Electric Auto Association

CURRENT EVENTS

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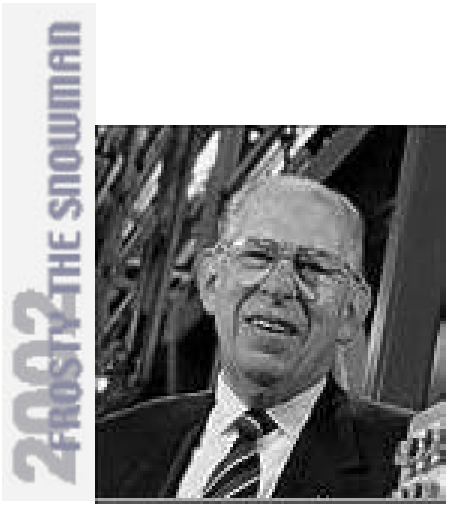
2002 AWARDS
(the envelope, please)

By Chip Gribben, EVA/DC member and webmaster

The New Year promises to be a challenging one for the EV community. With *EV-1* owners in the last days of their lease terms, hybrids gaining in popularity, the *Th!nk City* in limbo and the *California Air Resource Board* cowing to the auto industry, what better way to end the year than to honor those who made an influence in 2002.

And without further adieu, the awards. . .



Just when you thought Ex-GM CEO **Robert Stempel** has melted away, he magically appears to announce plans to produce an affordable four-passenger EV. Stempel, who is currently Chairman of the Board of Energy Conversion Devices (ECD), says the EV will incorporate Nickel-metal Hydride batteries (NiMH) that ECD currently produces. Hopefully, his dream of a mass-produced EV won't melt away like those before him. ECD has also broken ground on a new plant in Ohio that will manufacture NiMH batteries for the growing hybrid vehicle market.

Ford, whose *better* idea was to produce a neighborhood electric vehicle (NEV) with the **Th!nk City** has taken the program to new heights . . . a cliff that is. The program has since been dropped. Will the *Whos* ever get a chance to tool around *Whoville* in a Th!nk? We think not. In this story, the *Grinch's* heart still remains two sizes too small.

This year's *Santa Clause Award* goes to the California **Air Resource Board** (ARB) for their generous gift to the automobile industry . . . a *clause* in the form of a reprieve to delay the EV mandate. The lawyers for the auto industry made a list and Santa's Elves, the CARB lawyers, checked it twice. Santa determined the little boys and girls in Detroit were good children after all.

Without a doubt GM earns the dubious distinction as this year's *Scrooge*. The **GM EV-1**, one of the most technically advanced EVs offered to the automotive consumer, will soon end up as nothing more then a twisted conglomeration of plastic, aluminum and silicone as it meets its fate in the jaws of a crusher. For those spending their final days with their EV *Tiny Tims* this is a year of mourning. Unfortunately, no *Ghost of Christmas Past*, *Present* or *Future* will unshackle GMs resolve to deep-six the EV-1 program.

This award is presented to all the **die-hard EVers** in the world who continue to rally behind the EV and those who continue to believe EVs are an environmentally viable form of transportation and a means to reduce our dependency on foreign oil.

Congratulations to all our winners and Have a Happy New Year.

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COVER STORY

Graphics by Chip Gribben

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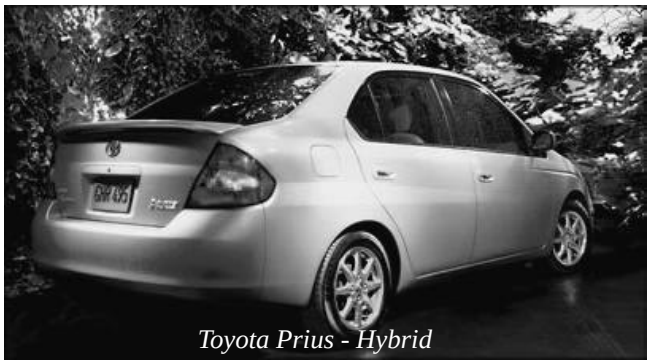
AC Propulsion's Tzero - bEV, PbA


GM's EV-1 - bEV, NiMH


Toyota Prius - Hybrid


Lamborhinni - Gas

UNpopular Science

By William Korthof

Written in response to a colleage's email about an article in Popular Science and the public's general mis-understanding about EV's efficiency.

>Despite their reputation, electric cars are almost never as fuel efficient as gasoline cars. The reason is that the energy consumed by a car is a function of the mass multiplied by acceleration; electric cars have heavy batteries, and hence they almost always consume more energy than an equivalent gas car. On the emission side, if the electricity powering the car came from a coal burning plant, it can mean that the car is responsible for higher total emission levels than a gasoline powered car.

Where do they come up with this bogus garbage!?!

Electric cars are THE MOST ENERGY EFFICIENT VEHICLES on the road, period. When you compare the vehicle efficiency of every single electric-powered vehicle to comparable combustion engine vehicles, the electric vehicle is more efficient in every case.

Sorry for the English units, but here's my quickest conversion:

AC Prop. Tzero:	819 BTU/mile
EV1 PbA:	853 BTU/mile
energy use	
RAV4 EV:	887 BTU/mile
Nissan Altra EV:	989 BTU/mile
EV1 NiMH:	1263 BTU/mile
energy use	
EV Plus:	1433 BTU/mile
Ford Ranger EV:	1672 BTU/mile
Chrysler EV minivan:	2047 BTU/mile
Ford Postal EV:	2389 BTU/mile
CNG Civic:	3485 BTU/mile
Toyota Prius hybrid:	2250 BTU/mile
Honda Civic:	3150 BTU/mile
Toyota Camry:	4107 BTU/mile
RAV4 ICE vehicle:	4423 BTU/mile
Ford Ranger 2WD:	4790 BTU/mile
Chrysler ICE minivan:	6052 BTU/mile
Postal ICE vehicle:	7187 BTU/mile
Lamborghinni (vs Tzero):	14375BTU/mile

Note the BEST ICE-powered vehicle shown (Civic) uses 32% MORE energy than the biggest energy pig in the electric category.

In comparing vehicle-over-vehicle energy use, the gasoline vehicles typically use FOUR TIMES AS MUCH energy!!!! The Tzero is over FIFTEENFOLD more efficient than Lamborghini, yet still accelerates faster!!

Now when you add in the total fuel cycle with upstream emissions, the EV generally has a lower overall efficiency advantage, but offers huge advantages in energy diversification, lower overall emissions, and emissions controls that are 100% reliable. Show me the ICE car that can run off renewable solar or wind power...

>The thing is, Popular Science is just about one half step removed from the supermarket tabloids. Their reporting is credulous and poor on many subjects. Sadly, they re read by a lot of people.

Apparently!!

William Korthof can be contacted at wkorthof@earthlink.net

2,913,357 miles driven by EAA **EV**s, as of 12/31/02, as reported by membership renewals.

THE PROMISES OF ZINC-AIR (BATTERIES)

By Dave Goldstein, EVA/DC president, and others (as noted)

Correct on both counts, although the distinction between a metal-air battery that runs on "Oxygen" and fuel cell that runs on Hydrogen, is somewhat blurry. The fundamental difference is that the zinc anode (positive battery plate) gets "used up" in the process and becomes zinc-oxide, which can then be recycled into a reusable zinc battery plate — a process that can go on almost indefinitely with the aid of removable battery cassettes. It is the air or oxygen cathode that gives a Zinc-Air "fuel cell" its amazing Energy Density, about 6 times that of a Lead-Acid battery.

The Zinc-Air system developed by Electric Fuel is more expensive, initially, than other types of EV batteries, largely because of the investment required for the regeneration facility needed for the zinc anodes, but it is *far cheaper* than the investment required for hydrogen fuel cells and the associated hydrogen infrastructure requirements (hydrogen separation, pumping, compression and storage) and the system has been demonstrated to work effectively in *all weather conditions* in heavy vehicles, notably 7 ton Daimler postal delivery vans used by the German Postal Service, which can travel well over 250 miles on a "charge".

Although Zinc-Air "fuel cells"/ batteries are less efficient overall than Lead-Acid, NiMH or Lithium batteries, they are *more efficient* than Hydrogen fuel cells when the H2 infrastructure is factored in. Z-A also has lower power density (W/kg) than the other batteries mentioned previously, but again, better than hydrogen fuel cells, which is why the discussion of Ultracapacitors has taken on added importance.

Electric Fuel has also demonstrated an E-Bus powered by its Zinc-Air modules in combination with a NiCad battery pack. The advantage of the NiCads is that they provide added peak power for acceleration and can accept *regen* energy, which the Zinc-Air battery cannot. In normal operation, the long-range Z-A's recharge the NiCads while providing all of the needed motive and accessory energy for the bus or heavy vehicle.

Dave Goldstein: There are no Oxygen tanks used in a Zinc-Air battery. Instead, the Oxygen comes from ordinary everyday air. When the zinc material reacts with the oxygen in air, it releases electrons and forms zinc oxide powder (same stuff that snow skiers use to protect their lips). This is similar to the reaction inside a hydrogen fuel cell, in which Hydrogen and air are combined, releasing electrons and forming a byproduct — water!

If the Zinc gets used up completely in a Z-A battery, it runs out of "charge". The same thing happens when a fuel cell runs out of Hydrogen. I drove a Hydrogen Fuel Cell sedan at EVS17. A compressed Hydrogen tank filled the entire trunk, but the vehicle had only a 50 mile range between Hydrogen "recharges."

Zinc-Air can do a lot better than that. Many different types of zinc anode materials have been tried, including zinc slurries, pellets and even thin rolls of zinc film that work like a camera. Electric Fuel uses solid plates (not "rods") inside removable cassettes. This is the only Z-A system that has been shown capable of powering *heavy vehicles* like 7 ton cargo vans and even big buses, with extended range.

When the Zinc is used up, the cassettes are replaced in about 15 minutes with fresh cassettes, which is why this is called "mechanical recharging." The old, spent cassettes are put through a *regeneration* process in which the zinc oxide powder is recombined into solid zinc plates, and the cassettes are then ready for reuse again and again.

This system is probably best suited for *fleet operations*, as opposed to individual EV use, because of the high initial cost of the "regen" facility. But it is not out of the question to think about a future in which service stations — or former "Jiffy Lubes" — will offer quick-change Z-A battery cassette service for private owners. This is not unlike the huge and expensive Hydrogen infrastructure requirements envisioned by Fuel Cell proponents.

In the meantime, for individual EV conversion owners, it is hard to beat the cost-effectiveness of flooded lead-acid batteries like the T-105 or US-105!

David Roden: I'm not saying ZnA batteries aren't one possible solution for EVs, and I don't want to diminish their importance. But calling this "mechanical recharging" is, in my book, just semantic games. Zinc-air, aluminum-air, and similar batteries are ~primary~ batteries. That is, they are non-rechargeable. The only difference between them and zinc-air hearing aid batteries is that instead of being discarded when they go flat, they're rebuilt.

Again, this isn't necessarily bad (though the necessary infrastructure, as you point out, isn't trivial), but I think it's less than cricket to suggest that zinc-air batteries are rechargeable. They're not. That's significant in terms of vehicle design and user convenience.

Non-rechargeability may turn out to be an advantage for someone in the long run, perhaps for corporations which like to control markets as the oil companies now do with transportation fuels. But, IMHO, it's not a good idea to sidestep it by calling battery rebuilding (or refueling if you will) "mechanical recharging."

Lonnie Borntreger: Sounds perfect for a new function for "gas" stations (could even be set up like walk-up "ATMs").
1- Pull up in your car,
2- open a side panel on your car,
3- take out the old "cassettes",
4- slip them and a credit card into the appropriate slots of a zinc "cassette dispenser",
5- the "dispenser" determine the amount of "life" used on the old "cassettes",
6- the "dispenser" charges you for the amount to "recharge" them,
7- dispenses already charged "cassettes",
8- you place new "cassettes" in car and drive off,
9- the old cassettes are "regenerated" and placed into the "output" tray for another customer.

NOTE: each "dispenser" would have to have a couple hundred charged "cassettes" preloaded so that you wouldn't end up with all the dispensers being out of charged cassettes.

Should take less time than filling the gas tank, and a LOT less time than recharging the battery pack. Cool!

Rich Rudman: Metallic Power was doing something like this. They had some impressive literature, and looked like they were going places. But.... I have heard nothing in quite a while about them.

Zinc Air needs to be place in the same low power, Slow to turn on, slow to turn off category as Fuel cells. They will need a Low resistance high current battery pack to complete the "Energy Storage" battery. Both technologies won't be able to supply the high starting amps that EVs need to be safe and practical.

But having a 5 to 10 Kw Fuel cell or ZnAir recharge system is a Very good idea. The post about Super Caps adding +25% range to a ZnAir is to be expected. Anything that load levels on a Low power charger really helps.

For us Home brew Evers.. ZnAir has to be really cheap. Once installed.... the "cassettes", canisters, What ever need to be As cheap as buying the Juice straight from the socket. This is going to get hard to do. But Plugging in 20 to 50 Kwhr of charger, that has the 5to 10 Kw extraction rate, is a nifty range extender. Cute idea is off the Wall for in town, and Buy some ZnAir cassettes for longer cross country work.

Also electro winning is a standard Mining and ore extraction process. A Zn Air recharge plant is going to look and smell a whole lot like a Zinc smelter. The active electrolyte is KOH same as NIcads and NiZns (evercell). Replacing cassettes will require you to open replace and reseal the KOH loop. Then purge and restart the system. I don't know how "Plug and Play" you can make it. I have a feeling that this last little bit of "Real life with Zinc Air" is why we don't have them in our home brew hands yet.

Now if we could just use all those old Alum Cans laying about as a few hundred Watt hour each... Then we would have some real recycle appeal.

Vintage EVs in Australia

By Tom Dowling, Chico EAA member

When I was in Australia in October, 2001, I attended a rally of the Australian Veteran Car Club, held in Canberra, the Australian Capital. There I saw an original 1903 Baker Electric. This car was imported to Australia from the Baker Motor Vehicle Company of Cleveland, Ohio, when new. It has the original 24V DC motor. There were two new 12V batteries in the battery box behind the seat.

This 1903 car is in running condition. It participated in a parade, driving several miles to a picnic site. It has chain drive to the rear axle. There's no differential. One of the rear wheels is free-wheeling, so it's one-wheel drive. One-wheel brakes, too! Top speed is about 10 mph.

EVAA Electric Transportation Industry Conference 2002

Conference & Exposition December 10-13, 2002 Hollywood, Florida

By Mark E. Hanson Copyright 2002

Key elements of the conference were cars on display, fuel cells, infrastructure, testing, seminars, and the ride and drive program. An initial overview entitled "National Energy Security" was presented at the starting plenary session and it set the theme of reducing reliance on foreign oil. Throughout the conference the agenda emphasized that federal dollars have been changed from EVs and hybrids in the previous PNGV program (now cancelled by the Bush administration) in favor of the "FreedomCar" initiative towards a hydrogen based fuel cell economy.

There was more emphasis on fuel cell conferences and infrastructure, i.e. "gas stations" for national hydrogen delivery to these proposed vehicles. Noticeably absent were improved battery technology seminars that were prevalent in previous years. The oil companies and government seemed to embrace the hydrogen based economy better than EVs since hydrogen can be distributed like oil and highway taxed at the pump.

I noted from attending the session on Building a US Hydrogen-based Economy that building infrastructure would cost $2 trillion and be similar to putting a man on the moon or building the interstate highway system, and would take until the year 2030 to fully implement. Much of the infrastructure would have to be replaced. There must be 40 megatons of hydrogen produced, stored, and distributed per year to fuel 100 million cars. Bush made an announcement during the State of the Union speech regarding funding on this hydrogen based infrastructure and fuel cell vehicles and will include the initiative in the 2003 Energy Bill.

Even though the general consensus of the vehicle manufacturers was that fuel cell vehicles would be available in 2010, they would not be affordable (below $100k) until 2030. Thus with formidable obstacles, cost, and infrastructure it will be a long time before we see practical affordable fuel cell vehicles. This directional push appears to be more political than scientific. After pressing speakers on this issue in the fuel cell seminars, they conceded that direct burn hydrogen piston engines starting with Ford and BMW by 2004 would probably be available first due to their lower cost and within 10% efficiency of fuel cells but with minor pollution.

Several speakers spoke about the different technologies of generating, storing, transporting and distributing hydrogen and some of the very daunting problems each of these steps involves.

There were several new NEV's demonstrated but their top speed was federally regulated to 25mph, and with their $10 - $14k price tag, they will be a tough sell.

There were reports on valve-regulated lead-acid, lithium-ion, and zinc-air battery technology, explaining the benefits and drawbacks of each. Michael Miller with Curtis Instruments spoke about battery charging technology and its importance in assuring long life and optimum performance.

Andy Frank with the University of California said that plug-in HEV's (true hybrids) are a stepping-stone toward a fuel cell car. He noted that mild hybrids such as the Honda Insight/Civic or Toyota Prius boost fuel economy up to 50%. Plug-in HEVs offset gasoline usage by 50-90% and there is no need for a rapid charge.

Tom Gross, Deputy Assistant Secretary of USDOE, noted that the US supply of coal and natural gas is used for electricity and imported oil is mostly wasted in inefficient vehicles. The growing gap between production and demand is presently 11 million barrels (22gal/barrel) per day. A 60% increase in CAFE and 10 billion barrels from ANWR in Alaska still won't close the gap.

Several presenters noted that with our present consumption increasing, 2011 would be the peak of oil production where the world will be half empty. Beyond 2011 the fuel prices will steadily increase as supply becomes scarcer. This will induce other means of transportation, as petroleum is needed for many critical plastic-rubber products.

Robert King with GE talked about their hybrid bus program based at GE R&D in Schenectady NY. King is working with NY Power Authority using batteries and ultracaps on a Novabus. The ultracaps helped improve range by 20-30% by soaking up the current surges.

Honda (Civic & Insight) and Toyota (Prius) are currently the only manufacturers of hybrid sedans in today's market place. The American manufacturers say they will concentrate on the larger hybrid vehicles, trucks & SUVs, probably due to their higher profit margin and poor fuel economy.

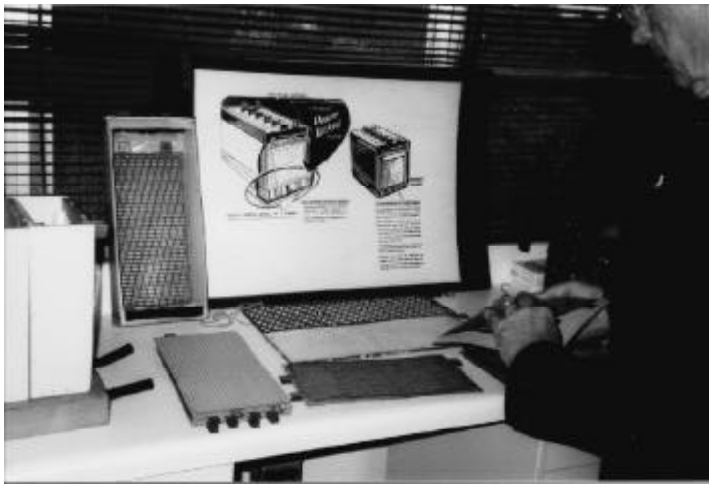
Jonathan Lash, President of World Resources Institute, talked about a Shell partnership to reduce demand for oil and develop better long term choices. It appears that a rapidly expanding fossil fuel economy makes society better but this is only a 50-year snapshot, not a long-term solution. Climate change is real and underway. The arctic ice cap is retreating and trees are budding a week sooner. We don't know what the climate shift long- term effects will be. The coral reefs and old growth forests are retreating. There are reasons for achieving sustainability and risks if you don't. Driving new processes and products into knowledge intensive products is the best economic direction. The market is not the top 2% of the pyramid but the bottom 4 billion people. We are changing the world for our children and grandchildren who won't be able to change it back. Energy sustainability is not a threat but an opportunity.

The Electrowave tour of the downtown South Miami Beach electric buses was excellent. The electric buses made by Advanced Vehicle Systems in Chattanooga, Tennessee, and are operated at 10c per mile including battery cost vs. 30c per mile for the diesels they replaced. The battery packs are swapped twice a day, which takes less than 15 minutes, and charged off the vehicles. Opportunity fast charging, without having to swap the batteries with a forklift at all, is being tested in a pilot program that is working well.

Compact Powers LiIon sportscar, which holds Pike Peak record.

Another Lithium EV - Nissan's Hypermini.

Buses demonstrated various propulsion systems.



A display of the fuel cell componients - major focus of automakers.

Test rides of various electric motorcycles, and other vehicles.

Toyota's fuel cell vehicles was availabe for test rides.

CONVERSION WORKSHOP, STEP 14
SYSTEM WIRING

By Michael P. Brown, © 2002 & 2003

In the last two issues we discussed the installation of the EV components in our conversion. Now let's take a look at how to do the wiring that connects them together and provides the interface with the vehicle's existing electrical system.

Note: the following paragraphs describe the wiring circuits and parts used to install a Curtis/PMC controller in an EV. Other manufacturers' controllers may require different methods and parts. Contact the manufacturer or the supplier of your controller for the installation instructions for their product.

For clarity, keep in mind that "traction batteries" refers to the main battery pack that powers the car's motor. The "auxiliary" or "accessory" battery is a separate 12-volt battery to power the low voltage system in the car.

What To Leave Alone & What To Use

Most of the car's 12-volt electrical system is left in place. The headlights, running lights, stop lights, turn signals, horn, and windshield wipers-as well as the switches and wiring supporting them-are not altered. The same is true for accessories like the radio/tape player/CD player, heater blower fan, and even power windows.

The parts of the car's electrical system that are the most affected by the conversion process - the wires and components that operate the engine - are also the parts that are used in making the interface between the two systems.

One of the first steps in the conversion was the removal of the internal combustion engine, and its cooling, exhaust, and fuel systems. All the wires connected to any of the components that were being removed should have been labeled with masking or duct tape with a word or two on the tape telling what the wire was attached to.

The original battery/ignition switch/coil wires and the alternator and oil pressure warning light wires are the only ones I use in my conversions. There are other systems and wires attached to the engine. But the amount of additional work and parts involved to turn them into something usable in an EV does not seem to be worth it. Some people have made electronic circuits to turn the fuel gauge into a voltmeter so it acts as an electric fuel gauge, but it's a lot of work, and isn't as accurate as a purpose-built EV voltmeter.

Warning Lights

Let's start with the two simplest interfaces. The wire from the oil pressure switch to the oil warning light in the dashboard can be used in the conversion as a motor overheat warning light. This is only true if the car has a plain oil pressure warning light. If so, the light is activated by a simple pressure switch which closes a circuit to ground if the oil pressure falls below a preset number.

If the car has a gauge with a needle instead of a warning light, its switch is a sensor that gives a scaled signal which moves the needle on the gauge. This set-up would not be usable for our purposes.

On my conversions, I wire the oil pressure warning light to a normally open temperature-sensitive switch that closes at 120°C (248°F) and then goes to chassis ground. The switch comes factory-installed on the commonly used Advanced D.C. EV motors. If the motor gets too hot, the switch closes and you get a warning light telling you to reduce your amp draw before you damage your motor.

The car's original alternator warning light is wired to a terminal in the alternator that provides a ground only as long as the engine isn't running. When the engine starts, the alternator begins producing electricity, and the terminal's polarity changes from negative to positive, turning off the light.

On my conversions, I use this as a "key on" indicator, since an EV makes no sound sitting still. I wire the alternator warning light wire directly to a convenient chassis ground. When the ignition switch is turned on with the key, the alternator light comes on and stays on, indicating that there is 12-volt power to the control system.

Making It Go

The original ignition wires from the 12-volt battery to the ignition switch, and from there to the ignition coil serve a similar function on an EV. They supply power to turn on the controller through the main contactor. However, there are a couple of additional skips and jumps along the way, which involve adding two small relays to the system.

The most important thing to keep in mind when making the connections between the car's existing 12-volt electrical system and the high voltage traction system is isolation. This means keeping the two systems from coming in direct contact with each other. Isolation is necessary for the operation of the controller and traction battery charger, and is a critical safety factor in eliminating shock hazards and short circuits which could cause dangerous electrical fires.

Since all the components of the 12-volt electrical system rely on the metal chassis of the car for their ground path, no connection should be made between the traction battery pack and the chassis, either on purpose or by accident. (This is one reason you can't tap two of the 6 V batteries in your traction pack to supply power to the accessories.) Proper system design, careful routing of wires and cables, and selection of properly rated components will make contact between the two systems unlikely.

All of the components in the ignition system have one thing in common: they use two sources of electricity. "Control voltage" (usually but not always low voltage) causes the component to turn on, or close its contacts. This allows the component to do its job of channeling electricity from the second source-the actual "traction voltage" that moves the car. In effect, control voltage controls a gate through which the traction

voltage flows.

The ignition system starts at the keyed ignition switch. The original wire from there to the ignition coil now goes to the potbox microswitch. From there, one branch controls the main contactor. A second branch controls the potbox relay, which controls the logic board of the controller. A third branch of the system goes from the keyed ignition switch to the key switch relay, which funnels high voltage from the main contactor to the voltmeter and DC/DC converter. We'll look at each of these branches in detail.

Keyed Ignition to Contactor

The potbox microswitch is, as the name indicates, a microswitch that is mounted on the potbox. The microswitch is open as long as the potbox arm is in the "off" position. When the car's accelerator pedal is depressed, the linkage or cable attached to both the pedal and the potbox arm pulls the arm off the microswitch contact. The microswitch closes, completing the circuit to the main contactor.

The main contactor is a large electromagnetic switch that closes when 12-volt positive control voltage from the microswitch is applied to its positive pull-down coil terminal. When the heavy duty contacts close, high voltage traction electricity flows from the battery pack to the controller.

The opening and closing of the main contactor each time the accelerator pedal is released or depressed acts as "deadman" switch. In the event of a problem with the controller or the motor, releasing the accelerator pedal shuts off the high current traction electricity to the controller.

Potbox Microswitch to Controller

However, the controller is not fully turned on until its logic board receives positive control voltage from the battery pack (not the auxiliary battery). This is applied to the top-most of three small terminals at one side of the end of the controller. This is the key switch input terminal, and its only function is to turn on the logic board.

The logic board, in turn, tells the controller how much traction voltage and amperage to give the motor. This depends on the control signal the controller receives from the potbox via wires to the two remaining small terminals on the controller.

In order for the key switch input circuit to act as another "deadman" switch in case the main contactor fails in a closed position, it must be switched on and off independently of the main contactor. This is done by using a potbox relay.

This relay gets its positive 12-volt control voltage to its pull-down coil from the same potbox microswitch terminal that controls the main contactor. So it closes and opens at the same time as main contactor. The relay gets its high voltage positive electricity from the "positive" (battery pack input) terminal of the main contactor. When the relay closes, this high voltage electricity goes to the key switch input terminal of the controller and turns on the logic board. This is the one example of a high voltage control input.

The high-voltage contacts of both the main

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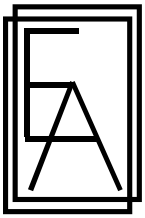


contactor and the potbox relay are isolated from their low-voltage pull-down coils, which are grounded to the chassis. A 12-volt control connection from the potbox microswitch closes the potbox relay whenever the main contactor closes. This allows high voltage to flow, on an isolated path, from the main contactor, through the potbox relay, to the key switch input terminal on the controller, thus turning on the "brain" of the controller.

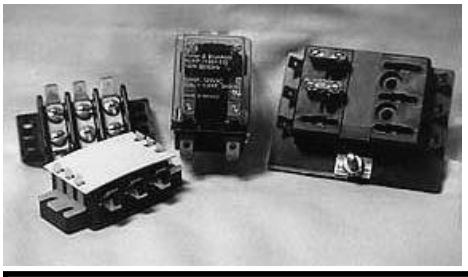
Main Contactor to High Voltage Accessories

Letting the accelerator pedal control the closing and opening of the main contactor and potbox relay is desirable as a safety feature. But there are some parts of the EV's system where this intermittent off-and-on could be irritating or harmful to components. These components need to stay on continuously while the car is on, and be turned off when the EV is not in use.

A state-of-charge meter or a voltmeter used to measure battery pack voltage should go on or off with the ignition key. The problem of using a grounded 12-volt system to control an isolated high voltage path is solved with the same type of relay used for the potbox relay.

This relay, called the key switch relay, gets its high voltage positive electricity from the "positive" side of the main contactor, just like the potbox relay. The 12-volt positive electricity goes directly from the ignition switch to the pull-down coil of the relay. The pull-down coil is grounded to the chassis.

When the relay's isolated contacts close, the battery pack voltage from the contactor goes to the voltmeter or state-of-charge gauge, and any other high voltage systems it is controlling, such as the DC/DC converter, which we'll talk about in a minute. One relay can control a number of systems as long as the total amperage draw of all the systems doesn't exceed the amperage rating of the relay.



Fuses Are Your Friends; Have Lots of Friends

As an additional safety precaution, I install another fuse block to protect the car's existing electrical system from shorts that might occur in the EV components added to the car. This fuse block gets its electricity from the ignition switch and puts a fuse between the ignition switch and the potbox relay, key switch relay, and any other 12-volt components that might be added during the conversion. Any high voltage accessories such as voltmeters and DC/DC converters should have fuses of the proper rating between them and the battery pack.

Possible Complications & Other 12-Volt Sources

Throughout this article I have been referring to the wire from the ignition switch as the source of 12-volt positive electricity. Some car manufacturers put a resistor or a wire with a built-in resistance between the ignition switch and the ignition coil. Remove the resistor from the car if it is a separate part. If your car's shop manual shows a resistor wire, remove it from the circuit or wire around it.

If it's a diesel car you are converting, your source of key-switched 12-volt positive electricity is probably going to be an electric fuel cut-off valve on the injector pump. Again, refer to your car's shop manual to be sure.

DC to DC Converter

In the old days we used a large heavy deep discharge marine battery as the source of 12-volt power for the cars original electrical system and the EV control system. Since this battery was charged at the same time as the traction battery pack this battery had to last longer than the traction battery pack.

This so-called "total loss" system worked most of the time but there was always a chance that excessive current draw on the auxiliary battery would shut you down before you were out traction pack voltage. In the modern conversion world, we have a device called the DC/DC converter to keep the auxiliary battery charged.

The DC/DC converter is an electronic device that takes the traction battery pack high voltage and converts it to about 14.5 volts at 25 amps. The DC/DC converter carries the car's average 12-volt load and keeps the auxiliary battery charged at the same time.

In times of heavy load, such as driving with the lights and wipers on, both the DC/DC converter and the auxiliary battery carry the load. The fact that there are times when the auxiliary battery has to carry a substantial part of the 12-volt load limits how small you can make the auxiliary battery. This also cancels out any idea of eliminating the auxiliary battery altogether and relying solely on the DC/DC converter.

The circuitry of the DC/DC converter isolates the high voltage battery pack from the 12-volt auxiliary battery, and its output side is fused to protect it. The DC/DC converter is one of the high voltage accessories that is turned on by the key switch relay.

There are four connections to the DC/DC converter. The high voltage most positive terminal of the battery pack is connected in via the key switch relay to the high voltage positive input terminal. The high voltage negative input terminal connects to the most negative side of the battery pack circuit at some point. I pick this up at the battery pack negative terminal of the controller. The low voltage positive output terminal is connected to the positive terminal of the auxiliary battery. The low voltage negative output terminal is connected to chassis ground.

This is an overview of how the high voltage traction system is interfaced with the car's existing 12-volt system. We'll look at how to do the actual physical wiring in another article.

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RANGER EV - DYNAMOMETER TESTING

By Mark Farver, NTEAA member

I ran my Ranger on a chassis dyno, both before and after conversion. It wasn't a very scientific process (my batteries were a little low when the run was made, and we had some troubles measuring motor RPM), but the results are interesting. http://www.mindbent.org/evranger/dyno/

The Siemens/MetricMind AC drive didn't put out quite as much horsepower as the stock 2.5L 4cyl (not too surprising, it is designed for smaller vehicles) but the torque curve (or lack of one) is neat. The gearheads at the performance shop were I made the runs were quite impressed.

I was curious to see what the effective engine power would be before and after conversion. While the Ranger was still running the stock 2.5L 4-cylinder engine I took it to the Dynamometer at Colvin Automotive, here in Austin. Cost is about $54 for the setup and first run and about $10 a run thereafter. Colvin Automotive specializes in exotic and high performance cars, and just wandering thru the garage to the dyno we saw several Ferrari's and other impressive autos. (I, not being a car nut, would be hard pressed to even identify half.)

After getting the Ranger strapped to the dyno we ran a couple of runs, trying to get a feel for the best numbers. The stock 2.5L managed a best run of about 105HP at the rear wheels and about 119lb/ft of torque.

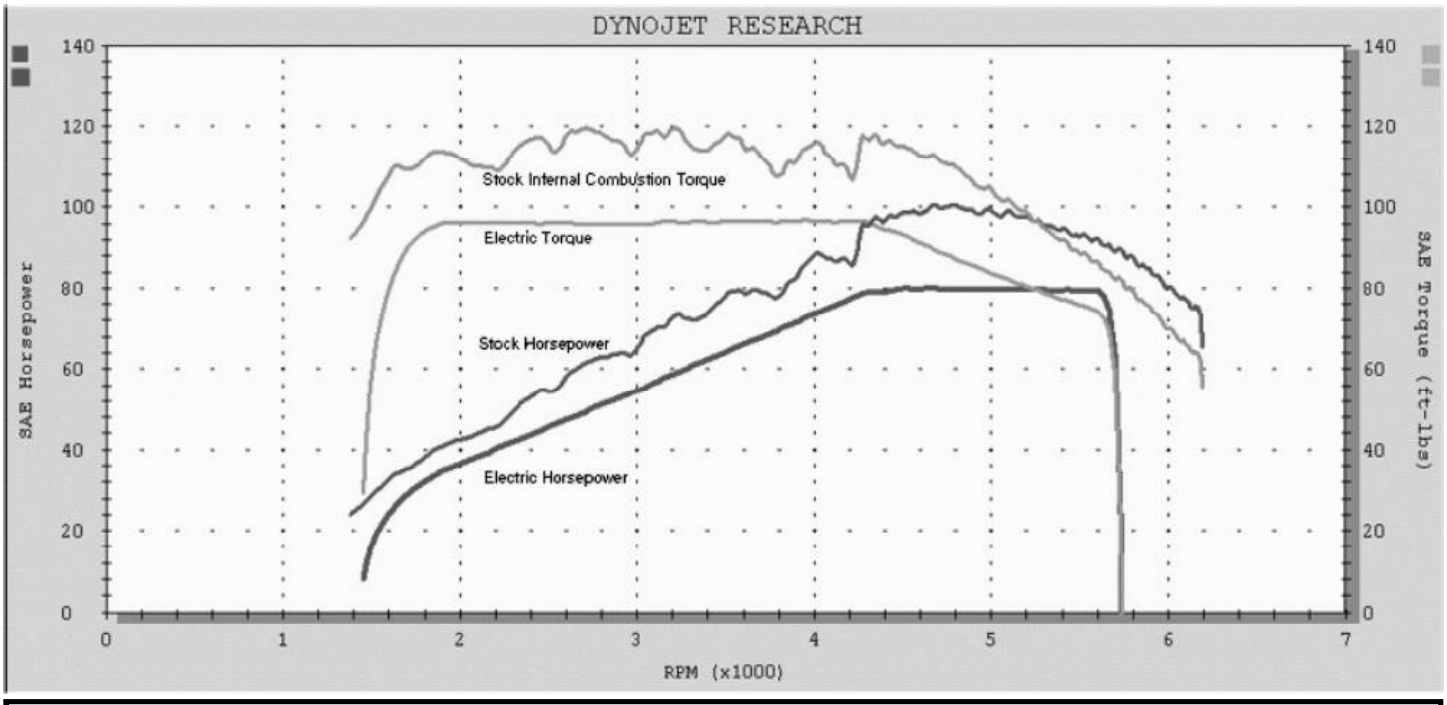
The real fun came 6 months later, after (mostly) finishes the conversion. Driving the truck around town had given us a good feel for the Siemen's drive. General agreement was that despite the AC drive being somewhat undersized (it was built for small cars, not trucks) it still performed better than stock. This despite a weight increase of about 650lbs.

We missed our appointed timeslot, having gotten lost on the way, and having overheated the inverter. I didn't have time to put a cooling fan on the radiator and the water loop temp was pretty warm. Fortunately a homeowner lent us a hose, and by spraying water over the radiator we managed to get it cooled off. The 3pm timeslot was also a no show, so we slipped in before a heavily modified Nissan 300Z. While I was inside filling out the paper work, Alaric was drawing a crowd showing under the hood in the parking lot. The dyno tech, after a quick lesson in driving the Ranger (just put it in second, don't use the clutch) drove silently away the crowd, to a chorus of "Way cool" statements from the crowd of vehicle owners and service techs.

Getting the Ranger strapped in again was no problem, but a great deal of thought had to go into getting a RPM signal. The dyno's existing RPM probe was an inductive pickup designed to go around the coil or sparkplug wire. The dyno could measure horsepower without RPM, but for reading torque it needed an engine RPM. Much head scratching ensued, with the dyno tech finding an unused optical pickup in the parts shipped with the dyno. The eventual solution was to read the drive shaft RPM using the optical pickup and some reflective tape. In the meantime, work in the shop stopped as all the service techs and gear heads drifted in top watch. It was pretty cool to have a large crowd of performance gear heads poking at my work and snapping pictures.

The final results: The electric drive gives a picture perfect torque curve (or lack thereof). Torque is even from about 1000RPM all the way till the rev limited kicks in at 4500 RPM. The below graph is a little shifted since we were reading drive shaft RPM, not motor RPM for the electric run. The electric run also started with the motor and wheels already turning, so the drop off in torque at low (below 500) motor RPM is not apparent. Rear wheel horsepower is noticeably less than stock (best run was 88HP at the rear wheels), and yet most people agreed the electric was more fun to drive.

So anyhow, its not perfect info, but I would encourage other EV enthusiasts to dyno their cars (I'd love to see the numbers for some of the dragsters).



A DAY WITH BRITISH EV'ER PAUL COMPTON

By Chip Gribben, EVA/DC member

During our summer vacation to visit relatives in England I had the opportunity to also visit Paul Compton who lives in Luton. Paul has been an active member of the EV Discussion List for quite a while and is a member of the Battery Vehicle Society, which is made up of EV enthusiasts from all corners of the United Kingdom. I also had a chance to meet the father of the Lynch motor, Cedric Lynch himself. Cedric just happened to drop by Paul's house in his EV while I was visiting.

After my wife's Aunt dropped me off on an August Saturday afternoon, the original plan was for me to visit for just a couple hours and I'd catch a bus back to Hatfield Heath, later in the afternoon. But time flew by . . . I didn't even bother to catch the last bus out of Luton and didn't get home till after midnight!! Paul was gracious enough to give me a lift home.

Paul Compton with his 192v Scirocco conversion

After our introductions, when I met Paul and his mom, Paul led me to his garage in his backyard. As we approached the garage, along the path were bits and pieces of engines, motorcycles and even a Triumph Spitfire chassis hidden in some weeds . . . just clues to what awaited inside. And what a garage indeed . . . an EV hobbyists dream.

The garage is two-car deep with the front section wider then the back section by a few feet. Paul needed the extra width of that front part because occupying it was a humongous milling machine, a lathe and a drill press. On the opposite side was a mechanics tool chest loaded with the usual mechanic's tools and sophisticated measuring devices and shelves from floor to ceiling loaded with all kinds of EV parts . . . Prestolite motors, controllers, Paul's prototype component projects and more. With all this equipment Paul has easily been able to create his own adaptor plates and more.

I was awestruck . . .

After picking myself off the floor I glanced upon one of Paul's project cars . . . a rolling Formula Ford (1979 VanDiemen RF79) racecar frame, which he bought for 500 pounds ($750.00). Paul had stripped it down to the metal and had brazed battery support frames to the sides. The gearbox, gearshift and Prestolite motor were all installed and he was working on installing the axle shafts. He had created new end plates for the gearbox, which he modeled himself and had custom cast, to adapt the gearbox to the axles he was using. Beside the car was a row of Genesis EP batteries, which he had bought from Solectria. He was in the process of charging and load testing them with a charging system and load tester he configured himself.

I had a chance to slip inside the drivers seat and imagine how thrilling it would be to pilot this beauty around the racetrack.

After a tour of the Formula Ford we went for a spin in Paul's daily driver, a VW Scirocco powered by 192 volts of Yellow Tops and a Grizzley controller. It was parked just behind the Formula car. Since Paul has a short commute to work . . . where they let him charge up . . . he had the controller set to "Valet" mode and was still able to keep up with a Porsche Boxster S that was in front of us!

The Scirocco is where some of Paul's craftsmanship shines. No visible wires anywhere. Under the bonnet everything looks OEM. His battery boxes are constructed of 22swg. The boxes were professionally bent, pop riveted with 4mm steel rivets at close centers and supported by a MIG welded tubular steel frame. The entire unit was topped off with industrial gray enamel paint. Although Paul uses thin gauge metal, instead of angle iron, his frames, boxes and brackets are built in such a way that the whole structure works together as a single unit for strength. The tops of his battery boxes are bolted on with fasteners every couple inches for added rigidity. He told me he was once offered a job from a fellow who worked in the aircraft industry after he seen the car. In the boot the batteries are sunk low in the floor so no space is wasted.

He also installed a battery monitoring system of his own design with a digital readout cleverly mounted in the dash, which also looks OEM. There is also a port installed on the control box so he can export data from the device to a PC. He mentioned that he sells these systems to anyone who wants one.

After the tour of the Scirocco Paul showed me his other project, which was parked outside the garage. A red 1992 Skota Rapid is a 2-door coupe version of the Estelle. Skota's are Czech built cars and are actually perfect for building conversions. The body style is similar to a Saab but the "A" pillars are raked back more. The Skota has a high profile and a heavy-duty suspension. The

spare tire compartment is cleverly located under the front of the car between the front wheels. The engine is in the rear with a gearbox setup similar to a VW Bug. As a matter of fact the Prestolite he is using fits perfectly where the rear motor mount is. The Skota's rear taillight panel is bolted on, instead of welded, so the panel could be easily removed to access the engine (when it had one). Paul installed a battery box above the motor and a battery box in the front.

This conversion is going to be a simple one only using 96 volts. At this voltage, it's a kind of around town car.

Paul also showed me some EV videos including one of the Tropica, some footage of EV activities from our friends on the West Coast and an interesting video of some "Feet-First motorcycles". He also showed me some pictures and plans for his design for a new IGBT controller. At some point in the conversation that day he told me of his work helping Clare Bell with her 914 at the APS Electrics in the late 90's. Paul was over in the states at one time for 5 weeks tweeking the car for the race.

After the tour of the cars and the garage we headed inside for dinner. While we were having dinner Cedric Lynch called and said he would drop by in half an hour. By that time I had missed the last bus I was planning to take back but I didn't mind since I was having too much fun. I did call the family to tell them not to expect me for dinner that evening.

Shortly after dinner, Cedric drove up in his electric powered recumbent styled bicycle complete with a body and lexan top, akin to an Electrathon EV. He often drives his bike quite frequently to Paul's house which is 25 miles from Cedric's place in Potter's Bar. The bike is 48 volts and is powered by one of his Lynch motors and a Brusa controller. The charger is a Zivan K2 and the bike is also equipped with regen. Cedric welded the bike together himself and the body panels are plastiboard. I'm not sure if that's the name but it looks like corrugated cardboard but it's made of a plastic like material.

Cedric let me sit in the vehicle. Although the two-wheeler is enclosed the sides aren't fixed so when you come to a stop you can easily pop your legs out to balance the bike. Another unique feature of the bike is a gimble type steering setup he has. It's rather complicated to describe but works quite well. The front of the bike features a fiberglass over foam-constructed nose with a headlight in the middle.

Since Cedric was there I asked him about his motor and to get a gist of who is marketing and manufacturing it. There is Lynch Motors which Cedric runs and there is LEMCO, which manufactures the motor. Briggs and Straton also bought the licensing rights for the Lynch motor and is selling it under the brand name E-Tek. Paul has a version of the latest Lynch motor, which is quite powerful. Although I can't recall the specs, I do remember him saying that its a permanent magnet motor and the magnets are so powerful there are no fasteners holding the two halves of the motor together. You need a special jig to pull the halves apart.

Surprisingly the conversation that evening didn't center on the Lynch motor. Instead we talked about EV's in general, the Battery Vehicle Society, motorcycles, American and European cars, and even planes. Towards the end of the evening Paul's mom kept coming out as a polite gesture to remind us it was getting late and I needed to head back. So Paul closed up the garage, Cedric got in his bike and Paul gave me a lift home.

It was quite a trip. One I'll never forget.

Visit Paul's site at:
http://www.sciroccoev.co.uk

Also check out the Lynch Motor site at :
http://www.lynchmotor.com

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By Eric Ryan, Director, EV Challenge (www.evchallenge.org)

During the first weekend of October in rural Northampton County, North Carolina, high school students from across the southeast gathered for the annual Northampton Electric Vehicle Rally. Now in its seventh consecutive year, this rally is especially unique in that it is *conducted and run by the high school students* of NEAT – the Northampton Electric Auto Team. Led by automotive instructor Danny Johnson, NEAT is a year-round electric vehicle education program conducted at Northampton-East High School in Conway, North Carolina.

The article below is a student's perspective on the rally and was written by Heather Ferguson, a twelfth-grade student member of NEAT.

The 7th Annual Northampton Electric Vehicle Rally

by Heather Ferguson

It's finally over. The 7th Annual Electric Vehicle Rally was a huge success. On Friday, October 4, 2002, eleven schools all came together in the parking lot of the Becker Village Mall in Roanoke Rapids to kick everything off. Teachers and instructors from the following schools attended:

Hertford County High School
Ahoskie, NC
Northampton-East High School
Conway, NC
Northeast Guilford High School
Greensboro, NC
Northern Vance High School
Henderson, NC
Roanoke Rapids High School
Roanoke Rapids, NC
Robeson County Career Center
Lumberton, NC
Shenandoah Valley Governor's School
Fishersville, VA
Southern Durham High School
Durham, NC
Topsail High School
Hampstead, NC
Wake Forest-Rolesville
Wake Forest, NC
West Carteret High School
Morehead City, NC

After lunch, the racing got underway in the autocross. Three classes were set up – cars, trucks and modifieds. (A description of the classes can be found in the "Vehicle Specifications" section of the EV Challenge web site – www.evchallenge.org) The car class ran first; followed by the truck class; and bringing up the rear was the modified class. In the car class, Wake Forest/Rolesville came in first with an impressive time of 24.726.

Top winner in the truck class was West Carteret High School with a fantastic time of 26.186. Last but not least, in the modified class, the Northampton East Automotive Team's very own Shocker III, driven by Allen Taylor, ran the course the fastest with an amazing time of 22.636. After all of the cars ran their final lap; Fun Runs were given to the members of the teams.

On Friday evening, members of the DC Electric Auto Association conducted a "hospitality suite" at the official rally hotel. Jerry Asher and Dave Goldstein gave everybody an overview of the EAA, their solar slot car racers and showed some excellent EV videos.

Then on Saturday, October 5, the schools met at the Northampton County Board of Education in Jackson. There, we ate breakfast and talked about the events of the previous day. To start Saturday's events, the cars were lined up and then they paraded through Jackson's Annual Market Day, where they ended up at the Jackson Courthouse. There, they were arranged in place for photos.

While the pictures were being taken at the front of the courthouse, Northampton East Automotive Team members were around back given the second part of the rally. Schools sent a representative to take an EV Knowledge quiz. This was a new category at the rally so here's how it worked: students were asked questions about the EV Challenge curriculum handbook that was sent out to the schools. Then students were to give a brief oral presentation of what the EV program means to them.

After pictures, the schools went around to various booths at Market Day to learn about Jackson while the final presentations were being done. Then, once all of the scores had been tallied up, they met back behind the courthouse for the awards ceremony. NEAT members presented trophies to the top three schools in each class, and then to the top three schools in EV Knowledge. Our "thanks" were said to all that participated and helped in the rally. After that, the awards ceremony was concluded and the schools packed their electric vehicles up and got ready to depart. Once everyone had left, NEAT cleaned up, packed up, and headed home. This year's rally was a massive triumph. With the help of our instructor, Mr. Danny Johnson, we are sure that next year's eighth Annual E.V. Rally will be just as magnificent as this year's!

(Big thanks goes out to The Tarheel Sports Car Club who came out and set up the obstacle course for the Autocross part of the rally. The registration booth was tremendous thanks in large part to all of the schools' cooperation. Thanks to Mrs. Diane Mumford from the Education Foundation along side with Ms. Susie Strickland from the Board of Education who helped the Northampton East Automotive Team sell hotdogs. NEAT did this to raise money to put on the rally due to a lack of funding. A big thanks goes out to Eric Ryan and Harold Miller for their outstanding work in the rally. With them, they brought the EV Challenge Mobile Classroom to show the history of the Electric Vehicle program.)

For more information about next year's rally, contact Danny Johnson at johnsond.east@ncs.schoollink.net.

The 7th Annual Northampton Electric Vehicle Rally

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Tour de Sol – May 11-14, 2003

By Nancy Hazard

Dear friends:
We invite you to join us for the 15th annual Tour de Sol: The Great American Green Transportation Festival.

In the last 15 years we have come a long way, but I am sure you will agree, that we have a long way to go. With increasing awareness in the press about the connection between oil dependence, national security, and global warming, it is more important than ever to showcase gas-sipping and alternative vehicles – to let the public know that these options exist today!

If you have built an electric or alternative fueled vehicle, or if you own a hybrid, CNG or flexi-fuel car, we invite you to join us and compete for the coveted Green Vehicle Awards, or you can join us for one or more festival, and talk about your vehicle to some of the thousands of people who will come to the Tour de Sol.

To register, look for the link to the registration form on our web site, http://www.nesea.org/transportation/tour/involved/enter.html

The Norwegian-built electric car Think, and associated jobs in Aurskog, now appear to be rescued. On Thursday it became clear that the Swiss firm Kamkorp Microelectronics has bought Think Nordic from owner Ford Motor Company.

In a letter to Minister of Trade and Industry Ansgar Gabrielsen, Ford said that the new owners will continue the development and production of the battery-driven electric cars, and take over the brand names "THINK" and "City".

The sale should not only secure jobs in Aurskog, but also years of investment and technological research. (Aftenposten English Web Desk/NTB)

Ford to sell Norwegian electric car subsidiary

Thu Dec 19, 2002

OSLO, Norway - The tiny electric car company Think Nordic announced its apparent rescue Thursday after Ford Motor Co. agreed to sell it to Kamkorp Microelectronics.

In late August, Ford announced it would stop selling electric cars in the United States, and was prepared to withdraw from the Think Nordic plant that makes the Think City. Ford said the market for electric cars was too small.

The Dearborn, Michigan-based automaker said it plans to focus on other technologies for cleaner-running cars and trucks, including hydrogen fuel cells and the gas-electric hybrid vehicles.

Since then Think and Ford have been seeking a buyer rather than shutting down the operation.

Think Managing Director Ingemar Bjoerholt told The Associated Press that Ford and Kamkorp had signed a binding letter of intent and planned to complete the transaction in January. He said they had agree not to disclose a price.

The terms of the deal were not disclosed. "It is good news," said Bjoerholt. "The most important thing is maintaining the technology and production that we have developed."

The Norwegian government helped fund the original development of the Think two-seater electronic cars before Ford acquired it in 1999. Think has about 100 employees, and has produced more than 1,000 of the cars.

The company had just finished developing a new model when Ford decided to pull the plug on electric cars. Bjoerholt said it wasn't clear when full production would start.

According to the Norwegian news agency NTB, in a letter to Norway's Minister of Industry, Ford said the new owner planned to continue the development and production of electric cars, and will retain the rights to the Think and City names.

Ingvar Sviggum, a Norwegian who is a vice president of Ford Europe, refused to disclose the sales price, but confirmed that it was low.

"Ford, of course, must have made the basis extremely favorable so that Think Nordic could continue to be a success in the future," he said.

According to Bjoerholt, Kampkorp's products include Frazer-Nash electric vehicles. He said Kamkorp Microelectronic was registered in Switzerland, while its parent company Kamkorp Ltd. was based in Britain.

Ford Will Not "Think" - Bye Bye Electric Car

Oslo, Norway December 19, 2002; John Griffiths writing for FT reported that Ford plans to sell its Think Nordic electric car unit to Kamkorp, a Singapore-based group with global electronic, engineering and property interests.

The world's second-largest carmaker has invested more than $100m in the Norway-based business.

However, like many of its rivals, the Detroit -based company is dropping a decades-long attempt to develop viable battery- powered vehicles that could rival petrol or diesel cars. Ford is to concentrate instead - like virtually all of its rivals - on the development of hydrogen fuel cells as the propulsion unit for automobiles of the future.

It said in August that it would make no more investments in Think Nordic, which was established with the backing of the Norwegian government.

No financial details of the planned disposal were revealed but the sale is expected to be completed next month, following the signing yesterday of a binding letter of intent.

Think Nordic's plant near Oslo has the capacity to make 4,000 cars a year but only about 1,000 have been sold.

The sale price of Think Nordic is believed to be much lower than the $70m that Ford originally paid for the company nearly four years ago.

However, the final abandonment of Ford 's costly research programmes to develop environmentally "clean" battery-powered cars should make at least a small contribution to reducing the large losses sustained.

Ford is in the throes of a global restructuring after seeing its fortunes plunge from a record profit of $7.2bn three years ago to a $5.45bn loss last year.

Kamkorp, whose European headquarters are in the UK, has a significant stake in electric vehicles and is expected to continue development and production at Think Nordic, which had a new vehicle almost ready for production when Ford announced it was pulling the plug. More than 100 workers have been laid off since.

Kamkorp owns Frazer-Nash of the UK, which has electric car body building capabilities, and Electrosource, based in San Marcos, Texas, which produces advanced lightweight lithium batteries. It supplied some vehicles for the 2000 Sydney Olympic Games.

"The most important thing is maintaining the technology and production that we have developed," Think Nordic's managing director, Ingemar Bjoerholt, said last night.

Maryland Town Considers Ban on Scooters

The town council in Mount Airy, MD is considering a proposal to ban motor scooters and moped-style vehicles on public roads and sidewalks. The town currently has an ordinance banning the use of dirt bikes, snowmobiles and all-terrain vehicles on public roads. An amendment introduced by the town council would broaden the ban to include motorized scooters and "any motorized scooter with seating for a driver and/or passengers which is not subject to registration by the Motor Vehicle Association (MVA)." MVA requires the registration of any vehicle with an engine size of 50 cubic centimeters or larger.

Town officials noted that the ban would also include both electric and gasoline-powered scooters falling under the MVA classification in the amendment. Critics of the amendment said the regulation would restrict the freedom of children who are not allowed to drive automobiles and would abolish an efficient mode of transportation. Mount Airy council president Frank Johnson said the introduction of the amendment was motivated by safety and noise concerns. Officials said nearby Baltimore City and Baltimore County have already banned seat-less scooters, which have been heralded by some as a solution to traffic and pollution problems in congested and urban areas. Similar concerns have been raised over the safety of small electric scooters on sidewalks in urban areas. (FREDERICK MARYLAND NEWS POST: 8/8)

PSU Students Develop Hybrid Fuel Cell Vehicle

A team of students with Pennsylvania State University's (PSU) Energy and Geoenvironmental Engineering Program recently unveiled a hybrid electric vehicle that features both a battery pack and a magnesium hydride-powered fuel cell (FC) system. During a recent presentation at the 224th annual meeting of the American Chemical Society (ACS), the team discussed the challenges of developing the FC-powered General Motors Precept, including odorizing the vehicle's hydrogen fuel and developing a safe, effective energy storage system.

"The professors asked the class to solve the problem of hydrogen odorization," said PSU graduate student Jamie Weston. "We came up with a simple system that removes the odorant with absorbers and then tests to ensure that all the odorant is removed before sending the hydrogen to solid storage and fuel cell." The team said it avoided safety issues associated with the storage of compressed hydrogen gas by using a magnesium hydride that is able to safely store hydrogen gas up to 554 degrees Fahrenheit. The students said the system requires approximately 23 pounds of hydrogen to travel 500 miles.

The Precept electric vehicle also features a stack of batteries that power the vehicle during short trips and provide energy for electric heating units used to warm sections of the magnesium hydride. The batteries can be charged using a household outlet or excess energy generated by the FC system. "Batteries are now being reduced in size, so the weight of the batteries and the hydrogen

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fuel system will not make the car too heavy," said Weston. "Because most of the hydrogen is stored as a solid, the automobile may be as safe as today's cars." (EIN STAFF: 8/19)

eGO Vehicles Introduces New Electric Bicycle

Providence, RI-based eGO Vehicles, Inc. recently introduced its eGO Cycle2, the company's second-generation Cycle, following the launch of its original eGO Cycle earlier this year. The company said the eGO Cycle2 has a single-charge range of 25 miles and a top speed of 23 miles per hour (mph). Additionally, eGO said the Cycle2 features a standard onboard battery charger that is able to recharge the cycle's batteries in four to five hours, or an optional "external fast charger" that provides a full charge in 90 minutes.

"The eGO Cycle2's sleek design includes front suspension for a smooth ride, a wider foot platform and front disc brakes for stopping on a dime with the heaviest cargo," the company said. (EIN STAFF: 8/20)

Prius Battery Problems Reported in Article

The Los Angeles Times published a column featuring a letter from a Century City, CA, couple who had experienced a number of "battery-draining" issues with their Toyota Prius hybrid electric vehicle (HEV). The article reported that the dealer who had sold the HEV told the couple that nothing was wrong with the vehicle and that they needed to drive the car more often in order to keep the batteries charged.

In response to the article, Los Angeles Times columnist Jeanne Wright said she received 11 e-mail messages praising the HEVs and eight messages reporting problems. Wright noted that the issues surrounding the Prius primarily focused on the vehicle's smaller batteries, which provide initial starting power. According to Wright, other Prius owners described similar "battery-draining" experiences with their 2001 models, noting that they were often told to drive the HEVs more to keep the battery charged. Prius owner Bob Walrath said his dealer found a problem with his HEV's auxiliary battery, which has since been replaced. Additionally, a service manager at a Norwalk, CA, Toyota dealership reported that he has had to replace starting batteries in two Priuses.

"I appreciate the benefits hybrid cars offer for our environment," said Wright. "But if there's a defect in some of the vehicles' batteries, it needs to be addressed, not dismissed. The better their reputation for reliability, the more hybrids we'll see on the roads." (LOS ANGELES TIMES: 8/21)

Toyota Exhibits EVs at Johannesburg Summit

Toyota Motor Corporation recently exhibited two electric vehicles (EVs) at the World Summit on Sustainable Development in Johannesburg, South Africa. The exhibit was part of the Japan Pavilion and featured the automaker's Estima hybrid electric minivan and its hydrogen-powered Fuel Cell Hybrid Vehicle (FCHV)-4 prototype.

Toyota noted that the exhibit also included display panels highlighting the automaker's overall approach to creating "the ultimate eco-car" and specific achievements the company has made in the field of EV technology. "Both the Estima hybrid and the FCHV-4 represent achievable environmental and resource-conservation solutions: the former has twice the fuel efficiency of conventional minivans and features the world's first commercialized electric four-wheel-drive system; the latter emits only water and is set to serve as the platform for a soon-to-be-marketed Toyota FCHV," the automaker said. (JCN NEWSWIRE: 8/23)

Tribune Columnist Reports on Insight Phaseout

In a recent article in the "Chicago Tribune," columnist Jim Mateja observed that Honda will likely begin phasing out production of its initial hybrid electric offering — the Insight — now that the automaker has introduced a new hybrid electric version of its Civic model vehicle. In an interview with Honda executive vice president Tom Elliott, Mateja quoted the company official as saying the Insight "has a limited future" and was primarily intended to "introduce the hybrid concept."

According to Mateja, the two-seat Insight, which features a one-liter, 63-horsepower (hp) gasoline engine combined with a seven-hp battery-powered electric motor, "proved that the combination of gas/electric power was superior to batteries-only systems as an energy source."

Mateja said the Civic hybrid, which was introduced earlier this year, improves upon its predecessor with a 1.3-liter, 85-hp gasoline engine and a 13-hp electric motor, offering the ability to seat four. Elliott told Mateja that Honda considers the Insight a "low-volume" automobile since the company has sold approximately 5,000 units per year. Comparatively, Elliott said the new Civic has been selling at a rate of 2,000 cars per month, which the Honda official said necessitates "lowering Insight volume." (CHICAGO TRIBUNE: 8/27)

Virginia County to Receive 15 Prius HEVs

Government officials in Arlington County, VA, recently announced that the county will soon receive 15 Toyota Prius hybrid electric vehicles (HEVs) for use in the city's vehicle fleet. Officials said the Priuses will replace such older fleet vehicles as the Ford Taurus, Chevrolet Cavalier and Ford Contour.

"By replacing the mid-size and small sedans currently in our fleet with the hybrids, we are reducing the pollutants our cars put into the air by nearly 100 percent and doubling our gas mileage," said Arlington County board chairman Chris Zimmerman. "It's extremely beneficial for the environment and very cost-effective."

According to county officials, when the last car is delivered, the purchase will be complete and the vehicle contract will be re-bid for next year. The average cost of the hybrid vehicles purchased by the county was approximately $19,900. Officials said they hope the introduction of new hybrid vehicle options will help lower the cost of the vehicles for the next round of contracts. (EIN STAFF: 8/14)

Hybrid Humvees Delivered to Army for Testing

Integrated Defense Technologies (IDT) subsidiary PEI Electronics will deliver two additional hybrid electric High Mobility Multipurpose Wheeled Vehicles (Humvees) to the U.S. Army for performance testing and evaluation at the Yuma Proving Grounds in Yuma, AZ. Other hybrid electric Humvees are currently undergoing testing at Aberdeen Proving Grounds in Aberdeen, MD.

PEI has been actively working with the Army to introduce hybrid electric drive technology for use in "tactical and support vehicles." The company noted that the Humvees are the "first such hybrid-powered vehicles to be produced and subjected to formal Army assessment, testing and evaluation."

Earlier in the program, PEI developed and built two hybrid Humvees for "proof of concept demonstration," including a "tactical" model featuring a 55-kilowatt (kW) generator and four 75-kW propulsion motors, and a "utility" model with a 75-kW generator and two 75-kW propulsion motors. The company said both models included onboard power generation capability sufficient to operate field hospitals, telecommunications centers and auxiliary radar, and have demonstrated fuel economy improvements of up to 30 percent. (EIN STAFF: 8/29)

New York Power Authority Lauds Commuter Program on Long Island

The New York Power Authority (NYPA) recently joined with Ford Motor Company's Th!nk electric vehicle group, the Long Island Power Authority (LIPA) and New York City's Metropolitan Transportation Authority (MTA) to recognize the success of the group's electric station car demonstration project launched last year, with a goal to lease 100 Th!nk city electric vehicles (EVs) to suburban commuters.

Program officials said the project has "exceeded expectations on Long Island," where consumer interest forced NYPA and Ford to reassign 10 EVs from other localities to Huntington Station in the town of Huntington on Long Island. NYPA said the addition of the EVs makes Long Island the "regional leader in the Clean Commute program, representing 40 percent of the program's vehicles."

Clean Commute officials said Ford has leased 95 Th!nk city EVs to individuals in Westchester, Putnam, Rockland, Queens, Nassau and Suffolk counties. Program participants charge the EVs using equipment at the parking lots of commuter train stations where the vehicles are parked during the day. NYPA said the EVs are provided by local Ford dealers, who leases the vehicles directly to consumers and provide maintenance service and basic vehicle instruction. (BUSINESS WIRE: 8/28)

Yamaha to Develop Hybrid Electric Motorcycle

Japanese motorcycle manufacturer Yamaha recently unveiled a prototype hybrid electric motorcycle that combines an electric motor with a gasoline engine to achieve a fuel efficiency of 250 kilometers per liter (about 588 miles per gallon).

By way of comparison, the Honda Super Cub 50 Custom, considered to be the world's most fuel-efficient motorcycle, achieves only 146 kilometers per liter (about 343 miles per gallon). The company said its new Hybrid Commuter motorcycle is built on a frame similar to a bicycle and features an electric motor that is used for startup power. Once the cycle reaches a speed of 3 kilometers per hour (about 5 miles per hour), the gasoline engine begins providing propulsion for the vehicle. (KYODO: 8/29)

EVAA Conducts 2nd Electric Bus Workshop in CA

The Electric Vehicle Association of the Americas (EVAA) recently conducted the second of four workshops on electric and hybrid electric bus technologies at the Santa Barbara Metropolitan Transit District (SBMTD) in Santa Barbara, CA. The workshop provided information about the status of bus electric drive technologies and efforts underway by industry and government to encourage their development and use. During the workshop, SBMTD was inducted into EVAA's "Million Mile Club.

EVAA's third electric bus workshop will be held in New York City on October 10 to 11, while the final workshop is scheduled for December 10 in Hollywood Beach, Florida. (EIN STAFF: 9/5)

Nissan to Use Electric Motor in e-4WD System

Nissan Motor Company plans to equip a new model of its "March" subcompact car with an electric motor that will assist the vehicle's internal combustion engine by powering the rear wheels. The automaker said the "e-4WD" system will be five percent more fuel efficient than traditional four-wheel-drive systems. The March models will not be able to store electricity generated by the vehicle's engine.

Nissan plans to produce approximately 800 March models featuring the e-4WD technology per month. The conventional March models have a fuel economy of 16.6 kilometers per liter (about 39 miles per gallon) of gasoline, while the e-4WD models will have a fuel economy of 19 kilometers per liter (about 44 miles per gallon). (NIKKEI ENGLISH NEWS: 9/5)

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EV HUMOR - HOW THE GRINCH SOLD GREEN-NESS

By Lee Hart

Every E down in Eville liked EVs a lot.
But the Grinch on the hill, he liked EVs... NOT!

The Grinch HATED EVs! No matter the season.
Don't ask me why; I don't know the reason.
Maybe because all his power and wealth
Was coming from cars that were bad for your health.
But I think the most likely reason of all
Could be from a conscience two sizes too small.

He stood on his hill, looking down with a frown
Knowing each smoggy light was the light of a town
Where everyone drove Grinch Gasamobiles
To go anywhere reachable on wheels.
For there weren't any buses; there weren't any rails.
There weren't any sidewalks or cycling trails.
So they drove to their jobs; they drove to the store.
They even drove to the neighbors next door.

All except Eville, which shone bright and far.
Its skies were as clear as the light of a star.
For you see, down in Eville, in 1913
The very first car leaked gasamoline
Which started a fire that burned up the car,
The barn it was in, the house, and a bar,
Then a school, and a church, and a factory burned down.
In fact, it burned down the town all around!

So they banned gasoline with a big proclamation.
And today, Eville is the last 'ville in the nation
That doesn't have even one gasoline station.
Oohville and Ahville have big fancy cars
And air so polluted they never see stars.
But in Eville they all have electric cars.

So the Grinch stood there growling, and hating the E's.
"How dare they ignore me, and do as they please!"
So he thinked and he thenked and he thought and he thunk.
He thought so hard that his thinker went "clunk".
And hatched an idea; a ghastly, grimacely, grinchly idea.
"While I can't steal Christmas (like last Christmas Eve),
I'll bet I can make them abandon EVs!"

He called his designers. "We've cars that don't sell.
Get busy and change them! How, I will tell.
Throw in a big starter, and more batteries,
And stick on 'em stickers that say "HEVs".
Then ship 'em to Eville, and quick if you please!"

Then he got on the phone to Senator Phooles.
Who heads the Committee for Autocar Rules.
"Those voices of Eville are trying to say
That cars would be great if we built 'em their way.
But EVs don't work; they sit on the shelf.
Meet me in Eville, and see for yourself!
Bring your reporters; a gaggle or two
And I'll show 'em something incredibly new!"

Then the Grinch threw some ladders and tools in his truck
And wore his old Santy Claus suit, just for luck.
He drove out to Eville, and crept into town
On Christmas eve evening, just after sundown.

The streets were deserted; the E's in their beds
While visions of batteries danced in their heads.
The air was refreshing, the snow was snow-white
And the stars above glowed with a crystalline light.
The first house he came to, all festive and gay
Was all decorated a Christmas-E way.
Did this fill the Grinch with a Christmas-E spirit?

No! He climbed up a pole as soon as he neared it
Where he broke every breaker, switched off every switch
And snipped every wire with his wire snipping snips.
Til there wasn't a single light left in the house
And the darkness was too dark for even a mouse.

Then he put on his snow-stilts, and marched up the streets,
Cutting wires from every pole he could reach,
Repeating his crime at the other E houses,
Leaving too little light for the other E mouses.
Switching and snipping, he worked through the night
And cut every wire where there was a light.

And nobod-E saw him; well, only one she.
Little Mary Lee E; who was no more than three.
She chanced to look out as the Grinch stilted by
And said, "Santa, you're cutting our wires! Why?"
Oh, that Grinch he was clever; that Grinch he was slick.
For he thought up a lie, and he thought it up quick.
He said, "There's a wire that's wobbled on top.
So I'm taking it North to fix in my shop.
Then I'll bring it back here, and replace it, chop-chop!"
Then he gave her a smile, and patted her head
Saying, "Don't catch a cold dear; now back into bed!"

Then he went back to work, and finished by three.
Til the town was in darkness, and he chortled with glee,
"Their EV's won't run without 'lectricity!"

Was the Grinch done? No! Not a chance, you can bet!
For his evil for Eville was even worse yet.
He rushed to a building he'd secretly leased
On the corner of Main, and Eco Street East
He arrived just in time to see that a truck
With his Grinchomobile HEVs had pulled up.
"Unload 'em!" he shouted, "We ain't got all day!"
"Seven more truckloads are still on the way."

He busied himself putting up a big sign.
"Grinch Eco-Mobiles" (his marketing line).
In front, he installed his "recharging station"
With a sign that said, "Fastest Charge in the Nation".
And a "charge-port connector" that looked, I suppose
Like a gasoline station fill-er-up hose.

I have to admit, that greedy old Grinch
Could really work hard and fast in a pinch.
He got it all up, and finished on time
And on Christmas morning, he opened at nine.
Senator Phooles, with his newsmonger crew
Cut the ribbon, and posed for a photo or two.

"They claim we are doomed", he pontificated,
"If auto pollution is not soon abated.
They say our beloved cars are the cause
And seek to pass ruinous emission laws.
But Grinch Motors funded a brand new selection."
(and also the Senator's coming election)
"We stand at death's door; what should we do?
Call on the Grinch; he'll pull us through!"

Then the Grinch said, "My friends..." with a crocodile grin.
"I have just the thing for the fix we are in.
My Grinch Eco-Mobile SUV car
Has ten times the range of an E-lectric car!
It uses my new improved Ecogas fuel
With no sugar, no salt, or cholesterule,
It's organic, wholistic, and all naturule!"
And though it was really just plain gasoline
For his final trick, he dyed his fuel green.

The press "ooh'd" and "ahh'd" from the dealership floor.
They'd never seen anything like it before.
These cars were so massive, so hugely luxurious
But the MPG claims were downright penurious.
Had the Grinch really done it? Could it be true?

Could they keep their big cars, and have cleaner air too?

The Grinch sighed and said, "I hate to be rude."
But the EV's the E's drive are dreadfully crude.
They haven't got heaters; the're icy EVs.
Not toasty and warm like my ICE V's!
And I hear that a freak winter storm in the night
Has left their cars dead, without power or light.
"So watch," bragged the Grinch, "How they flock in the door."

And he waited...

And waited...

An hour or more.

So he looked out the window, and what did he see?
Electric cars, driving by silently!
"Something is wrong," thought the Grinch with a glower
"How could they drive without 'lectrical power?"

Just then a customer drove on the lot
Announcing, "I'm here to see what you've got."
"For I am the Lorax, I speak for the E's.
So can you explain your cars, if you please."

He was fuzzily short; an odd little fellow
With eyes rather green, and his moustache was yellow.
But the Grinch didn't care if they're short or look funny.
All that's important is that they have money.
So the old Grinch adopted his oiliest smile
Saying, "Won't you come in; look around for a while."

Said the Grinch, "HEVs save on gas, don't you know.
Their engine shuts off when they stop or go slow.
And pollution and noise are lowest, you see
When the car is moving electrically."
"I see," said the Lorax, "the source of the perks."
"The more it's electric, the better it works!"

"No!" said the Grinch with a trace of a glower.
"You cannot drive on just 'lectrical power!
The gas engine's needed; it's outright required.
We never would sell a car that's just wired.
It's un-natural, un-normal, it's... un-what-we-do!"
(He almost said "unprofitable", too).

And so, an argument quickly ensued.
The Lorax polite; the Grinch rather rude.

"My HEVs never plug in, not a bit..."
"So they have to burn gas for every trip."
"But gasoline is a cheaper solution..."
"If you don't count all the wars and pollution."
"EVs just move their pollution around..."
"Our power's from hydro and wind in this town."
"Batteries are costly, and they never last."
"Amortized over life, they're cheaper than gas."
"EVs are slow, just like an old lady."
"GM's EV1 can zoom past you at 80."
"They haven't the range, they'll die on the way."
"They go twice as far as I drive in a day."
"Outlets are deadly, you'll be 'lectrocuted!"
"So you think a gas pump is safer, more suited?"
"Last year, we offered to sell some EVs..."
"No you didn't; you LEASED them to celebrities."
"There was no demand for EVs, do you hear!"
"Then why was the waiting list over a year?"
"If a storm cuts your power, like it did last night
You'll be stuck in the dark to wail."
"Then our EVs will power our heat and light
And can still drive that 'storm' to jail."
At that, the old Grinch began to get mad.
He flustered and blustered, "Now looky here, dad!"
Building big gassers is all that we know,
And we're figuring on biggering, 'cause that's

how we grow.
We're going to keep following our master plan
To get bigger and BIGGER, as long as we can!
We don't give a toot for your sissy car voices
Cause' you HAFTA buy OUR cars; there's no other choices!"

The Lorax said sadly, "There's someone I knew.
We called him the Once-ler; he was once like you.
Once he was mighty; once he was great.
But he wouldn't change, til it was too late.
Like those selling slide rules, or watches with gears
Technology changed, and their wealth disappears!

Our EVs are crude, I admit that it's true
But we built them ourselves; what else could we do?
You took a first step with your big HEVs.
We'd like you to do a bit more, if you please.
If a little electric can make a car better
Then won't a bit more make it still better yetter?

How long can you keep selling gasoline cars
With oil so scarce that
we have to fight wars?
Great HEV cars are coming to light
Like Toyota Prius, and Honda Insight
And the Sparrow, and Gizmo, and Think EV too.
Competitors do it; so why can't you?
You cannot stop progress; time never sits still
If you don't do it, then someone else will.

The Grinch started forming an angry retort
But then thought of something that brought him up short.
A customer's telling me what he will buy.
Like a fool, I don't listen; I'm arguing! Why?

They go to such trouble to build their own cars.
If we did it for them, they'd surely buy ours.
The government fines, putting us in the red,
Would turn into grants and incentives instead.
My marketing morons spend fortunes as well
Telling people to buy what we want to sell.
But if we had cars people wanted to buy
The ads would be cheap; off lots they will fly!
I'm tired of lobbying in government foyers
Besides, engineers are cheaper than lawyers!

And so, then and there, in the length of a sneeze
The Grinch changed his mind about selling EVs.
The cameras were rolling, in his showroom that day
As the Grinch announced what no one thought he could say.

"We've a hundred EVs, built for a test
In a populous state, located out west.
They cost us a fortune (until we build more)
But we'll sell 'em to whoever walks in the door.
And after some work on our first HEVs
You'll be able to drive them on batteries.
When gas or electric can refuel a car
Then people can choose to drive cheap, or drive far.
Driving most of your trips electrically
Saves fuel and emissions dramatically.
Competition, to keep the fuel prices down,
Reduces demand, so there's more to go 'round.
Now these are big changes; and hard for me
But it's what we must do for the new century."

Then the Lorax stepped up, and put out his hand
Saying, "Congratulations for taking a stand.
And to show that I'm with you on this all the way
I'm ordering one of your cars today."

And so, as the Christmas bells did ring
The newscasts showed an incredible thing.
The Grinch and the Lorax, hand in hand,
Saying EVs will be offered all across the land.
But now, you have to do your part, too.
The Grinch could change, but can you?
What will you buy?
Can you change, too?

THE WOODBURN EXPERIENCE

By Seth Murray
Originally posted to the EV List 9/2002

For a long time I have wanted to go out to the NEDRA electric drags in Woodburn, OR, the mecca of the EV world. This year I finally made the trip from Worcester, MA where I have just started college at WPI. Bob Rice, a fellow Easterner, told me he was going and urged me to come. I found reasonably priced plane tickets that would get me out to Portland on Saturday, August 31, and back into Boston on Monday September 2, not missing a single minute of Woodburn or even one lecture at school. I was sold!

After a hectic day of takeoffs and landings, I finally made it to my motel in Portland, and the next thing I knew, the Blue Meanie was pulling into the motel parking lot and I was shaking hands with John Wayland, the man himself. In the course of a day I had completely changed worlds. I was no longer in the East, relatively dismal EV-wise, but now in Portland, OR, the unofficial United States EV headquarters! As Steve Clunn once posted to the EV list, I'm here in Florida and if I want to see an EV I have to build it first then look at it... This applies pretty well to Maine also, so imagine my excitement when, after a brief handshake, I was getting my first-ever ride in an EV that I hadn't built!

With a long squealing of tires we left the parking lot and hit what seemed like 100 mph before the next light as we zipped by cars like they were standing still, John grinning ear to ear. As my initial panic wore off, the biggest EV grin I had ever worn spread across my face while John assured me that the car had really gone faster when the batteries and clutch were newer. It certainly seemed plenty fast to me!

We took the next left, leaving a layer or two of tire back at the light, then a few more turns and we pulled into John's driveway as I gazed in wonder upon a huge crowd of fellow ampheads and an impressive assortment of EVs. Soon I was being introduced to people whose names I recognized from the EV list - too many folks to name. There were scooters and other electric toys zipping by every which way, all over the place. What a scene!

Inside John's garage there were enough EV parts and tools to make any EVer drool out of both sides of their mouth. There were EV parts and electricity everywhere - outlets here, outlets there, controllers, extension cords, batteries, and stereos on shelves and benches, even a scratchless PFC-20 sitting amidst a bunch of homemade bad boy chargers. After a few hours of EV heaven, the entire group of us had a great dinner at a Mexican restaurant and then headed our respective ways to get some rest for the big day on Sunday.

We had all agreed to meet at John's house at 7 the next morning before heading down to the drag strip. When I arrived, John and a few others were just finishing installing his "suicide" pack of extra Hawker batteries and wiring, which, when THE button was pressed, would bring the nominal pack voltage up to 408 and bypass the controller for a bit of a boost. John said something to the effect of Either the car will go really fast or it will blow up - either way it will be exciting. What spirit! We were all snapping pictures of John hooking up his battery back - oops, should have turned off the flash!!

With all the trailered up, we set out for Woodburn in a long train, with John's wife Cheryl bringing up the rear in the Insight at over 80 mpg! It was a gorgeous day as we pulled into the drag strip, perfect for a great EVent.

Arriving at Woodburn, I immediately got that wide-eyed, grinning excitement I get every time there are lots of awesome things to see and people to meet. At first I just wandered around talking to everyone and looking at their cars and other creations, grinning from ear to ear - this was probably the best thing about Woodburn for me. People went zipping by on scooters and electric bikes and go carts in every direction and everyone was having a great time. I even had the chance to pilot Bill Bruder's incredible Wind Mobile - how cool, literally! I was quite excited when I got to take EV Part's supped up golf cart for a spin - it's not your average golf cart! Over the course of the day different people would fly past on it screaming ahhh ahhhh! It was a sight to see!

Of course, one of the reasons we were all there was to race EVs. Electric drags are something entirely different from gas, because there's no engine noise, just raw, silent power. A quick description for people who've never seen one: First the cars let the smoke out in the burnoff pit to warm up the tires. It is SO cool to see a car getting enveloped in white smoke but not making deafeningly loud engine noises. Next the cars pull forward to the start line and the lights start climbing down the tree - 1, 2, 3, green! With a quick squealing of tires the cars are gone!!!

I personally thought the best car races were the ones between John Wayland in the White Zombie and Rich Brown in the Dualin' 7. They had some pretty close runs and Rich was getting rubber in multiple gears! When John got down to about the eighth mile or so, he hit the suicide switch - you could hear the dual WarP 8" motors change pitch, it was soo cool. Pulling back to his van I watched in amazement as he put 250 amps of charging current into his Hawkers from the Optima powered dump charger. Amazing!

As the racers turned up their controllers, the races got more exciting. Rich Rudman's Goldie let out some nice smoke, as did Father Time's red bike, which has a 1000 amp meter with a noticeably bent needle. There were many very quick races between that bike and the Killacycle, which was using EVCL's new Zilla monster controller. I was rather disappointed to discover that the awesome 3-motored EV Parts Nissan would not be racing due to a broken drive train. There was also a very nice Tropica which had some respectable runs, despite a slipping drive belt.

Besides the regular racers, there were some rather unconventional runs - everyone laughed John Wayland down the strip in the 1908 Olds "Time Machine", as he ran a 50.253-second quarter mile, reaching a top speed of 19.27 mph. Bill Bruder hit 40 mph in his Wind Wagon!

Other vehicles that were there but not racing included Mark Mongillo's very clean Fiat conversion with the big Optimas, Victor Tikhonov's 28-Optima AC CRX, Mr. Sharkey's VW and pusher trailer (very cool). John's Heavy Metal garden tractor was, as usual, a complete hit. Rod Wilde's new "SUCK AMPS" tattoo also drew a lot of

John Wayland gets ready for his tire-smoking run.

ThunderMotors revives a 4-motor Tropica, the Spirit of Alameda.

The lineup of EVs, from dragsters to to recycled cars.

EVs come in all shapes and sizes..

attention! Rich Rudman was happily demonstrating an absolutely awesome PFC-50 by charging about half of the racers between runs.

After the awards, most of us went out for a pizza dinner and talked the races for a long while, before finally heading our respective ways. Despite almost missing my plane in the morning, I made it back to Worcester safe and sound, dead tired, but with creases around my mouth from having worn such a HUGE EV grin for the past two days. Woodburn is an experience unlike any other, and whether or not you have ever considered making the trip, it is very much worth it and I encourage you to go. It is an unbelievable experience - you will see some awesome cars and meet lots of great people.

Thanks to everyone who was out there for such a great time, it was awesome to meet you all. Special thanks to John and Cheryl Wayland for being so hospitable, and Bob Rice for convincing me to make the trip. Hope to see all of you again next year and catch some new faces too! Keep on EV-grinnin'

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Pictures by Bruce Parmeter.
http://brucedp02b.150m.com/woodburn02/

WHAT: **2003 Challenge Bibendum**
WHEN: **Sept. 23-25** WHERE: **Infineon Raceway**

PitReport

BACKGROUND: Challenge Bibendum was conceived by Groupe Michelin as an objective way to bring together and test the best available technologies for environmentally positive vehicles. The event is open to all energy sources.

Challenge Bibendum Comes to Infineon Raceway in 2003

Infineon Raceway has been selected as the host site in 2003 for one of the annual premier global events for advanced technology vehicles: Michelin's Challenge Bibendum.

The three-day event will take place Sept. 23-25 and Infineon Raceway will serve as the host site, with other events planned for San Francisco and Sacramento. This will mark the second Challenge Bibendum in North America.

Challenge Bibendum was conceived by Groupe Michelin as an objective way to bring together and test the best available technologies for environmentally positive vehicles. The event is open to all energy sources. It features vehicles from virtually every major vehicle manufacturer and brings together all facets of the automotive world: vehicle manufacturers, designers, energy suppliers, technical and industrial partners.

Some of the companies that signed up for 2002 Challenge Bibendum included: Toyota, Daimler-Chrysler, Opel, Citroen, Peugeot, Ford, Honda, Mercedes, BMW, Fiat, Nissan, Renault, Audi and Volvo, among others. Energy sources included bio-ethanol, electric, bio-fuel and hybrid electric, to name just a few.

"Challenge Bibendum has become the key international showcase for these new technologies that will govern how we move about our planet in the coming years," said Steve Page, president and general manager at Infineon Raceway. "We are very honored that Groupe Michelin has selected Infineon Raceway and the Sonoma Valley to host this important event."

The 2001 Challenge Bibendum tested new technologies during a rally from Los Angeles to Las Vegas. It featured the largest collection of fuel cell vehicles in the world – 10 vehicles from seven manufacturers. The 2002 event began in Heidelberg, Germany and concluded in Paris for the opening of the Paris International Motorshow.

"We are excited to have the event return to North America," said Michael Fanning, vice president, public relations and government affairs, Michelin North America. "The North American market already has several choices of hybrid and electrical vehicles – with more coming every day. Challenge Bibendum is the perfect place to showcase vehicles consumers can choose today to make our planet a better place to live."

Plans for the 2003 event have already begun.

"The support from Sonoma and San Francisco has been extraordinary," said Michelin's North American Project Leader Ron Musgnug. "We considered many locations for the 2003 event, but the work being done today in the Bay Area to promote advanced technology vehicles is a wonderful model to showcase to the world. The beauty of the wine country and the forward thinking of the city and county of San Francisco will be the perfect backdrop to the 5th Challenge Bibendum."

Vehicle testing, information booths and media seminars will be based at the newly renovated Infineon Raceway in Sonoma. Vehicles will then rally across the Golden Gate Bridge to conclude the event in San Francisco. More than 200 international journalists are expected for the 2003 event.

Although some Americans may be unfamiliar with the name "Bibendum," it is well known elsewhere in the world. "Bibendum" is the original name of the Michelin Man– the ever-pleasant man of tires that has symbolized Michelin for more than 100 years. The first Challenge Bibendum was held in 1998 to help celebrate his 100th birthday.

Updates for 2003 Challenge Bibendum can be found at www.challengebibendum.com.

WWW.INFINEONRACEWAY.COM 1.800.870.RACE 11

At our annual national meeting in February, we will be introducing 4 new members to the EAA Board of Directors. Here is some background on each of them, describing their involvement and commitment to the EV movement.

Jerry "EVJerr" Asher:

Currently, I am filling the above position as an appointed EAA Board Member since July 2001; I also serve as the Educational Chair with my EAA Chapter, the Electric Vehicle Association of Washington, DC (EVA/DC). My EVndeavers now are to continue to serve on the EAA Board for the next three years. Or even two term or one year of being in service. And even beyond, such as working with Jim & Elaine Stack and Jesse James of the Phoenix Electric Auto Association, as one in PEAA's Corps of EVolunteers, who are bringing back the Tour de AZ to Arizona, come the last weekend in March 2003.

At the same time and place, I've taken on chairing the 2nd EVer EAA Chapters Conference -- focusing on transforming EAA into truly a national as well as an international association with 100s of EAA Chapters and tens of 1,000s EAA members.

Previous tangible EVforts included: co-founding the Triangle EAA in North Carolina in 1996; assisting with the setting up of the EAA - Coastal Carolinas in 2001, and bringing the well established but previously independent Eastern Electric Vehicle Club on-board as a EAA Chapter during the winter of 2002. Aside from years of EVolunteering with the premier high school EVent--the EVChallenge, and the renown Tour de Sol, there were rumors of EVJerr being a tad instrumental in setting up and chairing the 1st EVer EAA Chapters Conference in Washington, DC. Note: the 1st EVer ... was unanimously approved by the Board and hosted by EVA/DC as well as done in conjunction with the Tour de Sol in May 2002.

The EVisions that I have for EAA, its Chapters and members, are varied and many--that is pretty much stated in terms of growing the numbers with dynamic fellow EAA Board Members and transforming EAA itself into a truly national association, an organization with international focus as well. That realization will be the day when EAA will have a Board whose Members oversee and approve policy and directions for EAA while selecting a paid Executive Coordinator with Staff for daily EAA operations, ... website maintenance, and ... definitely, the publication of Current EVents. More "thankful" EVisions from A-2-Z will obviously be forthcoming after the EAA Board Elections.

Bill Carroll:

I have been a member of the Electric Auto Association since 1981 and have been in the S. F. Peninsula Chapter. Since being in the EAA I took over the membership listing in 1985 (at which time we had 247 members, it grew to 1900 plus while I handled this job, then passed to the next person (June Munro).

\I have been on various boards of directors and governors since 1952. Navy Enlisted Men's Club, (where a requirement was learning the "Roberts Rules of Order'), small hobby clubs of a few members, I was a member of the board for the Square Dance Callers Assn. Of Northern California (of which I am a life member). I held each office of this organization, completing in 1979. I have been on the board of Directors for the Electric Auto Association as an appointee as chairman of the elections committee for the past 18 months.

I feel that I have the necessary knowledge to be of service to the board.
I have owned an electric car (1973 Honda now defunct) and am now trying to put another car together.

Karen Jones:

I have been a member of EAA since the early 1990's and am the founding president of PVEAA in Western Massachusetts. I commute year-round by bicycle and public transit. I also drive an EV conversion As an educator and environmental activist, I work with people of all ages to promote energy conservation and the use of renewable energy resources.

I support EV's and technology that increases fuel economy for their potential to reduce American dependence on foreign oil. I will work to help avoid having EV concept cars, such as the Ford TH!NK City, mothballed for insufficient "sales success," even before they are brought to market.

I pledge to support EAA's efforts to lend its voice to national debates regarding transportation options.

I will bring to the Board a commitment to strengthening connections between EAA chapters, in order to personalize the good work that is being done by EAA members across the country and to help develop greater advocacy among members.

Richard Sands:

The DMC-EAA was involved this year in a number of eVents and is presently planning for next year. I would at this time like to offer my personal service as a delegate nominee from Michigan to assist at the national level and open a few more doors for the benefit of everyone. Our local chapter of EAA has definitely made a great deal of progress during this past year. We are looking forward to an even better year in 2003. Please regard this email as my offer of service.

I am involved with a variety of local, county, and state coalitions that provides education and alternative programs for our youth. Furthermore, I have over 20 years in Electrical/Electronics, over 10 years in the Medical/Legal fields, and presently I am working full-time as an independent paralegal/investigator with mostly a small clientele of general practice law firms. Currently, I am in graduate school working on my MBA and looking forward to completing my Juris Doctorate in 3-5 years. Plus, my wife and I are working on our three-wheeler H-D elect conversion trike for next years NEDRA event and the Downriver Cruse.

MEMBERSHIPS: American Bar, Michigan Bar, Michigan Private Investigators Counsel, Board of Trustees' Madonna University, Kappa Gamma Pi, EAA, and NEDRA

ELECTRIC AUTO ASSOCIATION CHAPTERS

CANADA

VANCOUVER EVA (VEVA)
Web Site: http://www.veva.bc.ca/
Contact: Haakon MacCallum,1-604-258-9005, info@veva.bc.ca
Mailings: P.O. Box 3456, Vancouver, BC V6B3Y4, Canada
Meetings: 3rd Wed./month, 7:30 pm
Location: 3750 Kitchener St., BC Transit

UNITED STATES

ARIZONA

PHOENIX EAA (PEAA)
Web Site: http://www.phoenixeaa.com
Contact: Sam DiMarco, 1-480-948-0719, voltek_2000@yahoo.com
Mailing: PO Box 6465, Scottsdale, AZ 85258-6465, USA
Meetings: 4th Sat./month, 9:00 am
Location: Varies, see Web Site for details.

CALIFORNIA

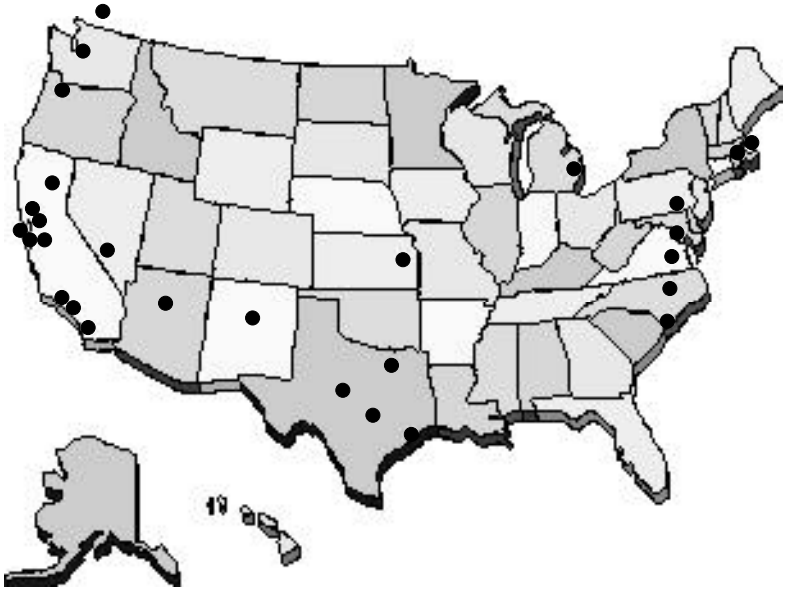
CHICO EAA (CEAA)
Web Site: http://geocities.com/chicoeaa/
Contact: Chuck Alldrin, 1-530-899-1835, calldrin@sunset.net
Mailing: 39 Lakewood Way, Chico, CA 95926-1555, USA
Meetings: 2th Sat./month, 10:00 am.
Location: 1350 East 9th St, Chico, CA

EAST (SF) BAY EAA (EBEAA)
Web Site: http://geocities.com/ebeaa/
Contact: Ed Thorpe, 1-510-864-0662, eaa-contact@excite.com
Mailing: 2 Smith Ct., Alameda, CA 94502-7786, USA
Meetings: 4th Sat./month, 10:00 am.
Location: 1515 Santa Clara Ave, Alameda, CA

LOS ANGELES EAA (LAEAA)
Contact: Louis Weiss, 1-323-935-2690
Mailing: 1811 Hi Point St., Los Angeles, 90035-4621, USA
Meetings: 1st Sat./month, 10:00 am
Location: 1200 E California Blvd, Pasadena, CA

NORTH BAY EAA (NBEAA)
Web Site: http://geocities.com/nbeaa/
Contact: Dr. Nick Carter, 1-707-573 9361, nick@npcimaging.com
Mailing: 3000 Cleveland Avenue, Suite 209, Santa Rosa CA 95403-2117, USA
Meetings: 2nd Sat./month, 10:00 am.
Location: Call for meeting details.

SAN DIEGO ELECTRIC VEHICLE ASSOCIATION (SDEVA)
Web Site: http://home.att.net/~NCSDCA/EVAoSD/
Contact: Chris Jones, 619-913-6030, NCSDCA@WorldNet.ATT.net



Mailing: 315 South Coast Highway 101, Suite U44, Encinitas, CA 92024-3543, USA
Meetings: 4th Tues./month, 7:00 pm
Location: 2080 Pan American Plaza, Balboa Park, San Diego

SAN FRANCISCO PENINSULA EAA (SFPEAA)
Web Site: http://geocities.com/sfpeaa/
Contact: Bill Carroll, 1-650-589-2491
Mailing: 160 Ramona Ave., San Francisco, CA 94114-2736, USA
Meetings: 1st Sat./month, 10:00 am
Location: 701 West Angus St., San Bruno, CA

SAN JOSE EAA (SJEAA)
Web Site: http://geocities.com/sjeaa/
Contact: Mike Thompson, m.t.thompson@ieee.org
Contact: Roy Paulson, 1-408-997-2404
Mailing: 1592 Jacob Ave., San Jose, CA 95118-1612, USA
Meetings: 2nd Sat./month, 10:00 am
Location: 2350 Cunningham Ave., San Jose, CA

SILICON VALLEY EAA (SVEAA)
Web Site: http://eaasv.org/
Contact: Will Beckett, 1-650-494-6922, will@becketts.ws
Mailing: 4189 Baker Ave., Palo Alto, CA 94306-3908, USA
Meetings: 3rd Sat./month, 10:00 am
Location: 3000 Hanover St., Palo Alto, CA

VENTURA COUNTY EAA (VCEAA)
Web Site: http://geocities.com/vceaa/
Contact: Bruce Trucker, 805-495-1026, tuckerb2@adelphia.net
Mailing: 283 Bethany Court, Thousand Oaks, CA 91360-2013 ,USA
Meetings: Call or email for location/meetings.

KANSAS / MISSOURI

MID AMERICA EAA (MAEAA)
Web Site: http://maeaa.org/
Contact: Mike Chancey, 1-816-822-8079, eaa@maeaa.org
Mailing: 1700 E. 80th St., Kansas City, MO 64131-2361, USA
Meetings: 2nd Sat./month, 1:30 pm
Location: See web site for details.

MASSACHUSETTS

NEW ENGLAND EAA (NEEAA)
Web Site: http:/neeaa.org/
Contact: Tony Ascrizzi, 1-508-799-5977, eaa@maeaa.org
Mailing: 34 Paine Street, Worcester, MA 01605-3315, USA
Meetings: 2nd Sat./month, 2:00 pm
Location: Call or email for meeting location.

PIONEER VALLEY EAA (PVEAA)
Web Site: http://geocities.com/pveaa/
Contact: Karen Jones, 1-413-367-9585, pveaa@hotmail.com
Mailing: P.O. Box 153, Amherst, MA 01004-0153 USA
Meetings: 3rd Sat./month, 2:00 pm
Location: 43 Amity Street, Amhurst, MA.

MICHIGAN

DMC-EAA DETROIT MOTORCITY CHAPTER (DEAA)
Web Site: http://geocities.com/detroit_eaa/
Contact: Richard Sands, 1-734-281-4087, rsands01@comcast.net
Mailing: 13162 Fordline St, Southgate, MI 48195-2435, USA
Meetings: Call or email for location/meetings.

NEVADA

LAS VEGAS EVA (LVEAA)

Web Site: http://www.lveva.org/
Contact: William Kuehl, 1-702-645-2132, bill2k2000@yahoo.com
Mailing: 4504 W. Alexander Rd., N. Las Vegas, NV 89115-2489, USA
Meetings: 2nd Sat./month, 10:00 am
Location: 1401 E. Flamingo Rd, Las Vegas, NV

NEW MEXICO

ALBUQUERQUE EAA (AEAA)

Web Site: http://abqev.org/
Contact: Tom Stockebrand, 1-505-856-1412, Info@abqev.org
Mailing: 1013 Tramway Ln NE, Albuquerque, NM 87122-1316, USA
Meetings: 1st Tues./month, 7:00 pm
Location: 6810 Menaul NE, Albuquerque, NM

NORTH CAROLINA

EAA OF COASTAL CAROLINAS (EAACC)

Contact: Jayne Howard, 1-910-457-4383, EAAofCC@aol.com
Mailing: 4805 E. Southport Supply Rd., Hwy 211, Southport, NC 28461-8741, USA
Meetings: Varies, call for details.
Location: 4805 E. Southport Supply Rd., Hwy 211, Southport, NC

TRIANGLE EAA

Web Site: http://www.rtpnet.org/teaa/
Contact: Ken Dulaney, 1-919-461-1241, teaa@rtpnet.org
Mailing: 202 Whitehall Way, Cary, NC 27511-4825, USA
Meetings: 3rd Tues./month, 5:30 pm
Location: Varies, call for details.

OREGON

OREGON ELECTRIC VEHICLE ASSOCIATION (OEVA)

Web Site: http://www.oeva.org/
Contact: Ralph Merwin prizmev@yahoo.com
Mailing: 2905 NE 29th Ave., Portland, OR 97212-3558, USA
Meetings: 2nd Thur./month, 7:30 pm
Location: SW Salmon and 1st St, Portland, OR

PENNSYLVANIA

EASTERN ELECTRIC VEHICLE CLUB (EEVC)

Web Site: http://members.aol.com/easternev/
Contact: Peter Cleaveland, 1-610-828-7630, easternev@aol.com
Mailing: P.O. Box 717, Valley Forge, PA, 19482-0717
Meetings: 2nd Wed./month, 7:00 pm
Location: 201 E Germantown Pk, Plymouth, PA

TEXAS

AUSTIN AREA EAA (AAEAA)

Web Site: http://www.austinev.org/
Contact: Aaron Choate, 1-512-453-2890, info@austinev.org
Mailing: PO Box 49153, Austin, TX 78765, USA
Meetings: Call or email for location/meetings.

HOUSTON EAA (HEAA)

Web Site: http://www.hea.org/
Contact: Dale Brooks, 1-713-729-8668, brooksdale@usa.net
Mailing: 8541 Hatton St., Houston, TX 77025-3807, USA
Meetings: 3rd Thurs./month, 6:30 pm
Location: 3015 Richmond Ave., Houston, TX

NORTH TEXAS EAA (NTEAA)

Web Site: http://www.geocities.com/nteaa/
Contact: Paul Schaffer, 1-972-437-1584, pshf@hotmail.com
Mailing: 430 Ridge Crest, Richardson, TX 75080-2532, USA
Meetings: Varies, call/email for details.

VIRGINIA

CENTRAL VIRGINIA EAA (CVEAA)

Contact: Ernest Moore, 1-804-271-6411, ernie_moore@yahoo.com
Mailing: 4600 Melody Ct., Richmond, VA 23234-3602, USA
Meetings: 3rd Wed./month, Call for details.
Location: Westwood Ave., Richmond, VA.

WASHINGTON

SEATTLE ELECTRIC VEHICLE ASSOCIATION (SEVA)

Web Site: http://slough1.home.mindspring.com/seva.html
Contact: Steven Lough, 1-206-524-1351, slough1@mindspring.com
Mailing: 6021 32nd Ave. NE, Seattle, WA 98115-7230, USA
Meetings: 2nd Tues./month, 7:00 pm
Location: See website, call for details.

WASHINGTON D.C.

EVA OF WASHINGTON DC (EVA/DC)

Web Site: http://www.evadc.org/
Contact: David Goldstein, 1-301-869-4954, goldie.ev1@juno.com
Mailing: 9140 Centerway Rd., Gaitherburg, MD 20879-1882, USA
Meetings: 2nd or 3rd Tues./month, 7:00 pm
Location: Building 31-C, 6th, Bethesda, MD.

Listing updated, verified and current as of 08/15/02. Please check main web page for any changes in current listing. The Electric Auto Association is a 501 (c)(3) nonprofit organization.

Board of Directors 2003

Chairman
Ron Freund
chairman@eaaev.org

Vice-Chairman EAA Membership
Will Beckett
membership@eaaev.org
1-650-494-6922

Secretary
Scott Leavitt
secretary@eaaev.org

Treasurer
Gabrielle Adelman
treasurer@eaaev.org

EAA Chapter Relations East
Jerry Asher
ChapterRelationsEast@eaaev.org

EAA Historian EAA Awards
Terry Wilson
historian@eaaev.org

Elections Board Calendar
Bill Carroll
electionadmin@eaaev.org

Karen Jones

Richard Sands

Delegates:
Tom Dowling - *EV Charging*
charging@eaaev.org

Charlie Garlow - *Junior Solar Sprints*
juniorsolar@eaaev.org

Bruce Parmenter - *EAA Technology*
webmaster@eaaev.org

Ed Thorpe - *CE Publications*
ceeditor@eaaev.org

EAA Board contact:
board@eaaev.org 1-510-864-0662

Notice: IRS requires us to ask for a full disclosure by the donor for donations of $1000 or more. This should include Full Name, Complete Address, Phone Number, and Social Security or Tax ID Number.

Other USA EV Groups:

Bay Area Action
Web Site: http://www.baaction.org/
Location: San Francisco Bay Area, CA

Fox Valley
Web Site: http://www.fveaa.org
Location: Chicago, IL

Denver EV Council - DEVC
Web Site: http://www.devc.org
Location: Denver, CO

National EV Organizations:

Electrathon America
Web Site: http://electrathonamerica.org/
Focus: Light-weight EV racing

EV Challenge
Web Site: http://www.evchallenge.org/
Focus: Educating Middle & High School children

National Electric Drag-Racing Association - NEDRA
Web Site: http://www.nedra.com/
Focus: EV racing

National Station Car Project
Web Site: http://www.stncar.com/
Focus: EVs to public Transportation

Electric Vehicle Association of the Americas - EVAA
Web Site: http://www.evaa.org/
Focus: EV industry organization

Northeast Sustainable Energy Association, - NESEA
Web Site: http://www.nesea.org/
Focus: Sponsers of the annual Tour de Sol

EV List Photo Album
Web site: http://www.evalbum.com/
Focus: Listing almost 400 electric vehicles from around the world - EVDL List owners

Union of Concerned Scientists
Web Site: http://www.ucsusa.org/
Focus: Citizens and Scientists for Environmental Solutions

Non-USA EV Groups:

EV Council Of Ottawa
Web Site: http://econogics.com/ev/evco.htm
Location: Ottawa, Canada
Focus: Canadian EV organization and resource

Australian Electric Vehicle Association
Web Site: http://aeva.asn.au/
Focus: Australia national group

Japan Electric Vehicle Club
Web Site: http://www.asahi-net.or.jp/~MR5T-OKB/index.html
Focus: Japan national group (Choose the english pages)

Sources - Existing EVs-4-Sale:

Silicon Valley Chapter EAA
http://home.pacbell.net/beckettw/forsale.htm#owned

Innevations
http://www.innevations.com/used-evs.html

Eco-Motion Electric Cars
http://www.halcyon.com/slough/contributions.html

Arcata Electric Car
http://www.tidepool.com/~ecar/list.html

EV Tradin' Post
http://www.austinev.org/evalbum/geobook.html

EVA/DC
http://www.evadc.org/forsale.html

Triangle EAA
http://www.rtpnet.org/~teaa/forsale.html

Check out these websites and the various EAA Chapter websites for new and used EV vehicles, production and conversions, and EV parts.

EV Charging Maps And Information:

Tom Dowling's EV Charger list
Covers Arizona, California and Georgia.
Web Site: http://evchargernews.home.attbi.com/

EV1-club inductive Charging
Web Site: http://ev1-club.power.net/chglist.htm

AVCON Charging
Web Site: http://www.hondaev.org/chg.html

Arizona EV Public Charging Sites
Web Site: http://www.1opossum.com/chargers/

Ottawa Canada Charging Locations
Web Site: http://www.econogics.com/ev/chargloc.htm

Additional Canada Charging Locations
Web Site: http://www.ve-montreal2000.com/site/en/vebornes/Cartebornes.htm

How to Install Electric Vehicle Charging
Web Site: http://www.eaaev.org/eaaevcharging.html
Web Site: http://www.geocities.com/evcharging/

NEW WEBSITE FOR EVS-4-SALE VEHICLES

Check out the new website **www.evfinder.com** for current fast-moving listings, such as EVs on ebay and other sources.

FOR SALE

For Sale:

- Advanced FB1-4001A Motor
- Curtis 1231C-8601 Controller
- plus most other parts

for a complete conversion.
Will sell as a group or individually.
Contact *Lee Dunn* at 325-949-8534 or e-mail at elpulga@juno.com

The Electric Auto Association (EAA) is a *nonprofit* organization for the promotion of public Electric Vehicle (EV) use / awareness as a viable choice. All proceeds are used to cover the costs of our nonprofit efforts in this cause. Please show your support with your purchases for a better, cleaner, quieter, and lower maintenance transportation option.

Image	Description	Item#	Price	#
	License Plate Holder, black plastic frame, white lettering on visible green.	LICPH1	$10.00	
	In motorcycle size, only comes in metal & in either black or chrome, special order, allow 6 weeks.	LICPH2-B LICPH2-C	$14.00	
	*Embroidered Sew-On Paich, white* *This is a special order, please allow an additional three weeks.*	PATCH1	$ 9.00	
	*Embroidered Sew-On Paich, green* *This is a special order, please allow an additional three weeks.*	PATCH2	$ 9.00	
	*Embroidered Hat, adjustable fit.*	CAP002	$15.00	
	*Embroidered Bucket Hat, comes in:* small/medium and large/xlarge.	DCP01-S/M DCP01-L/XL	$25.00	
	*Long lasting metal "Electric Vehicle Parking Only" sign. Same materials used as a public no parking sign. Reflective white background with dark green lettering. Wall or pole mounting.*	PARK02	$40.00	
	*Blemished, Long lasting metal "Electric Vehicle Parking Only" sign. Same materials used as a public no parking sign. Reflective white background with dark green lettering. Wall or pole mounting.*	PARK01	$25.00	
	*Ceramic Coffee Mug*	MUG003	$ 5.50	
	*Insulated Car Coffee Mug*	MUG02	$ 6.50	
	*EAA Car Window Shade*	SS001 S	$ 8.00	
	*EAA Bumper Sticker #1 (10.5x3.75 inch)*	BS800	$ 2.00	
	*EAA Bumper Sticker #2 (The Switch is on) (15x3.75 inch)*	BS002	$ 2.00	

	*Embroidered Polo Shirt (Forest or Navy S,M,L,XL,XXL), 10 weeks for all colors other than the Forest.*	SHIRT01-F- SHIRT01-N-	S M L XL XXL S M L XL XXL	$40.00	
	-- *EV Buyers Guides* --				
	*Electrifying Times Preview 2000* *1997 EV Buyers Guide* *1996 EV Buyers Guide* *1995 EV Buyers Guide*	BG1998 BG1997 BG1996 BG1995		$ 5.95	
	-- *Literature* --				
	*Convert-It EV conversion Book*	CONV01		$24.95	
	*KTA Electric Vehicle Kits & Component Parts Catalog*	CATAL1		$5.00	
	Window Literature Holder (light plastic)	WL002		$15.00	
	Back issues of CE (Specify month/year)	CE001		$ 3.00	
	-- *Special* --				
	*AVCON to 14-50 adapter kit - sheet metal box, 14-50 outlet (2 hots and a ground, no neutral), for 220 VAC chargers, no 120 VAC * some assembly required - 6+ week delivery after payment deposited.*	ADAPT1		$200.00	
	Electric Auto Association Membership	EAAM01		$39.00	
			SUBTOTAL	$____	
	US RATE. -10%, or CANADA -15%, or OTHER = 20% of the total		Shipping	$____	
			Handling	$ 2.00	
			TOTAL	_____	

To order:

- Check off which items and how many you want, total the amount
- Postal mail it with your payment for the amount plus * shipping and * handling to:

EAA Merchandise, 5820 Herma St., San Jose, CA. 95123 USA

Name: Address:

City, State Zip: Email, Tel#

Electric Auto Association (EAA) Membership Application Form

Copy and fill out this form, attach a check or money order or use PayPal in US funds only for $39 ($42 Canada) ($45 International) payable to '**Electric Auto Association**'. You can fold this form as indicated and mail it with your payment enclosed. Use tape to seal the form before you mail it. Or send information in this form and pay through PayPal using http://eaaev.org/membership.htm.

New Member: ❑ Renewal: ❑ Country (if non-USA):_____ Date: _____

Name: _____ *email: _____

Mailing Street Address: _____ Home phone#: _____

Mailing City, State & ZIP: _____ *Work phone #: _____

*Do you ❑ own or ❑ lease an Electric Vehicle? ❑ Production ❑ Conversion ❑ Bicycle ❑ Other:_____ ❑ No

I support the _____ EAA Chapter, or please select an EAA Chapter closest to me. ❑

(*optional) All information in this application is for the exclusive use of the EAA and not be sold or given to any other organization.

(fold back ward, this will protect your personal information, placing it on the inside)

Please Identify your primary areas of interest relating to the EAA (check as many as you wish):

❑ Hobby/Builder ❑ Professional (income) ❑ Competition (Rallies, Races, Records) ❑ Owner/Driver
❑ Environmental/Gov. Regs. ❑ Social (Rallies, Shows, Dinners) ❑ New Technology & Research
❑ Promotion & Public Awareness of EVs ❑ Student or General Interest ❑ Electrathon/Bicycle/other

The Electric Auto Association www.eaaev.org

'Providing free Electric Vehicle information to the public since 1967'

The Electric Auto Association is a non-profit, 501(c)(3) for the promotion of electric vehicles. Membership includes the informative complementary EAA publication, "**Current EVents**". Donations are tax deductible. All information and statistics in this application are for the exclusive use of the EAA and is not sold or given to any other organization or company. From your membership dues, a percentage goes to the EAA Chapter you support for public Electric Vehicle promotion EVents like rallies, shows and EV rides.

(fold the bottom half under. This will now be the front of the letter. Be sure to seal it with tape)

Return address

_____
_____
_____

membership@eaaev.org

1st Class Postage Here

Electric Auto Association
Membership Renewals
4189 Baker Ave.
Palo Alto, CA 94306-3908 USA

EV CONFERENCE AND EAA CHAPTER EVENTS CALENDAR

January 15 - 18, 2003
Symposium on International Automotive Technology SIAT-EXPO 2003, Pune, INDIA
Automotive Research Association of India
E-mail: mrsaraf.sdl@araiindia.com
Phone: +91-20-5437180 / 2 / 3 / 5
Fax: +91-20-5434190
Web page: http://www.araiindia.com/html/SIAT2003/index.htm

February 15, 2003
ANNUAL EAA NATIONAL MEETING, Palo Alto, California, USA
Review of past year, planning for new year and installment of new Board members.
Web Site: eaaev.org

February 18 - 20, 2003
Global Alternative Fuels Forum, Cheltenham, UK
Organized by: The Energy Exchange Ltd
E-mail: c.pallen@theenergyexchange.co.uk
Phone: +44-(0)1242-529090
Fax: +44-(0)1242-570820
Web Site: http://www.theenergyexchange.co.uk

March 4 - 6, 2003
Hydrogen: The Freedom FuelSM, Washington , D.C. , USA
Longest standing annual hydrogen meeting, with U.S. and international content and an exhibition of technology and products from around the world.
Phone: +1-202-223-5547
Fax: +1-202-223-5537
Web Site: http://www.HydrogenUS.org

March 5 - 7, 2003
Automotive Fuel Cell Systems Seminar, Detroit, Michigan, USA
Phone: +1-877-606-7323
Fax: +1-724-776-0790
E-mail: CustomerService@sae.org
Web Site: www.sae.org

April 11 - 12, 2003
8th Annual EV Challenge, Raleigh, North Carolina, USA
Located at the EPA Campus in Research Triangle Park, for High School students.
E-mail: earyan@worldnet.att.net
Web Site: http://www.evchallenge.org/

April 16 - 18, 2003
BATTERIES 2003 5th Conference & Exhibition, Paris, FRANCE
Address the latest trends and market opportunities, new applications components, achievement in power supply. Discussion on raw materials, power management, research, electronic devices, high energy batteries, and Lithium evolution.
Phone: +33-1-5324-3356
E-mail: s.houssin@icad.fr
Web Site: www.batteries2003.com

April 24 - 25, 2003
Making Hydrogen Available to the Public, Reykjavík, ICELAND
Icelandic New Energy brings this conference on how hydrogen will be available to the public in the near future.
Phone: +354-588-0310
E-mail: maria.maack@newenergy.is
Web Site: www.newenergy.is

April 26, 2003
Wicked Watts, Las Vegas, Nevada, USA
Las Vegas EAA hosts Wicked Watts Nedra Electric Drags. The Nedra season opener.
Web Site: www.nedra.com

April 26, 2003
EBEAA EV Distance Rally, Pleasant Hill/Concord, California, USA
Annual East Bay Chapter display and distance event.
Web Site: www.geocities.com/ebeaa

April 27, 2003
Earth Day Expo, Austin TX
Participation by the Austin EAA Chapter, display of vehicles.
Web Site: http://www.austinev.org

May 3, 2003
Fort Pierce EV Rally, Fort Pierce, Florida, USA
Local Florida EV Rally/display.
Web Site: http://www.grassrootsev.com

May 5 - 7, 2003
FuSys2: Fuel Cell Systems Conference, Las Vegas, Nevada, USA
Email: powersourcesnet@aol.com
Phone: +1-561-367-0193
Fax: +1-561-367-8429

May 6 - 9, 2003
Advanced Automotive Battery Conference, Nice, FRANCE
Conference will discuss batteries for advanced vehicles, power generation and distribution on board vehicles, technical and financial challenges for ultracapacitors and fuel cells.
Phone: +1-530-692-0140
Fax: +1-530-692-0142
Web Site: www.advancedautobat.com

May 10 - 13, 2003 (tent.)
2ND EAA ALL-CHAPTERS CONFERENCE, Washington, DC, USA
Planned to be held in conjunction with the Tour de Sol. All Chapters invited.
E-mail: evjerry@usa.net
Web Site: http://www.eaaev.org

May 10 - 14, 2003
2003 Tour de Sol: The Great American Green Transportation Festival,Washington, DC, USA
From Burlington County NJ., through Trenton, NJ and Philadelphia, PA.
Sponsered by NorthEastern Sustainable Environment Assoc.
Phone: +1-413-774-6051
E-mail: nesea@nesea.org
Web Site: http://www.TourdeSol.org

June 3 - July 4, 2003
Fuel Cell 2003, Lucerne, SWITZERLAND
The Fuel Cell World & 2nd European PEFC
Phone: +41-56-496-7292
E-mail: info@efcf.com
Web Site: http://www.efcf.com

June 7, 2003
VEVA REV!2003, Vancouver, BC, CANADA
'EV Rides' near Science World.
Web Site: http://www.veva.bc.ca

June 8 - 11, 2003
Hydrogen and Fuel Cells 2003 Conference and Trade Show, Vancouver Canada
The Canadian Hydrogen Association
Phone: +1-604-688-9655
E-mail: hfc2003@advance-group.com

All EAA Chapter Events - please email <cenews@eaaev.org>.

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* WESTBERG Automotive Style Gauges in 12 configurations
* KTA SERVICES Expanded-Scale & Dual-Scale Meters
* CURTIS INSTRUMENTS Battery Fuel Gauges in 7 models
* CRUISING EQUIPMENT E-Meters, Prescalers, & DC-DC Converters
* LITTELFUSE Safety Fuses in 4 models from 200 to 800 A
* DELTEC Meter Shunts in 5 models from 50 to 1000 A
* DC POWER & CURTIS DC-DC Converters from 50 to 336 V input, 25 A output
* K&W ENGINEERING Onboard Battery Chargers and Boosters from 48 to 168 V
* BYCAN Battery Chargers for 48, 120-132-144 V
* EVCC Adapter Plates, Couplings, Clamps, Brackets & Motor Mounts
* Electric Vehicles Heating & Air Conditioning
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* PRESTOFLEX Welding Cable in 3 sizes from #6 to #2/0
* Battery Cable Assembly Tools
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