EEVC NEWSLETTER

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ELECTRIC SMART CAR

Hybrid Technologies' lithium-powered Smart Car boasts a top speed of up to 80 mph, 0-60 time of 7.1 seconds and range of 140+ miles.

There has been considerable coverage recently of the pending appearance of the Smart car in the U.S. The stubby little vehicle, long a favorite (770,000 sold in ten years) in crowded European cities, is scheduled to be introduced here soon; a media event is scheduled for San Francisco in January, and the company will begin to fill orders that month.

One look at the Smart and you just know it should be electric, and there have been a number of attempts to produce an EV version. In July 2006 DaimlerChrysler announced that the smart fortwo ev would celebrate its world premiere at the British International Motor Show in London, and that about a hundred of the vehicles would be delivered that November to selected British customers as lease vehicles. Power would come from a 30 kW/41 bhp motor fed by a zebra battery, with a range of 110 km (68 miles). The Zebra battery operated at 250°C and used a molten chloroaluminate electrolyte, a molten sodium negative electrode and a positive electrode that was nickel in the discharged state and nickel chloride in the charged state. A few months earlier ZAP had announced that it had sold its 200th "Americanized" Smart, and a year earlier (June, 2005) Zap's CEO had speculated about an electric version.

In September DaimlerChrysler announced a version equipped with the micro

hybrid drive (mhd), which uses a belt-driven starter/generator and automatically shuts off the engine while waiting at a light. The company claimed that the system would reduce fuel consumption from 4.7 l/100 km (50 mpg) to 4.3 l/100 km (54.7 mpg).

Now another company is having a go at an electric Smart. Hybrid Technologies Inc. (Las Vegas, NV) has been building electric versions of the Smart, the PT Cruiser, the Mini Cooper and the Chrysler Crossfire; on November 8, in one of the its periodic publicity events, it announced a deal in which Sam's Club Inc. offered a 2007 Hybrid Technologies lithium-powered Smart Car coupled with a behind-the-scenes VIP trip to the Kennedy Space Center for a shuttle launch. The price was $35,000 — how much of that was for the car and how much for the vacation trip wasn't revealed.

The car itself boasts a top speed of up to 80 mph (128 km/h), acceleration from 0-60 mph of 7.1 seconds, range of 140+ miles (225+ km), charge time of 6-8 hours on 220-240 Vac and cycle life of 1500+ full charges. The motor is a three-phase, brushless ac unit rated at 43 kW (58 hp) peak; the battery pack consists of ten lithium ion packs weighing 440 lbs/181 kg with a proprietary battery management system. Vehicle weight is 2097 lbs (951 kg).

UPDATED EV FROM MITSUBISHI

Mitsubishi Motors has shown a new version of its I MiEV electric car at this year's Tokyo Motor Show. The 970 kg (2130 lb) I MiEV Sport has two 20 kW hub-mounted PM synchronous motors at the front and one 47 kW motor at the rear that together deliver 680 Nm (500 lb-ft) of torque. They're controlled by the company's S-AWC (Super All Wheel Control) vehicle dynamics system, which includes an E-4WD system that electronically optimizes the output of all motors, plus a new E-AYC (Electric Active Yaw Control) system to directly regulate torque at the left and right rear wheels via an electric motor. The S-AWC system also integrates ABS and ASC (Active Stability Control) systems, enabling it to independently control driving force, traction and braking at all four wheels for maneuverability and stability.

The Li-ion battery is installed in the lowest area under the floor for better weight distribution and lower center of gravity. Interestingly, Mitsubishi has not released the capacity of the battery.

ELECTRIC PLANE TO ATTEMPT ROUND-THE-WORLD FLIGHT

One November 5 Bertrand Piccard and André Borschberg, leaders of the Solar Impulse team, and future pilots, presented the final design of the 61 meter wingspan HB-SIA solar-powered airplane, showing a 6 meter model of the prototype. The roll-out of the full-size prototype is due to take place in autumn 2008.

The idea behind the plane is to get the wing loading and speed as low as possible, which minimizes power requirements. Each square meter of solar cells is expected to provide an average output of about 30 W over 24 hours, and calculations show that 30 W of power can, in theory, sustain a weight of 8 kg. A conventional sailplane has a wing loading of about 40 kg/m^2, so getting down to 8 kg/m^2 is quite a challenge.

The Solar Impulse is planned for a a 61-meter 200 ft wingspan with 200 m^2 of solar cells which, combined with a weight of 1500 kg (3300 lb), will allow a flying speed of just 45 km/h (28 mph). This (the developers hope) will allow it to fly day and night on the energy available from the flexible solar cells covering the top surface of the wing.

Construction of the first prototype began in June 2007 and will last until the summer of 2008. Test flights should start in autumn 2008, with the objective of completing the first night flight in 2009. Another plane will then be developed to attempt to fly several 24-hour cycles consecutively, leading to the first trans-Atlantic flight in 2011, and then

the first round-the-world flight.

BE THANKFUL!
Oliver Perry

Although I have frequently expressed strong dissatisfaction with the direction our country is going, the lack of ethics among our political leaders, and the corruptness of our legal and judicial system, occasionally I am reminded that compared to other countries there is no better place to live than in the good old USA. So let's all give thanks this Thanksgiving season for the blessings that we frequently forget we have as citizens of American the Beautiful.

A few seasons ago protesters gathered in California in an attempt to stop GM from destroying the EV-1. What might have happened to these protesters in another country such as Russia or China?

A woman by the name of Marina Rikhvanova led thousands of protesters into the streets of Irkutsk, Russia last year, attempting to force government officials to scrub building an oil pipe line close to the pristine waters of Lake Baikal. Ms. Rikhvanova's stature as one of Russia's most influential environmental leaders has been borne out with her ability to attract scientists, ecologists, and common folk into a groundswell that has forced the government to pay attention to environmental concerns. One protest drew 5000 participants in freezing weather. And in the latest case, of the pipeline proposed too near the shores of Lake Baikal, she succeeded in forcing the government to move the pipeline 25 miles away. The national treasure known to locals as the Sacred Sea is a 400 mile long lake, a mile deep, which holds nearly one quarter of the world's unfrozen fresh water.

According to a recent *Wall Street Journal* report written by Alan Cullison, in the early 1990s Ms. Rikhvanova's organization, Baikal Ecological Wave, even began collecting grants from the likes of the U.S. Agency for International Development and Germany's Green Party. "Soon the group began locking horns with the government and the newly minted energy barons." In 2002, federal agents raided Baikal Wave's offices, seized its computers and accused the group of acquiring secret maps of the nuclear enrichment plant in Angarsk.

"This spring Ms. Rikhvanova put together new rallies against the Kremlin's plans to turn the Irkutsk region into a center for nuclear fuel processing. She helped protesters plan a tent bivouac near the fuel plant and printed leaflets for campers to hand out to the locals warning them of the dangers of radioactive leakage."

"One morning in late July she got a phone call telling her that the campers had been attacked in their sleep by masked men armed with metal pipes and wooden clubs. One camper was beaten to death." An eyewitness stated that he opened the flap of his tent to see a dozen young men rampaging through the camp slashing tents open with knives and beating those inside. In some countries, protesting for a cleaner environment comes with a steep price.

Global Gore? Dr. William Gray Speaks Out!

Climate crusader Al Gore was taken on last October by one of the world's foremost meteorologists, Dr. William Gray. Dr. Gray, a pioneer in the science of seasonal hurricane forecasts, told a packed lecture hall at the University of North Carolina that humans were not responsible for the warming of the earth. His comments came the same day that the Nobel committee honored Mr. Gore for his work in the support of the link between humans and global warming. Gray stated that Gore's theories are "ridiculous" and "the product of people who don't understand how the atmosphere works."

Gray said that a natural cycle of ocean water temperatures, related to the amount of salt in ocean water, was responsible for the global warming that he acknowledges has taken place. "The human impact on the atmosphere is simply too small to have a major effect on global temperatures," Dr. Gray said. "It bothers me that my fellow scientists are not speaking out against something they know is wrong, but they also know that

they'd never get any grants if they spoke out. I don't care about grants."

John Christy, co-recipient of Nobel Prize, adds…

Wall Street Journal, Oct 25, page A22… Notable &Quotable…When was asked by CNN anchor Miles O'Brien: "I assume you're not happy about sharing this award with Al Gore," Christy responded, "Well as a scientist at the University of Alabama at Huntsville, I always thought that prizes were given for performance and not for promotional activities."

"And when I look at the world I see that the carbon dioxide rate is increasing, and energy demand, of course is increasing. And that's because without energy, live is brutal and short. So I don't see very much effect in trying to scare people into not using energy when it is the very basis of how we can live in our society."

John Christy goes on to take issue with several of the points in Al Gore's movie "An Inconvenient Truth" He was upset with the fact that Gore spoke with certainty and confidence about climate and the changes that were going to take place when true scientists know that climate and Mother Nature are too complex to predict at this point. "And when we build — and I'm one of the few people in the world that actually builds these climate data sets — we don't see the catastrophic changes that are being promoted all over the place." "For example, I suppose CNN did NOT announce two weeks ago that the Antarctic sea ice extent REACHED ITS ALL TIME MAXIMUM, even though in the Arctic at the North Pole, it reached its all time minimum.

In letters to the editor, *WSJ* same issue, Donald R Spalding from Whitefield N.H. adds, "Al Gore is awarded the Nobel Peace Prize for highlighting the importance of climate change, but scientifically based research, that might not track with the hyperbolic (over the top, tabloid type) perceptions advanced by activists, is ignored."

Wm. Robert Irvin, Senior Vice President for Conservation Programs in Washington adds in his letter to the editor, "We do need to increase our scientific knowledge of global warming impacts. But that should not be an excuse for failing to take action immediately to reduce greenhouse gas pollution and help wildlife survive the impacts of global warming."

Clash Between US Auto Industry and Petroleum Users

The *Wall Street Journal*, Nov 8, 2007, Front page. "As energy prices soar, U.S. Industries Collide"

"Dow Chemical Co. Chief executive Andrew Liveris took a stand a year ago that turned heads in Washington." He called for tougher fuel-economy requirements for auto makers who buy over a billion dollars of goods per year from Dow. Dow reasoned that if car companies would ease pressure on the use of fossil fuels then there would be a larger supply of oil for Dow. Dow must purchase large quantities of energy to feed its factories. According to Jeffrey Ball, the writer of the article, Dow also reasoned that if car makers were forced to improve car mileage they might also purchase more Dow products which can make vehicles go further on a gallon of fuel. (The implication is that better fuel economy is possible today through a number of means.)

The article stressed that fights are now erupting among industrial corporations as to who is going to bear the burden of America and the World's voracious energy appetite and who will win the spoils. The auto and oil industries are at each other's throats, with Detroit saying the oil industry should install more ethanol pumps and the oil industry saying that Detroit should make their cars more fuel efficient. Renewable energy producers are arguing over who qualifies for federal tax breaks. (We used to feel that the oil and car companies were bedfellows. Apparently a divorce may be in the making.)

Dow claims that it is the world's biggest consumer of energy, using a vast amount of natural gas and oil for raw materials to make its products. When the price of oil goes up, Dow claims that the cost of energy becomes half of its production and operating costs. There are two benefits to Dow for curbs on oil consumption. One obvious result is that if everyone else uses less oil, the demand for oil will drop and the price for it will be less. Lower oil prices reduce Dow's energy budget directly. But secondly, Dow makes insulation

and solar panels. Both will be in greater demand if everyone is forced to conserve energy. When people are forced to conserve, Dow will be able to sell more of its energy conserving products. Therefore Dow is very interested in having everyone use less fuel, including the car companies which can make vehicles that reduce fossil energy consumption.

An interesting side note: Dow makes an adhesive that can fasten steel auto parts together, replacing steel welds. Steel that isn't welded can be made thinner and thus lighter. A lighter vehicle is more fuel efficient. Dow stands to profit if it can convince the auto companies to utilize Dow's specialty glue in their car production.

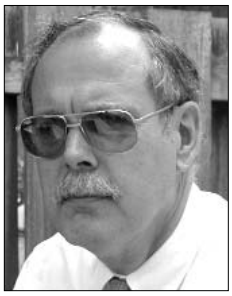
When it comes to the battle in Washington over energy policies, every industry is affected. They all lobby hard to sway policy makers to invoke laws in their favor. We are not always aware of the efforts of corporations like Dow behind the scenes to influence the outcome. After efforts a year ago (to prod Congress to enact tougher efficiency standards on the auto companies) Dow reversed its decision. Why? The loser in this case would have been the car companies that didn't want to spend the money to raise vehicle efficiency. The automakers screamed at Dow for having the audacity to upset the apple cart! So Dow quickly reneged and took a number of less provocative routes to achieving their goals, those that would not directly impinge on the auto industry. They pressed for tighter regulations on building codes, tax incentives, and mandates for more efficient appliances etc.

Today's partners may have been yesterday's enemies and vice versa. Who is driving who? Will there come a day when Hummer and Prius crowds will partner in some type mutual lobby effort? Don't say it will never happen. Stranger partnerships than that have blossomed.

I hope my readers will gain the understanding that simplistic attacks on Bush for creating our energy dilemma are not on target. Bush is not singularly driving nor controlling the major energy issues of our day. I run into too many people today that blame everything they don't like about the country on Bush. While they are beating the bushes, (literally) other more influential corporations are silently going about the business of controlling energy (and almost every other segment of society).

What we don't know relative to the real forces that control the world of industry and politics is considerable. We, merely single blades of grass on the White House lawn, can only see the forces that govern our environmental concerns, and regulate energy, from a limited perspective. We do not always know what is really happening behind the walls. We hear the spokespersons when they come outside and address the press, but we do not always know if their speeches are accurate representations of reality or spinning curve balls. We would like to know what really is happening behind their speeches. The situation lends itself to conspiracy theories, which in turn add even more uncertainty to the mix. I don't have an answer for finding out the whole truth. I simply advise myself to proceed with caution on any issue. And I give thanks that if I join a peaceful protest group in this country I most likely will not be beaten up and thrown in jail as are protesters in several other countries.

OIL AND FIRE - AGAIN
By California Pete



California is suffering from a pair of disasters this year, one entirely man-made and the other exacerbated by human activity.

Bay oily

The most recent is the spilling of 58,000 gallons of bunker oil into San Francisco Bay, the result of a container ship sideswiping the protective fender around the base of one of the towers on the Bay Bridge. Bunker oil — the last thing to emerge from the refining process and essentially one step up from asphalt — is nasty stuff. Crude oil contains lighter constituents like naphtha and gasoline, so much of it evaporates after a spill. Bunker doesn't, instead drifting with the tides and fouling everything it touches. As of the morning of November 9 it had contaminated miles of beach in the Bay and some of it had already gone out the Golden

Gate and into the Pacific. Dozens of birds have been coated with the oil, and the danger to fish and other wildlife is a worry as well. Scientists fear the effects will last for years. I had Sunday brunch at a restaurant overlooking one corner of the Bay and saw blobs ranging up to fist size, each trailing its own little slick.

California burning

This year's fire season has been especially spectacular, with close to a million people evacuated from homes in the area around Los Angeles as brush fires driven by Santa Ana winds swept over hills and houses. The basic problem, of course, is that California was not intended by nature to have even a fraction of its present population. Half a millennium ago there were probably a few tens of thousands of Native Americans living in harmony with the environment over the length of what is now a state with 37,700,000 people. On top of that, many of these people have decided to live in fire ecosystems — areas in which periodic wildfires are normal. And after their houses have burned most of them vow to rebuild on the same spot.

There have been a few improvements, like regulations that require a defensible space around each dwelling (no brush allowed close to the house), and ordinances are being passed that will prohibit wood roofs, but as long as people continue to put houses where they shouldn't the danger will remain; in fact, it will grow worse as the climate warms.

Someone with a suspicious mind might suspect that the much better response of the authorities to this disaster than to hurricane Katrina has a lot to do with the income levels of the people involved, and it does cost a lot to live around here. Self-serve regular gasoline has been above $3.00 per gallon for a long time, and there are places in San Francisco selling premium at $4.05 a gallon, but that's just part of it. According to an October 17 *San Francisco Chronicle* article by Sam Zuckerman, "A family of four in the Bay Area with two working adults must earn $77,069, equaling an hourly wage of $18.53, just to pay for basic necessities, a study released today calculates. If only one adult works, that figure falls to $53,075, largely because the family doesn't have to pay for child care, according to the report by the California Budget Project, a liberal Sacramento research group. But that one wage-earner must make $25.52 an hour.

"And a single parent with two children needs to take in $65,864 annually, at an hourly wage of $31.67, to cover expenses, the Budget Project figures."

Lots of sun, not enough solar panels yet

On a recent car trip between the Bay Area and Los Angeles it struck me that California is missing out on a splendid opportunity. Interstate 5 runs from Sacramento to Los Angeles, through some pretty boring country: miles of orchards interspersed among miles and miles of brown desert. To reach I-5 from the Bay area you travel east over Altamont Pass, which is festooned with power-producing wind turbines, but once on I-5 itself you realize you're looking at an excellent site for a series of massive solar farms. Large areas of the countryside consist of essentially unused land, baked by the sun. Why are there no fields of photovoltaic panels harvesting that sunshine? There's even a high-tension electric line running roughly parallel to the highway, just waiting to carry away the power those solar panels would generate.

That's not to say that California is neglecting the sun; far from it. The city of Berkeley recently approved a plan under which home and business owners could install solar panels using money from the city, then pay for them over 20 years via a surcharge on their property taxes. In theory the savings in electric bills would pay the tax; the property owner would come out even financially but would help cut greenhouse gas emissions.

An Open Forum piece by Donald Shoup in the *Chronicle* for October 14 advocated a law requiring the installation of solar panels on canopies above the parking lots that surround commercial and industrial buildings. That space is unused as it is, and the solar panels would help to reduce peak utility loads during the heat of the day.

In mid-October the governor signed legislation to spend $250 million over the next 10 years on rebates for solar water heaters.

Just a few days ago the local electric utility, PG&E, announced plans with a Palo Alto startup called Ausra Inc. to build a 177 MW

solar thermal power plant in the central part of the state. The company previously announced plans to purchase power from a 553 MW solar plant to be built in the desert, and plans to buy 1000 MW of solar thermal energy within the next five years. PG&E is under a state mandate to increase its use of renewables by one percent of load per year to reach 20 percent by 2010.

NEWS UPDATE

GE to fund PHEV research

GE Global Research has announced $6.8 million in funding for two projects with DOE to help accelerate the introduction of plug-in hybrid vehicles to market. The first project is a $5.6 million contract to develop smaller, lower cost, higher performing hybrid drivetrain motors; the second is a $1.2 million project to develop advanced high temperature, high energy density capacitors. The projects are co-funded by the DOE's Office of Vehicle Technologies and managed by the National Energy Technology Laboratory.

Subaru improves its EV

Gizmag reports that Subaru has released a new concept EV that's a considerable improvement over its previous battery-electric commuter car. The new five-seat G4e has a 65 kW motor and a lithium battery that gives it a range of 200 km (125 miles) and can be changed to 80% in 15 minutes using a quick charger. A normal charge takes about 8 hours.

So soft

Japan has long been known for odd and whimsical concept cars, and the Honda Puyo is no exception. It's powered by fuel cells, and all four wheels can turn, allowing it to spin 360° in place, but the oddest part is the body. Not that it has no corners, but that it's soft to the touch. And it glows in the dark.

Daimler, Ford set up fuel cell operation

Ballard Power Systems has transferred its division for automotive fuel cell applications to a new privately-held company called Automotive Fuel Cell Cooperation (AFCC). Daimler AG will hold 50.1 percent of AFCC, Ford Motor Company will hold a 30-percent stake and Ballard Power Systems the remaining stake of 19.9 percent

PG&E, Tesla study vehicle-to-grid

Automotive Industries for September reported that Pacific Gas and Electric Company has partnered with Tesla Motors in researching vehicle-to-grid (V2G) technology. They're working on "smart charging — a form of V2G designed to allow remote control charging of electric vehicles connected to the power grid."

"Smart charging is a form of V2G in which the vehicle does not provide power back to the grid," said JB Straubel, Tesla's Chief Technology Officer. "Instead, the vehicle charging rate is controlled remotely in order to support the operation of the grid or to best match load to the availability of intermittent renewable energy resources such as wind and solar."

Volt a must-do for GM

An article by Mary M. Chapman in the *International Herald Tribune* published Oct 24 says that General Motors has staked its green credibility on the Chevy Volt (and has assigned plant to produce it, starting in 2010), but there is still considerable risk to the undertaking. The problem, the article points out, is that the battery that will make it all possible hasn't been developed yet — and with the amount of promoting GM has done, backing off would be a disaster. Nothing like a little pressure.

UK Li-ion research deal

QinetiQ and Ricardo have embarked on a two-year collaborative project part-funded by the UK Department for Transport, which aims to dramatically reduce the costs of Lithium-ion batteries for hybrid vehicles

while protecting or further improving vehicle performance. The specific objective of the Reduced cost Li-Ion (RED-LION) project is to demonstrate the application of new Li-Ion cell chemistry in a hybrid vehicle battery with an estimated production cost one-third that of conventional battery technologies and around half the weight.

In June 2006 Ricardo, QinetiQ and PSA Peugeot-Citroën unveiled their 100 g/km CO_2 Efficient-C full hybrid diesel demonstrator vehicle based on a Citroën Berlingo Multispace. While the vehicle worked, the project partners estimated that its incremental manufacturing cost needed to be reduced by around 50 per cent (to approximately 2,000) for the technology to become fully commercially viable based on prevailing fuel prices and consumer fiscal incentives.

DOE to fund $25M in solar projects

DOE Secretary Samuel W. Bodman has announced that the Department will invest $21.7 million in next generation photovoltaic technology to help accelerate the widespread use of advanced solar power. The 25 projects selected are part of the Solar America Initiative, which aims to make solar energy cost-competitive with conventional sources of electricity by 2015.

The projects will be implemented at 15 universities and six companies; each award averages $900,000 from DOE over three years, subject to final project negotiations and congressional appropriations.

COMING EVENTS

EVS 23: Sustainability: The Future of Transportation
Dec 2-5, Anaheim, CA. For information go to www.electricdrive.org/evs23.

Electric Dragin 2008
January 26-27, San Diego. For information visit the Electric Vehicle Association of San Diego at www.evaosd.com.

2008 Hybrid Vehicle Technologies Symposium
February 13-14, 2008, San Diego. Go to www.sae.org/events/training/symposia/hybrid/ or call 202-463-7319.

Motor, Drive & Automation Systems Conference
February 14-15, Atlanta. For information go to www.e-driveonline.com/motors_conf08_index.htm

2008 Clean Heavy Duty Vehicle Conference
February 20-22, San Diego. Go to www.calstart.org/programs/chdvc/ or call 626-744-5600.

WIREC 2008, Washington International Renewable Energy Conference
March 4-6, Washington, DC. For information call 202-647-6828.

2008 SAE World Congress
April 14-17, Detroit, MI. Go to www.sae.org/congress/ or call 626-744-5600.

Alternative Fuels & Vehicles National Conference & Expo 2008
May 11-14, Las Vegas. For information go to www.afvi.org/NationalConference2008/

WINDPOWER 2008
June 1-4, Houston. For information go to www.windpowerexpo.org/index.cfm.

Convergence 2008
October 20-22, 2008, Detroit, MI. Go to www.sae.org/events/convergence/ or call 626-744-5600.

MEETING SCHEDULE

Meetings are held in Room 49, Plymouth-Whitemarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m.

December 12

January 9

February 13

March 12

April 9