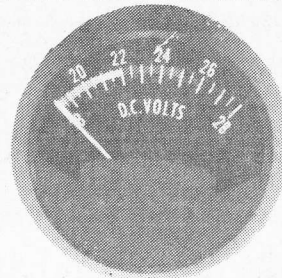
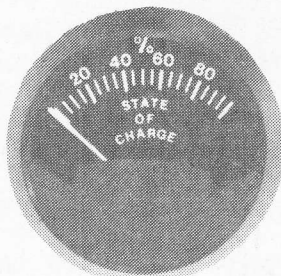
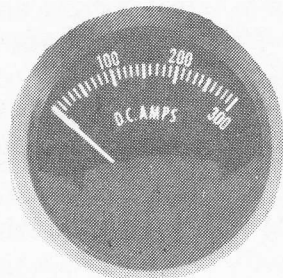
- Our complete component catalog, dynamically updated with latest prices and new products.
- News and editorial comment from our president, Mary Ann Chapman.
- Calendar of upcoming EV events.
- Technical information and conversion tips from our engineering guru, John Witt.
- Tucson Electric Vehicle Association newsletter excerpts.
- Links to other Internet EV sources.



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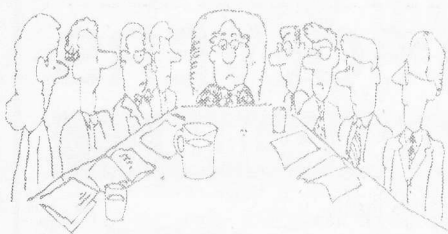
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July 22, 1995

Minutes by Stan Skokan

The EAA Board meet at 10:30 AM at the Cornells' in Pleasant Hill, CA. Present were Harold Bell, Anna Cornell, Hemstreet, Skokan, Slominski, Clare Bell on speakerphone and Gless by proxy. Guest, Technical Assistant Peter Barnes. The Board reviewed the 5/22/95 informal meeting minutes (no quorum for that meeting) and then reviewed and amended the 7/22/95 agenda. Brooks moved to approve the revisions, Hemstreet seconded and it passed unanimously.

Committees

Newsletter

Clare Bell - Bell proposed and moved to publish a 24-page CE every other month. Bruce Brooks recommended designating four technical pages in expanded issues. Clare so moved, Bruce seconded and it was passed with all in favor. Some Board members requested that the EAA logo, dropped from the July CE front page (appearing on the back) be restored. Clare agreed to have it back in place for the Sept issue.

Treasury

Mike Slominski - EAA is in good shape financially, though slightly behind in tabulating dues. Newsletter mailing costs increased, but print cost decreased. A new accounting category was established for the Gillis EAA mailing center. Costs for that are initially expected to exceed income, but that should soon turn around. EAA still

Board Minutes

does not have insurance coverage in Texas and Louisiana due to local laws. Chapters are using the insurance riders for their local events. The cost varies from \$50 to \$75, much less than buying a separate policy. Honorary mention goes to Sue Hollis for increasing advertising income. Skokan showed a six-months condensed financial spreadsheet comparing this year to last. It shows mid-year spending at 45 percent of the budget, less than the 50% projected.

Membership records

Bruce Brooks - U.S. newsletter mailings are slightly down. They started at 1533 in Jan., peaked at 1596 in March and dropped to 1533 in June. The slight drop recently may be due to adverse EV publicity. Internet is the latest source of new members. There are some new chapter start-up requests. Gillis is mailing start-up packages. Harold Bell will follow up. Some selected back-issue CE articles will be put on Internet. No response yet to a call for volunteers to replace June Munro. Clare is putting a promo ad for EAA in Electrifying Times, which is reprinting CE's July 95 editorial about Carnegie Mellon.

800

Anna Cornell - Since Jan 1, the 800 number received 415 inquiries. We are getting 35 to 45 new members per month. Anna recognizes 29 new members as being 800 number contacts. She will send copies of new member info to each Board member.

Activities

Anna Cornell - We have an invitation to bring cars to REDI in Willits, CA. They offer a 30% discount for attendees.

Info Clearing - Lee Hemstreet - Lee reported a contact with CA DMV. As of Feb. 28, 1995, DMV registered 51,547 street-legal EVs. Most of these are probably street-going golf-carts.

Elections

Lee Hemstreet - The committee received only one nomination (Peter Barnes). and needs more. Don Gillis was asked, but declined. Skokan will contact Ruth McDougal about a candidate from Sacramento. The annual meeting date was discussed. Brooks proposed and the board unanimously approved combining the annual meeting with a technical symposium to increase attendance.

Bruce Brooks moved to publish candidate bios in the Oct. CE issue and include ballots as inserts. Nominations would close by 8/26/95 and ballots would need to be returned by 10/31/95. Additional cost for the insert should be less than \$50.

At the Nov. meeting, the board will review and certify the election results. Lee Hemstreet seconded the motion and the Board gave unanimous approval. The Election Committee plans to meet in August.

Annual Meeting

Lee Hemstreet and Stan Skokan - The meeting will be combined with a technical symposium to be organized by Hemstreet and Skokan. It will be held at Hewlett-Packard in Santa Clara, CA. Non-Bay Area Board members will be compensated for travel expenses.

Awards

Harold Bell - EAA needs Corporate Awards to recognize companies who support EVs by (for instance) installing

Board Minutes

Continued from page 16

charging stations. Harold Bell moved to establish such a Corporate Award, Mike Slominski seconded and the motion passed unanimously. A Director Emeritus Award was proposed for John Newell. We need a good name for this award. For this year's Keith Crock Technical Award, Skokan nominated Bob Schneeveis. Stan will order the plaque, which will be presented at the Annual Meeting. Clare Bell nominated Pat hardage for the EAA Fellow Award

Other Actions

EV RN

Brooks delivered a sample chapter start-up manual to Skokan from Gillis. Will Beckett has two professional videotapes. We need a videotape list from Bob Wheeler. Gillis will handle tape sales and loans.

PCL

EAA received a request from the Planning and Conservation league, a pro-EV lobbying group. They wanted to access all EAA members for the purpose of setting up a ZEV activist network for ZEV '98 battles. The Board would not allow them to have our member mailing list. Instead, the Board agreed to offer an insert or special mailing at cost after prior approval of PCL material by Board members.

EV Parking Signs

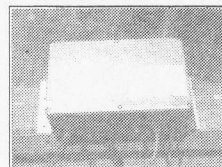
The Board approved a proposal by Mike Slominski to make a pilot run of EV Parking/charging station signs. These will be offered to members and businesses. Hemstreet seconded and the motion passed unanimously.

The Board authorized a phone line for the Cornells to handle 800# calls and fax.

Next meeting

Tandem Computer, Cupertino, CA 10:00 AM 9/23/95.

EV Dc-Dc Converters



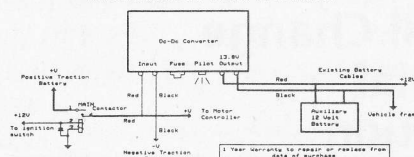
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News in Brief . . .

Contact Timothy Moore of RMI at (970)927-3851 or via the Internet at tmoore@rmi.org.

(London Financial Times: 6/29;
Rocky Mountain Institute: 7/95)

News in Brief... compiled by Ruth M. Shipley from information provided by the Environmental Information Networks. If reprinted, please credit CE and Ruth Shipley.

EVs Will Change Industrial Production

Several recent reports highlight the profound impact EVs will have on many diverse industries.

A report by the British research organization McKinsey & Company reveals that there will be less need for iron and steel forgings, gaskets, fuel systems and metal stampings and a greater need for semiconductors, electric motors, generators, transformers, self-contained chargers, graphite and carbon products and batteries. Demand for these new products is expected to grow by as much as 1,000%, according to the authors.

A report from the Rocky Mountain Institute echoes these findings. The authors of "Hypercars: Materials and Policy Implications" say "hypercars" will be 3- to 4-fold lighter, far simpler and based on advanced-composite monocoques. Each car will use about 94-98% less iron and steel, much less of most other metals, and about twice as much mass of polymers. Most components and subsystems will become much smaller, and many will disappear altogether.

Jump-Start EV Sales

The South Coast Air Quality Management District's (SCAQMD) Governing Board has unanimously approved a \$6 million incentive program to make EVs more affordable for California motorists.

The program will reimburse EV manufacturers \$5,000 for each car sold provided the vehicle sells for less than \$32,000, passes safety tests and can be serviced easily. Consumers may also receive up to \$5,000 in state and federal tax incentives toward the purchase.

This "Quick Charge" plan is the keystone of a \$25 million, two-year program encouraging the development of EVs and AFVs and is expected to cover up to 1,200 vehicles. It will begin July 1, 1996, and will be funded by part of a \$4 annual motor vehicle registration fee that supports programs reducing vehicular air pollution. For more information, contact Sam Atwood or Bill Kelly at (909)396-3456.

(Business Wire: 7/14)

Multi-Car Households Receptive to EVs

EVs may claim a greater market share in California than state policymakers assumed when they drafted the 1998

2% ZEV mandate, according to a recent study by the Institute of Transportation at the University of California at Davis.

"The Household Market for Electric Vehicles," found that a significant number of multi-car households would be interested in an EV as a second or third car and would not find driving range a great barrier. Forty-six percent of those surveyed would prefer an EV over a gasoline-powered vehicle when given a choice. The survey indicates that an EV with a range of 60-115 miles per charge holds enough appeal that 13%-15% of the annual car and light-duty truck market in California could be comprised of EVs. For more information, contact Julie Horan at (916)446-1285.

(Californians For Jobs and Clean Air News: 6/23)

Automakers Testify at CARB Hearings

Representatives of the U.S. automobile industry recently told the California Air Resources Board that the state's ZEV mandate would force EVs on state roads before consumers are ready for them.

Chrysler's William Glaub said his company has sold only 6 electric minivans in California, even though incentives cut the price dramatically and the van had a useable driving range of 80 miles. Glaub said this experience "has left us skeptical, to say the least. Even at near gasoline vehicle prices, the customers were not there."

"Our EV forecasting model indicates the total 1998 EV California

market is approximately 3,500 units, that is both retail and fleet units combined," said GM's Robert Purcell. "This falls substantially short of the 20,000 vehicle sales that are required by the 2% mandate."

"The ZEV mandate has been on the books for nearly five years, yet there is minimal infrastructure in place," said Dr. Richard Klimisch, VP of engineering affairs at the American Automobile Manufacturers Association. "Given the high cost of implementation...it only makes sense to conclude that the necessary infrastructure simply will not be ready for the 1998 model year mandate."

(News reports from Chrysler, GM and the AAMA)

Horizon Battery Powers EV 135 Miles

A four-passenger EV weighing over 2,800 pounds and powered by 13 Horizon batteries traveled 135 miles on a single charge during the five-day Tour de Sol race from Waterbury, CT, to Portland, ME, according to the battery's manufacturer.

"We're obviously very pleased with the performance of our Horizon battery under such tough and competitive conditions," commented Electrosource Inc. President and Chairman Michael Semmens.

Because of their high power and relatively low weight, Horizon batteries have become the battery of choice for many EV racing teams, according to Electrosource. The Horizon battery has powered vehicles in competitions

such as the Sunrayce 95 and the 1995 Hybrid EV Challenge.

For more information, contact Michael Weinstein at (505)298-1800.

(Electrosource News: 7/13)

Fuel Cell Contract for GE

The Department of Energy (DOE) has awarded a \$35.2 million contract to General Motors to develop a methanol-fueled, proton-exchange membrane (PEM) fuel cell propulsion system in partnership with DOE's Los Alamos National Laboratory.

DOE hopes to spur the creation of a light-duty vehicle with little or no tailpipe emissions and three times the fuel economy of cars by today's standards — while ideally maintaining an affordable cost and comparable performance.

(Energy Report: 7/17)

California May Pay Less

California Public Utilities Commission Judge Steven Weissman recently ruled that California's electric utilities can raise only \$166.6 million of the money to fund AFV programs from rate hikes.

Pacific Gas & Electric, Southern California Edison, San Diego Gas &

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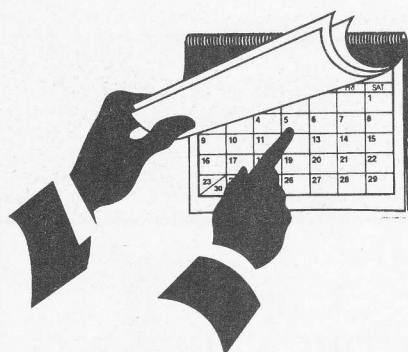
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Electric, and Southern California Gas had originally requested more than \$630 million from ratepayers.

Programs that promote safer, less costly, and more reliable electricity and gas service were allowed. But expenditures to fund lobbying, marketing or advertising were thrown out, as were charges for rebates or certain infrastructure installations.

Weissman said it isn't up to the utilities to sell the vehicles, but to simply provide a safe, reliable and low-cost EV to consumers.

(Sacramento Bee: 7/15)



Events Calendar

Sept. 10 - 1995 Silicon Valley Concours D'Elegance presented by San Jose Lions Club. EAA members are invited to exhibit. For information, contact Jim McCoy at (408) 267-9077 or fax (408) 978-5127.

Sept. 10 - 15 - PCIM '95, & Electric Transportation System Compatibility, Long Beach, California. Second International Conference investigating compatibility issues between power sources and transportation systems including electric vehicles. Sponsored by Intertec International. Location: Long Beach Convention Center. Contact Technical Director, Tel: (805) 650-7070, Fax: 805-650-7054. Or write to 2472 Eastman Ave, Bldg. 33 Ventura, CA 93003-5792.

Sept. 12-14 ElectroExpo '95 in Richmond, VA. Hosted by Virginia Power. This is sponsored by GM. Three days of exhibits and some opportunities for test drives. Vehicles are reportedly new, unseen, as yet.

Sept. 16 Silicon Valley Chapter Rally at 1184 N. Mathilda, Bld #56, Lockheed. Lee Hemstreet is helping to organize the rally. Interested in participating? Call Lee for info and a registration form (415)-493-5892.

Sept. 19-22 Fourth Grove Fuel-Cell Symposium will take place in London, England. Contact the conference secretary at Elsevier Advanced Technology, PO Box 150, Kidlington, Oxford OX5 1AS UK Phone +44 (0) 1865 843721/843659. Fax+44 (0) 1865 843971.

Sept. 25-30 Trade Show in Paso Robles, CA at the Fairgrounds. They are inviting EAA people to exhibit wares and possibly participate in a road rally. This would be similar to the EcoCar challenge of last year. Call Ben Lovejoy at 805-438-4646 for info.

Oct. 19-21 Monaco is having its FIRST EVENT! They are inviting American manufacturers to display, companies (such as our women's team) and teams to race/rally their vehicles. They are also looking for some AMERICAN SPONSORS (you'll get your name out there) MEDA WILL be INTERNATIONAL. Activities include test drives and race events. Both Princes will race too. This is a chance to impress the Monte Carlo Government. Contact Lisa Jeffery via fax at +92 15 03 13. Organization: Editions & Promotions Internationales, S. A. M. 11 Boulevard Albert 1st MC 98000 Principuats de Monaco.

Nov. 13-15 7th annual Sustainable Transportation S/EV 95 at Rhode Island Convention Center. The Washington Times calls this the biggest convocation of EV scholars in the country". Includes breakout sessions on fuel cells, EV technology, business opportunities, an EV tutorial and trade show. Organized by Northeast Sustainable Energy Association (NESEA), 50 Miles St., Greenfield, MA 01301, tel. 413-774-6051

Nov. 29-Dec. 1 Global Electric Vehicle Conference focuses on EVs and their impact on international business and the global environment. Crystal Gate Marriott, Arlington, VA Presented by INTERTEC Publications. Contact JoAnne Romanek, (610)-566-7080 or Betsy Norberg at (913)-967-1865.

Dec. 12-14 North American EV and Infrastructure Conference, held in Atlanta GA at the Stouffer Renaissance Hotel. International EV Synosium and Exposition combined with EPRI's National Infrastructure. Exhibitor info: (415) 855-2050, conference info: (415) 855-2010.

July 31-Aug. 5 Scandinavian Electric Car Rally from Gothenburg Sweden to Oslo, Norway. Tour the fjords in your green machine. Sanctioned by Federation Internationale de l'Automobile (FIA). Begins with a seminar on July 31, then the rally. Submit abstracts of papers to SECR '95. Travel and hotel compensation available to presenters (confirm directly with them first). Contact SECR '95 Box 53, 401 20 Gotenburg, Sweden. Tel. +46 31-62 60 61, fax. +46 31-62 60 66.

1996

Thanks to members of the Internet EV Discussion List who posted some of these items. Calendar info should go to Anna Cornell, (510) 685-7580.

Connections

Continued from page 8

Contact lubricants work. They exclude air and water, so the metal surfaces don't degrade as much over time. Mineral oil and vaseline are the classics; the various commercial products are trivially better, but do tend to stay around longer (they resist evaporating or being washed away).

Measure your connector's resistance; it is the best indication of trouble. If your charger puts out a known current, measure the voltage drops while charging and compute resistance R (ohms) = Volts / Amps.

For example, typical battery-to-battery resistances are: good: 0.0001 ohm (barely any temperature rise after sustained driving) fair: 0.0004 ohm (noticeably warm after sustained driving) bad: 0.001 ohm (too hot to touch after sustained driving; failure imminent!)

Someone claimed a 30% range increase after fixing high resistance connectors. That is ridiculous. It would mean 30% of the battery power was going up as heat in the connectors; many kilowatts! You would have had molten lead and fires! Even a dozen "bad" 0.001 ohm battery jumpers would only drop 2.4v at 200 amps, or 480 watts.

Dr. Mroczkowski said that battery connectors are one of the worst connector applications. His solution? Don't use a connector! Weld the wire to the battery, and put the connector (if necessary) at the end of a pigtail to get it away from the corrosive environment!

Hope this helps (or at least starts an entertaining riot :-)

— LH

<lhart@p02.mn10.honeywell.com>

Electric Hot Plates!



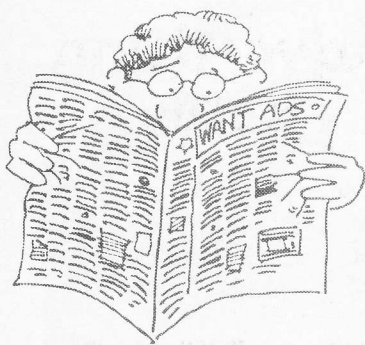
The plate [NOBIGAS], featured in the August '95 CE, belongs to Chuck Olson, of the Silicon Chapter. Chuck's '65 Saab, shown below, placed first in Distance in 1986. Chuck continues to experiment with different batteries and components to achieve the ultimate Saab EV.

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A great buy for individuals or schools. \$1490/obo. Call Paul @ (520) 743-7755 or Suzanne @ (520) 325-7586 or write to PO Box 5186, Tucson, AZ 85703. Will deliver within Tucson+ area.

FOR SALE: '62 Sunbeam Alpine, 2-seat, convertible, Prestolite, Curtis 1221, 132v, Invicta GLRs custom dash, gauges. \$6500. Call Paul @ (415) 324-8541.

FOR SALE: '81 Subaru G.L. Wagon, 2 WD, 108v system, PMC Controller, Prestolite motor, Trojan batteries, K&W charger. All new 4/93. \$6,500. Call Harold @ (804) 798-1818.

FOR SALE: '81 Comuta Car. Very good condition; low miles. Needs only 8 batteries and you're on your way. Come take it away. \$3400. Call Murad @ (508) 481-0114.

FOR SALE: '81 Jet Electra (Subaru) Vans (2) One fully functional with new batteries; other complete but not running. Manuals and many spare parts. All \$9500/obo. Call Monroe @ (415) 941-0433.

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WANTED: EV with the following: 50-70 mile range; 6-passenger seating; on-board charger; quality conversion (or new); safe; good documentation. Contact James (408) 741-0954 or FAX: (408) 867-6100.

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\$7 for the first 25 words. Each additional word, 25 cents.

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Send check payable to EAA, 18297 Baylor Avenue, Saratoga, CA 95070. Want ads must be received before the 1st of each month and must include payment to run in the next issue of CE. If you want to run your ad in more than 1 issue, please specify and include payment for each issue requested.

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3 ads	\$100 ea
12 ads	\$75 ea

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1 ad	\$100 ea
3 ads	\$75 ea
12 ads	\$50 ea

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The Deadline for camera-ready copy is the **1st of the month**. Copy received after the 1st will be run in the next issue. Ads will be placed in the priority received. Prepaid ads will receive 1st priority.

Contact Susan Hollis, Advertising Manager, for additional information or assistance at (408) 374-8605/FAX (408) 374-8750.

Make check payable to EAA. Camera-ready copy and payment for the ad should be sent to:

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