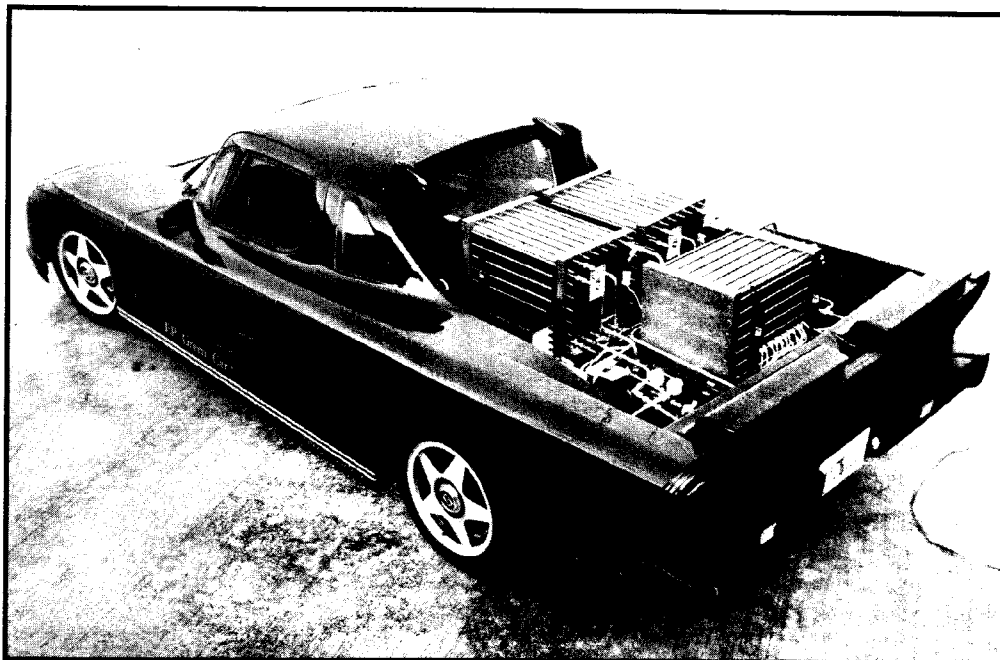


Hydrogen Today

"Clean Energy For A Better World"

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and more...

The Green Car

- By Andy English



What if there was an economical, dependable motor vehicle which was 100% pollution free?

Energy Partners, a Florida-based high tech company, is developing such a vehicle. They call it the Green Car. They have produced a prototype vehicle. Energy Partners expects to market a more advanced version within the decade.

The Green Car is powered by hydrogen fuel cells. A fuel cell takes stored hydrogen gas and combines it with oxygen from the air to produce electricity.

Electrolysis is the use of electricity to break water molecules (H₂O) apart into hydrogen and oxygen gases. Fuel cells run this reaction in reverse to make electricity. The only waste product emitted is water vapor. A fuel cell-powered car could therefore be pollution free.

"The hydrogen fuel cell system was developed to create a completely pollution-free power source for use in such applications as automobiles, naval vessels, locomotives, and stationary power supplies," according to John Perry, chairman of Energy Partners. "Unlike petroleum-fueled devices, hydrogen fuel cells do not release any pollutants into the atmosphere," adds Perry.

According to Rhett Ross, engineer and sales manager at Energy Partners, "PEM fuel cells are lighter weight, higher powered, longer lasting alternatives to batteries."

The fuel cells needed to power a 2200 pound vehicle weigh approximately half the amount of traditional batteries. The fuel cell is capable of 150 to 200 thousand miles of useful operation. A battery's operational life time is estimated to provide power for 10 to 30 thousand

Continued, page 7

LIFE WITH THE FAMILY CAR...

Each working day, millions of Americans are caught in the daily commuter car crunch, choking on the exhaust fumes of millions of automobiles. We add to the burden of pollution borne by our atmosphere with every auto excursion, whether for business or pleasure.

According to the Environmental Protection Agency, motor vehicle emissions are responsible for 37.7% of outdoor air pollution. Our cars and trucks also produce 58.1% of the carbon monoxide, 28.7% of sulfur oxides, 22.6% of the VOCs (volatile organic compounds), and 28.8% of lead emitted into the air (1992 data).

Continued, page 5



Hydrogen Is The Safest And Cleanest Fuel

New High Concentration Photovoltaic System Enters First Full-Scale Field Test

Tempe, AZ - A new, potentially low-cost solar energy system is now under full scale construction for the first time, at Arizona Public Service's Solar Test and Research Center (APS STAR) in Tempe, Arizona.

The system, which concentrates sunlight 260 times onto highly efficient photovoltaic cells, is being assembled into a 20 kilowatt sun-tracking array at the STAR Center, where it will be operated and tested for at least two years in preparation for further deployment.

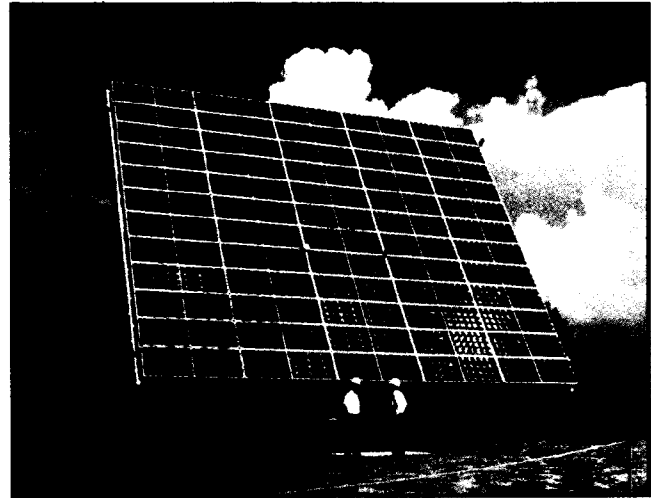
The high concentration photovoltaic design, or HCPV, has been generating 1 kilowatt in a smaller array at Georgia Power Company's Shenandoah Environment & Education Center in Newnan, Georgia. The APS test will for the first time verify the capability of the design to maintain the sun-tracking accuracy required, while handling the mechanical loads of weight and wind at full scale.

According to Tom Lepley, Senior Solar Project Manager for APS, "the Amonix system is perfect for Arizona's climate with lots of clear sunshine. It will convert sunlight to electricity at over 20%, which is more efficient than any comparable technology at this time.

"I expect it to be more cost-effective than any other photovoltaic option in the very near future. This system is not appropriate for rooftop applications, or for cloudy regions, since it needs to track the sun, but it will be well-suited for utility applications in the southwest."

According to the Electric Power Research Institute (EPRI), the Amonix system is the first integrated high-concentration photovoltaic (IHCPV) array that consolidates structural, electrical, thermal and optical components into simple building blocks. The integrated array concept eliminates unnecessary components so construction is simplified to lower capital, labor and maintenance costs.

The IHCPV array system successfully passed qualification testing according to the Department of Energy's (DOE) Sandia National Lab specification, and has been verified for use at the PVUSA industry-government project lead by Pacific Gas and Electric.



The price of this photovoltaic system installed is projected to be below \$2,000/Kw at multi-megawatt levels, which could make it competitive for a wide range of applications and with other forms of utility-scale power generation in regions with good sunlight such as the desert Southwest.

"With progress in high-concentration cell development, we expect to increase the system efficiency to 20 percent by the end of 1994, which will help make this technology cost competitive," said Frank Dostalek, EPRI's high concentration PV manager. EPRI reports that AMONIX recently demonstrated stable, individual-cell conversion efficiencies of more than 25 percent, the highest performance of any commercially available PV technology.

"The design was conceived so the whole system could be easily automated and scaled-up into high-volume production quantities," Dostalek added.

Georgia power, Arizona Public Service, PG&E, Los Angeles Department of Water & Power and Southern California Edison cosponsored the development of the technology with EPRI.

A team of EPRI contractors is responsible for deploying the array. The team included leader AMONIX, Inc. of Torrance, CA., Cummings Engineering of Wilmington Mass., Scientific Analysis, Inc. (SAI), of Montgomery, Alabama and Fresnel Optics of Rochester, NY.

AMONIX is the process of commercializing the technology and along with EPRI is seeking utility sites to demonstrate several arrays for testing and industry evaluation.

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The Hydrogen Association

dba The American Hydrogen Association
in the United States

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SHAW'S WELDING

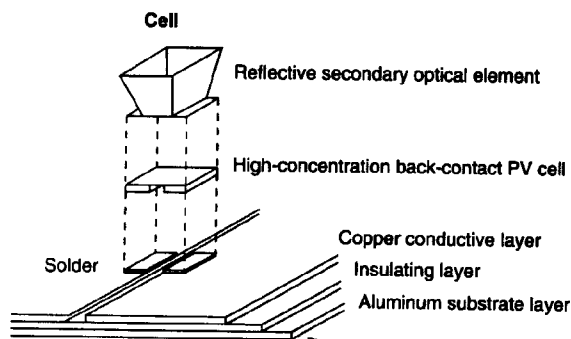
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Photovoltaic System

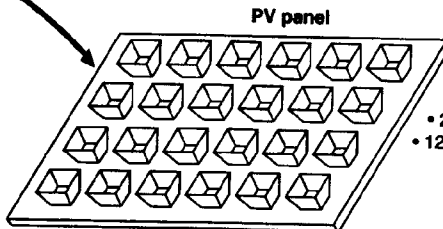
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Central to the IHCPV system is the high-concentration solar cell, developed by Stanford University under EPRI sponsorship. Sunlight-concentration solar cell systems use smaller-area silicon cells compared to systems without sunlight concentration.

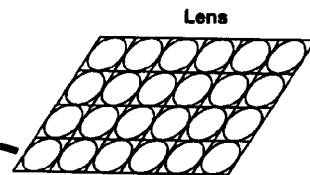
Alan Gunn of SAI, who is supervising the installation at APS, expects this installation to significantly exceed world efficiency records for PV arrays.

According to Vahan Garboushian, AMONIX's president, "We're confident that in this decade we can deliver IHCPV systems for a cost of \$2,000/Kw or provide electricity from these systems for 8 cents per kilowatt-hour with a production run of 100 megawatts. Our confidence is buoyed by the knowledge that volume production, not further technical breakthroughs, will achieve this cost reduction." 

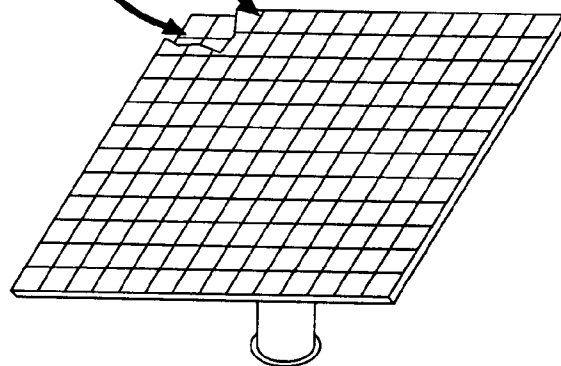


- 168 panels in array
- 24 cells per panel
- 120 W per panel

PV panel mounted to back of array structure



Molded-acrylic Fresnel lens parquet mounted to front of array structure



EPA Going After Lawn Mowers? So Is AHA!!

Recently the Environmental Protection Agency has announced that it will set emission standards for lawn mowers and other gasoline powered tools. The EPA finds that around 10 percent of our nation's air pollution comes from such tools, with one hour of use of a chain-saw emitting as much smog as a car traveling up to 3,465 miles.

What can be done about this? The EPA is saying that we need to have a two phased strategy, with the first stage taking effect on August 1, 1996. In this stage, the EPA will create standards for the

industry to comply by improving the air-fuel mixtures in the engines. The second phase would follow shortly thereafter with the EPA evaluating the successes and building upon them.

Several members of AHA have other ideas. They are interested in creating a lawn mower that will operate on hydrogen and actually clean the air that it is using! Imagine trimming your lawn with a machine that is doing little or no damage to the environment. It may even be possible someday to use grass clippings to create the fuel to run your lawn mower!

MICROBIAL FERMENTATION OF HYDROGEN FROM SUGAR — *Robert Rebello*

Most of the discussion surrounding the small-scale production of hydrogen as an energy carrier is focused on electrolysis. While this process is capable of generating sufficient quantities of gas for home and transportation use, the amount of electrical energy consumed is prodigious, and it can be argued that chemical storage in conventional batteries is more efficient than conversion to hydrogen in wet-cell alkaline electrolysis for the average person.

I'm not an engineer, but the dream of clean-burning fuel that can be produced domestically is one that has haunted my consciousness for as long as I can remember. Two years ago, Roy McAlister was kind enough to provide me with research papers on the production of hydrogen gas from fermentable sugars, and I decided to give the process a try in my own back yard.

Several variations on the procedure exist, but they all involve anaerobic fermentation by various microbes—the most successful inocular variety being “undefined.” This was perfect for me, as I lack both the knowledge and equipment to select any given species, nor do I have the funds to purchase much of anything from a scientific warehouse.

The bacteria were provided by a neighbor's chickens. My first digester was a methane model, and as soon as it produced gas, I siphoned off a small amount of slurry and introduced it into a one liter milk bottle filled with a 20% sugar solution. (A simple wine hydrometer helped me find the right proportion of fermentable sugar.) The milk bottle was placed into a tin can filled with water, which sat on top of a hot plate. The volume of liquid and its heat loss required that the 100 watt hot plate be kept on at all times, but it could have just as easily been heated by solar energy. (It was cheaper for me, at 3

cents/kilowatt, and to leave the thing plugged in than to build or buy a solar thermal panel.)

Although I'd been cautioned against using chlorinated water, it didn't seem to make any difference in output or time required to start producing gas. The Ph was adjusted using baking soda and litmus paper (we're talking seriously low-tech here...), and small amount of phosphate from the local garden supply shop added as a buffer. I started out with a teaspoon of phosphate, but most of it was still sitting in the bottom of my digester eight weeks after I'd put it in. The process probably requires less than this on a volume basis.

Originally, I used a fish tank heater to regulate the temperature. Unfortunately, continuous heating to 40 degrees Celsius cracked the glass case and ruined the heater. The hot plate was a compromise which works effectively as long as the outside temperature is not too cold. Insulation and a thermostatic control would be necessary on a larger scale, as gas production drops off dramatically if the digester temperature falls below 40 degrees Celsius.

The low molecular weight of hydrogen makes it prone to leakage. For the first five weeks of this digester's life, it was steadily producing tiny bubbles of gas, which gave the entire set-up the look of champagne (our water up here is bronze-colored due to the minerals dissolved in it), but very little hydrogen collected in the water-filled milk jug I used as a storage tank. Liberal use of silicone helped, but it was only after replacing all the rubber stoppers and tubing that gas production began to look encouraging. If you try this yourself, make sure your test area is well-ventilated and check for leaks with soapy water.

continued page 5

Nasa Selects Praxair For Hydrogen

— *Jennifer H. Cain*

DANBURY, Conn, April 1994 — Praxair, Inc. announced today that the National Aeronautics and Space Administration (NASA) has selected it for final award negotiations for a 15-year liquid hydrogen contract. The contract will cover the supply of liquid hydrogen to NASA's Stennis Space Center in Mississippi.


Stennis Space Center uses liquid hydrogen as a propellant for testing space shuttle main engines and components.

Praxair plans to transport the liquid hydrogen — an average of 11 tons per day — by truck and rail car from its new McIntosh, Ala., plant. Praxair currently supplies liquid hydrogen to NASA locations on the West Coast, and liquid oxygen to Kennedy Space Center, Cape Canaveral, FL.

“The NASA selection demonstrates our commitment to quality, excellence and value creation for customers,” said Edgar G. Hotard, Praxair President, Gases, U.S.A.

“Hydrogen is a strategic product for Praxair,” he added. “The McIntosh plant will expand our liquid hydrogen capacity by nearly 50 percent and allow us to better serve our southern U.S. customers. We are also a major supplier of gaseous hydrogen to the chemical and refinery industries in the Gulf Coast and to the U.S. steel industry.”

Formed in 1958, NASA manages research in aeronautics, astronautics, space sciences and exploration. The first civilian U.S. aerospace agency, NASA operates research, testing and launching facilities nationwide.


Praxair, Inc. is the largest industrial gases supplier in North and South America, and one of the largest worldwide, with 1993 sales of \$2.4 billion. The company also is a leading worldwide supplier of ceramic and metallic coatings and powders. Praxair, Inc. was formerly Union Carbide Industrial Gases Inc, and known as Linde in North America. (203) 794-5560 

FAMILY CAR

continued from page 1

According to the American Lung Association, 66% of all Americans live in areas that are in violation of federal clean air standards. Furthermore, lung disease is the third-leading cause of death in the U.S. Many of these deaths can be partially attributed to the effects of outdoor air pollution caused by petroleum-fueled vehicle emissions.

Expensive efforts to re-engineer automobiles for lower emissions of hazardous substances have worked. But increasing numbers of cars on the road and miles traveled per car mean that total air pollution contributed by cars has remained stable.

While increased public support of mass transit and trends toward telecommuting may someday alleviate our dilemma, Americans are still heavily dependent on the family car for transportation. 

International Symposium On Fuel Cells

By: Prof. O. Savadogo Dept. of Metallurgy & Materials Engineering Ecole Polytechnique de Montreal C.P. 6079, succ.A Montreal Quebec H3C 3A7 Canada
Phone: (514) 340-4725 Fax: (514) 340-4468

July 16-21, 1995, Montreal, Canada
Paper due: May 15; Acceptance June 15, 1994

The symposium is to survey the advances made during the previous years in the development of new materials for fuel cell systems. There have been many attempts over the years to find performance and enduring materials for fuel cells and related systems. However, the choice of materials related for the internal operation of fuel cells (i.e. electrocatalysts, gas diffusion electrodes, membranes, separators, current collectors, etc) is limited since every material which is developed must have excellent performance from high to low or sub ambient temperatures depending on fuel cell technologies.

The purpose of the symposium is to provide an opportunity for all important groups working in the field together with industrial researchers to present recent advances in research, development, and practice of fuel cell systems. Technologies to be included are alkaline, phosphoric acid, solid polymer electrolyte, molten carbonate, solid oxide and hydrogen fuel cells. Current technologies, together with fundamental relationship between the material characteristics, electrochemical kinetics and fuel cell performance will be discussed in details.

MICROBES

Continued from page 4


But was the gas hydrogen?

I have no access to gas analysis, but I've fooled around with electrolyzers enough to recognize the characteristic "popping" of hydrogen combustion in air. The gas I produced was flammable, at least, and I never saw a color to the flame when it burned in low light conditions. Whether it was hydrogen or methane, a mixture of the two, and a helping of carbon dioxide I can't be certain. Perhaps greater minds than mine might know.

This sounds like a great process, but sugar is expensive! Unless it can be obtained from waste products, electrolysis from the utility grid is a cheaper way to produce hydrogen in this area. (Solar gensets are a great idea, but we don't see the sun in this region for at least three months of the year...) Here in the Okanagan Valley of British Columbia, cherries, peaches, pears and apples are grown in orchards ranging in size from several

hundred acres, to a tree or two in the yard. Quite a bit of this fruit ends up rotting on the ground due to windfall, and local growers are known to dump excess product into Okanagan Lake to keep the prices high enough to make a profit. Wouldn't it be terrific if an energy market existed for their waste fruit?

My one liter digester produced an average gas volume of 150 ml per day at atmospheric pressure. Better seals and insulation would increase this, I'm sure, for it makes almost no gas at night when it's cold. If my calculations are correct, this works out to about 11 Btu of hydrogen per day — not a lot, but if the feed stock was free, the heat was provided from the sun (evacuated glass solar heaters work even when it's cloudy) and the digester built on a large scale, it could produce a sizeable volume of gas with a relatively small monetary investment.

Wouldn't it make more sense to find a use for something we're throwing away right now? We can manage our resources more wisely than that! 

❖ About Those Fuel Cells...

The first fuel cell was invented in 1839 by Sir William Robert Grove, an English jurist and scientist. In recent years, new types of fuel cell have been developed which are more efficient, powerful, lighter, and cheaper to make. Because of these advances, we are now on the verge of creating mass-produced non-polluting hydrogen powered vehicles.

Fuel cell technology began moving forward rapidly during the 1960s when NASA needed a power system lighter than earlier space-proven battery systems for the Apollo program. The onset of the energy crisis in the 1970s and the rise of environmentalism has spurred further research into fuel cells.

All fuel cells consist of two plate-shaped electrodes (an anode and a cathode) separated by a electrolytic conducting medium, making a kind of sandwich. Hydrogen or oxygen gas flows along one and is ionized. The electrolyte transports the ions to the other side of the fuel cell where they combine with the other element to create water. The flow of ions creates an electrical current that can be connected to a motor.

In most types of fuel cells the gas that is ionized is hydrogen. The diatomic hydrogen gas is converted into a monatomic form and stripped of its single electron at the anode. The resulting protons are absorbed through the electrolyte, and carried to the cathode, where they react with oxygen. Energy Partners uses a type of fuel cell called a PEM (for Proton Exchange Membrane) fuel cell. A fluorocarbon-based membrane is placed between the electrodes.


continued, page 6

Fuel Cells *continued from page 5*

The membrane is a variation of a teflon-based film called Nafion. Sulfonic acid groups are attached to sites throughout the membrane. Hydrogen protons are absorbed through the semipermeable membrane, exchanged site to site by the sulfonic acid groups, diffusing to the cathode side.

Other types of fuel cells include the phosphoric acid fuel cell (using a silicon carbide matrix and a phosphoric acid electrolyte), solid oxide fuel cells (using a yttrium-doped zirconium oxide matrix that conducts oxygen ions instead of protons), molten carbonate fuel cells, and alkaline fuel cells (which use potassium hydroxide as the electrolyte).

Compared to PEM fuel cells, these other types are either more expensive, heavier, or require high operating temperatures (from 200°C to 1000°C in some cases) to function. These other types of fuel cells are usually more suited to large-scale fixed site operations. For these reasons, the PEM fuel cell has been the favored technology at by Energy Partners and other developers of fuel cell-powered vehicles (including Mazda and Ballard Corporation).

Among the advantages of PEMs are high power density, light weight, high efficiency, and low-temperature operation (start up at 80°C). 

Journey of the Tern

— Author: Robert Beatty

Thomas Gage, automotive executive, receives an electronic message that his brother Jack has been shot and is close to death. Thomas hasn't seen his brother in years—not since Jack got mixed up with those “environmental radicals.”

What begins as an investigation into his brother's shooting becomes a journey into a new world.

A mysterious woman named Winter leads Thomas to a strange society where solar collectors and hydrogen-powered cars are the norm, a place where human beings live in unique harmony with their environment. She teaches him to appreciate the beauty of a rare bird, the magic of the virgin forest, and the destructiveness of the industrial progress he has spent his life pursuing.

In the end, Thomas uncovers the truth about his brother, but the truth demands painful choices.

Ultimately, Thomas must choose between his career and the woman he loves...between his old world and the new.

Editor's note: The book is \$7.95 and can be ordered from your local book store. The author, Robert Beatty, shared his manuscript with AHA before the book was published.

Senator Richard Bryan and DOE Announce Solar Power Task Force

Washington, D.C. — United States Senator Richard Bryan (D-Nevada) and the Department of Energy announced the formation of the Solar Power Task Force for the Nevada Test Site. The task force is charged with exploring ways to use the Nevada Test Site for a solar power generating and research facility.

“This is the team which will begin work on converting the Test Site into the Twenty First Century,” Bryan said. Bryan will be co-Chair of the Task Force, sharing the chair with Christine Ervin, Assistant Secretary for Energy Efficiency and Renewable Energy. “We want to bring everyone into this effort, the private sector, the State of Nevada, and the DOE, so we are pulling together on a common goal.” Bryan attached an amendment to the 1992 Defense Authorization Bill which directed the DOE to conduct a feasibility study on the potential for solar power production at the Test Site. The study was complete late last year.

The feasibility study, contracted by DOE, concluded that the 1,350-square-mile site could host an array of solar electricity generating equipment owned by private companies. The study suggested that private industry might be attracted to the site if the Federal government provided the land, some power line improvements and other support.

“The Department of Energy's feasibility study showed the Nevada Test Site to be a significant solar resource that could provide clean power and local economic development in Nevada,” Ervin said. “The goal of the Solar Power Task Force will be to build a consensus for realizing the potential of this site.”

The Solar Power Task Force for Nevada Test Site will be co-chaired by:

Christine Ervin — Assistant Secretary for Energy Efficiency Renewable Energy.

Richard Bryan — United States Senator from Nevada

In addition, the Task Force will include:

Bob Miller — Governor of Nevada

Nick Aquilina — Manager, DC Nevada Operations Office


Bill Martin — President and CEO, Pioneer Citizens Savings Bank

Dina Titus — Nevada State Senator

Claude Evans — Nevada AFL-

Scott Sklar — Executive Director, Solar Energy Industries Association

Bryan has met regularly over the last year with private industry representatives, the Solar Energy Industries Association, DOE officials, the Nevada Public Service Commission, and the Nevada environmental community to discuss the Test Site's solar power potential. In January, he took the idea to DOE's new Assistant Secretary for Energy Efficiency Renewable Resources, Christine Ervin, and then in February went to Vice President Al Gore. “The Vice President has been very encouraging, even assigning a member of his staff to work with my staff,” Bryan said.

Bryan said the “Task Force will meet within the next few weeks to plan how a solar project can be developed and financed at the NTS location. The National Renewable Energy Laboratory will provide technical assistance to the Task Force.” 

Green Car

continued from page 1

miles. Fuel cells are light and recyclable; batteries are heavy and contain heavy metals that are not easily recycled. Batteries may take 6 to 8 hours for recharging. A fuel cell powered car could be refueled in less than 10 minutes.

The major problems with PEM fuel cells include the need to keep the membrane moist and decreased performance when carbon monoxide contaminants are present.

The Energy Partners Green Car uses three 7-kilowatt fuel cell stacks to provide the vehicle's primary power. The stack provides 125 volts at 120 amps. A traditional lead acid battery provides peak power. The car can accelerate from zero to 30 mph in 10 seconds.

The present prototype has a range of 60 miles for city driving and a maximum vehicle speed of 60 mph.

Energy Partners believes that within this decade, new versions of the Green Car will attain maximum speeds of 100 mph and a range of 300 miles. Traditional gas stations could be equipped with hydrogen refueling capabilities. Pollution-free automotive travel would then be a reality. Part of the necessary technical advances for developing the green car is reducing the vehicle's weight, thereby increasing fuel efficiency. Therefore, Energy Partners selected an auto body made from advanced light weight composite materials (provided by Consulier Automotive, a Riviera Beach, Florida builder of high performance cars). The vehicle provided met all federal safety requirements, including 30 mph crash tests. In future models, Energy Partners plans to replace the standard suspension and

transmission with a lightweight alloy suspension and a variable speed electric motor. The company also believes that further advances in fuel cell technology will make the lead acid batteries unnecessary for peak power.

Energy Partners' goal is to provide PEM fuel cell systems to a car builder. EP estimates that the PEM fuel cell power system will be available to automobile manufacturers for approximately \$5000 by the year 2000.

Energy Partners, and its ancestor companies, has 30 years of experience in fuel cell technology. It has also developed fuel cell powered submersible vehicles and mobile/remote power systems for naval use. For more information contact: Energy Partners, 1501 Northpoint Parkway, Technology Center, Suite 102, West Palm Beach, Florida 33407, phone: 407-688-0500.

First Vehicle Conversion Class a Success

The first vehicle conversion class has now come and gone with 9 people graduating. The end of class surveys have shown that the class is of high quality and well worth the time and price. The class was ranked in the top of every category, with many positive comments. The main improvement suggested was more classes! In response to this, we will be offering them as quickly as they attract students.

The class ran for six weeks, covering everything from the theory behind storage, to safety, to actually converting a lawn mower engine and several cars to run on pure hydrogen (see related articles). The members of the class were quite excited to actually get some experience doing what we were teaching them in theory!

We will offer three different choices for our next set of classes. There will be two weekend choices for the convenience of out-of-towners. Accommodations in town will be arranged at cost for those who request them in advance.

We will also develop a more advanced class for those that are more experienced with internal combustion engines. Less time will be spent on how an actual engine works, with more time spent on performance tuning and other tricks of auto conversion. This option

will be suitable for those that have extensive experience in auto mechanics.

Our next three classes will be held in June; a weekend class the first weekend, an advanced weekend class on the third weekend, and a six week class held on Monday nights starting the first week of June. Other classes will be planned as long as there is interest, which means we will probably be planning a couple more in July, August, and beyond. Call AHA for more information.

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Inside the AHA • • • •


Southern California Chapter

By: Dan Morton 4916 Stoddard Ave San Bernardino, CA 92407

President Dick Williams and Treasurer/Secretary/Membership Craig Pals spends many hours working on the AHA Southern California Chapter. Current topic of discussions at the meetings have been grants, funding and hydrogen related projects and goals.

The monthly meeting starts at 6:30 p.m. at the Town Center Hall, 11740 E. Telegraph Road, Santa Fe Springs, CA. Take the east off ramp of the Telegraph Road exit from the 605 Freeway. The Town Center hall is located just past the Fire Station. A business meeting is scheduled for 5:50 p.m.

This is a free informational meeting and is open to the public. For more information call (800) 854-5225.

Dr. Paul Scott and Paul Dieges are co-chairpersons of the Technology Committee. Dr. Bob Zweig chairs the Health Committee. Perry Kollman is in charge of Marketing. We do need a Fundraising Chairman... this is perhaps the most important Committee. Steve Vererian is Chair of the Safety Committee. If you would like to be on a Committee, please volunteer. The newsletter committee (Dan Morton) appreciates any news on hydrogen projects or information that is of interest to our members. 

Update on the AHA Cadillac Conversion Project – By: Tim Murphy

The AHA in Tempe is converting a 1978 GM automobile to operate with equal facility on gasoline or gaseous fuel s(hydrogen, natural gas, or mixtures thereof). We would like to thank the following for their contributions and assistance.

Shaw's Welding/Claude Culbertson (602) 964-2120 for excellent welding fabrication services.

GO Regulators, 305 South Acacia, San Dimas, CA 91773, for the high quality gas-pressure control devices.

Structural Composites Industries of Pomona, CA, for the latest high-pressure, natural gas cylinders and Parker Fluid Connectors, Minneapolis, MN (612) 544-7781 for the hydrogen connectors.

"Doc" Ottemoeller for the 1978 Cadillac.

Larsen Radax/Mel Larsen for engineering and machine-shop services.

The Cadillac conversion project is being performed according to the

standards set forth in NFPA 52, 1992 edition. This Standard for Compressed Natural Gas Vehicles can be found at most City codes and inspection departments, your local Fire Marshall, or at most University libraries.

The fuel storage system installed in the Cadillac was two SCI aluminum/fiber-glass wrapped cylinders that are attached to the vehicle frame with steel brackets. The brackets, fabricated by Claude Culbertson, and the cylinders' installation satisfy all elements of NFPA 52 sections: 3-3 (Installation of Fuel Supply Containers), 3-4 (Installation of Venting Systems), and 3-5 (Installation of Piping).

Installation standards include cylinder security from slippage, loosening, etc. The installation must withstand static loading equal to eight times the pressurized cylinder weight in six principal directions with a maximum of 1/2" displacement.

Continued, Page 9

Northern California Chapter – John G


A new demo that we hope to have ready to display by the time of Hydrogen '94 in Cocoa Beach is a model radio control car powered by Hydrogen Micro-Spheres/Fuel Cell power.

Changes are also coming in the Micro fuel kits, as we are upgrading the experimental quality. Included with all these kits is a holographic spinner, in addition to the spin fan. The next upgrade will be a revision to Explanations and Instructions and a shift to higher speed motor and a see-through motor mount. The price increases to \$149.50 plus shipping and handling \$5.00 US, \$15.00 for

Our best fuel cells are now putting out 500 milliamps/inch squared and then degrading to Platinum migration to approximately 30 Initial tests of membranes from Jet Laboratory have not been successful for this experiment.

We attended the Renewable Energy Fair in Arcata, CA and had an AHA booth. We met with Dr. Peter Lehman and got a tour of Schatz Fuel Cell project. John Gotthold was featured speaker at the Fair, talking on the Reality of the Solar Hydrogen Energy Economy. At the fair we offered the first issue of the Warsitz Enterprises Solar Hydrogen Energy Systems Catalog (and for those who paid \$2.00 for a catalog, Kathy will be sending it as soon as it is completed). The layout of the catalog will include real purchasable hardware from the Micro Solar Hydrogen Energy Systems Experimenters Kit to Utility size Engineering Services to help the customer with the detailed systems engineering required to optimize the equipment for the site. We intend to have a staff of experts available to assist the customer on a paid basis. In that regard please send us catalog copies of any real commercial available Hydrogen hardware that you may be aware of and we will include it in our computerized catalog data base.

The objective with the catalog is to pull together the commercial hardware from around the

We have had a new Electronic systems engineer join our group. He has some neat ideas about Ultra capacitors and Voltage doublers that fit in very well with making fuel cells more functional as power units. 

Fuel Cell Association Joins American Hydrogen Association


The American Association for Fuel Cells has become a project of the American Hydrogen Association. We have been noticing that AAFC and the AHA have a lot of common ground, since the best fuel cells use hydrogen as a fuel.

The AAFC was started by Tom Dickerman of Daly City, California in 1992. Roy McAlister, AHA President, says, "Mr. Dickerman and his associates have done a great deal for the cause of clean energy. We commend their work, and look forward to a cleaner, more efficient future through the important transition to hydrogen fuel cells."

AAFC has grown over the past year to over 100 members. Its mailing list

reaches over 1200 in the fuel cell industry and in government, education, and environmental agencies.

The AAFC has just issued its fifth quarterly newsletter, which covers fuel cell developments around the world. AAFC will continue to provide its fuel-cell information in cooperation with AHA.

AAFC has held joint meetings with the Silicon Valley Chapter of AHA for about a year. Meetings are at 10 a.m., the second Saturday of every month, at the Peninsula Conservation Center, 3921 E. Bayshore Road, Palo Alto, CA. If you live in the San Francisco Bay area, or plan to visit there, please drop in and participate. 

Engine Switched to Hydrogen in Under 20 Minutes

During our recent auto conversion class a challenge was issued. This challenge was issued to the class teacher, Claire Van Ausdale, and was accepted whole heartedly! This challenge was for Claire to run a truck engine on hydrogen right then and there.

Claire bravely opened the hood of the truck to reveal a freshly rebuilt chevy V-8 engine. Claire proceeded to lock the distributor

down, disconnect the gasoline lines, and feed in a line carrying hydrogen! The owner of the truck, shaking his head in doubt, turned the key and with a mighty roar the engine shook to life. Claire had this engine running on hydrogen with an elapsed time of under 20 minutes!

Wouldn't it be nice if we could all convert our engines to run on this non-polluting fuel?


Cadillac

continued from page 8

Venting standards include continuous venting to atmosphere of any and all fuel system connections or devices located within an enclosed vehicle compartment. The cylinder valves, their pressure relief devices, and other fittings must be vented, though not to a wheel well. This required some ingenuity.

Piping standards apply to the entire fuel system. On this project, high-pressure stainless steel tube is specified for all piping. It is technically feasible to use hydraulic hose at regulated lower pressures (psig). The use of double-ferrule compression type tube fittings is recommended for high-pressure hydrogen applications.

This phase of vehicle conversion amounts to steel fabrication, stainless steel plumbing, common sense, and regulation compliance. The materials are expensive, but save yourself the trials of lower cost materials. Do all you can to minimize piping joints - you will save money and reduce leak potentials. Minimize joints in enclosed compartments (the engine compartment is continuously vented).

As the Cadillac conversion tests progress they will be covered in Hydrogen Today. The Tempe AHA offers a series of courses on "how to" convert a vehicle to use gaseous fuels, ideally hydrogen. 


AHA Tempe BBS Expanding!

The AHA Tempe BBS (602-894-8403) is now connected to the Internet for both e-mail and news groups. What this means for the users is that they now have the ability to send mail to anyone on the Internet. There are about 25 million people on the Internet, with up to a million being added each month!

There also is a hydrogen discussion group on the Internet that focuses on upcoming trends and discoveries. We now have the ability to participate in these discussions directly, with each person sending in their own thoughts and ideas. With this addition, the AHA Tempe BBS can truly be a clearinghouse for hydrogen information.

The Internet access also allows us to bring in other forms of alternative energy. We are adding areas that deal with all facets of the environment, from solar to bio-mass to general discussions. If there are any other topics you would like to see once you get onto the system, please let the sysop know and we will see about adding them.

The cost for using the Internet access is \$15 per 6 months for members and \$25 per 6 months for non-members. This amount is only going to cover the costs of providing this valuable service. The rest of the AHA Tempe BBS continues to be free to all who call in.

To connect to the AHA Tempe BBS, just set your modem communications program to 8-N-1, the most common setting, and dial our number. Once you have connected, you will be asked for your user name and password. Just put in the password that you would like to use. After a short questionnaire, you may be given full status on the system. If you are an AHA member, be sure and leave a message to have an upgraded member status! Our number is (602) 894-8403. The number for our BBS in the San Francisco Bay Area is (415) 494-3116. 

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Letters

Dear Editor:

I thought that you might like to encourage others to join my "license-plate-advertizing campaign."

I no longer use H₂ IS OK, which is available for use by somebody else, to the best of my knowledge.

I now use H₂FUEL.

Other thoughts for special license plates have occurred to me, which others might be interested in using, for instance BURN H₂.

Special plates cost \$25/year. I hope others will join my campaign.

Stephen A. Langford, Ph.D

To Whom It May Concern:

I am a student at Portland State University and I found your address in the Encyclopedia of Associations in the school library. I am extremely interested in the idea of the extraction of hydrogen fuel from water as well as any uses that can arise from the use of this fuel alone or coupled with solar technology!

My science teacher challenged me to join your organization and said he'd buy me lunch if I met the challenge; what a deal, eh?! I am aware of your newsletter, "Hydrogen Today", but have no information regarding membership and exactly what membership would entitle me. This is where I need your help.

Please send information regarding membership as well as information on how to order your newsletter; I would appreciate a response very soon as I will be leaving the country on May 27th and will be in France for the next six months; perhaps you have European contacts as well that I could contact as well??

Thank you for your time. I look forward to hearing from you soon.

Dan Loder

Congratulations to Matthew Meschke Senior at Buhler High School, Buhler, KS

Matt is a student member of AHA. He won the State of Kansas High School Sr. Isaac Newton award for outstanding progress in calculus.

The Industrial Revolution has been greatly aided, if not dependent upon the contribution of Isaac Newton, including his work in physics and mathematics. We could not build a bridge, airplane or machine tool without employing the principles of physics and mathematics discovered by Isaac Newton.

We challenge Matt, along with all of our student members, to bring a new phase of the Industrial Revolution. Rather than continue the Industrial Revolution on fossil fuels and face increasing environmental degradation and economic inflation, we must adopt renewable energy resources.

Today's students can have prosperity without pollution for their future.



Dear Mr. McAlister,

The information communicated by *Hydrogen Today* becomes more exciting each year. Please renew my membership and congratulations on the important work which has been accomplished so far.

The Solar Energy Center in Florida is also working with hydrogen fuel but I believe they may be overlooking an abundant source. In several articles in *Hydrogen Today* you have talked about producing hydrogen from biomass, including sewage, garbage and other agricultural wastes. Florida has an abundance of biomass and more can quickly be grown.

I would like to learn the methods of producing hydrogen from biomass. Is this a process involving microbes? If I can learn this process I may wish to demonstrate it to farmers and especially to the owner of a biomass collection center nearby. I would be interested in learning about the conversion process with a view toward commercialization.

Congratulations and best wishes for increased hydrogen applications.

*Yours truly,
Samuel Kendall*

Hydrogen Today

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Upcoming Events . . .

NOTE: June-Sept — AHA headquarter's monthly summer meetings will be held at AHA, 216 S. Clark Dr. #103, Tempe, AZ. Informational, Educational and Leadership Roundtable. 7:00pm to 9:00p.m 3rd Wednesday of each month. (June 15th is a Hydrogen Bar-b-Que)

Southern California Chapter: Call 1-800 854-5225 for meeting schedules.

Silicon Valley Chapter: Call John Gotthold, President @ (408) 738-4014

June 6-8 — Austin, TX — Texas' 4th Annual Alternative Vehicle Fuels Market Fair & Symposium. Contact: 800-6-FUEL-99.

June 10 — CALL FOR PAPERS: Fourteenth ASME Wind Energy Symposium: Contact: Susan Hock: (303) 231-7650. (Jan 29-Feb. 1, 1995 Energy-sources Technology Conference & Exhibition...Adams Mark Hotel Houston, TX.)

June 18-19 — Tempe, AZ — Auto Conversion Class (weekend, Advanced class \$225)

June 20-23 — Milan, Italy — 19th World Gas Conference. Contact: (39) 2 5202-3030 (fax).

June 20-24 — Cocoa Beach, Florida — Hydrogen '94. Contact: Ingrid Melody, Florida Solar Energy Commission. (407) 783-0300, ext. 139

June 21 — Southfield, MI — Hybrid Electric Vehicles TOPTec; Radisson Plaza @ Town Center. Contact: (412) 772-7148 or Fax: (412) 776-5760.

June 24-July 3 — Manchester UK — Cities and Sustainable Development...Global Forum '94, Tel: (44-61) 234 3741 Fax: (44-61) 234 3743. e-mail: Geonet.mcr1:gf94-centre; Greenet: gf94@gn.apc.org; Internet: gf94-centre@mcr1.geonet.de x400: c=de; a=dbp;p=geonet; o=gf94; ou=centre.

June 25-30 — San Jose, CA — 23rd American Solar Energy Society Annual Conference. Contact: (303) 443-3130.

July 27-28 — Mexico City, Mexico — Latin American Power Generation — Hotel Fiesta Americana Contact: 211-1194 y 254-3008; Fax: 211-1568 y 254-2839

July 28-July 1 — Milwaukee, WI — International Alternative Fuels & Clean Cities Conference. (In conjunction with the Fueling the Future: A Clean Air Transportation and Engine Show). Contact: (703) 528-2500 or 1 800 USA-FUEL: Greg Haigwood. Fax: (703) 528-1603.

July Auto Conversion Class — Tempe, AZ- Contact: Rod Gallagher (602) 921-0433.

July 6-8 — Reading, England — World Renewable Energy Conference III. Contact: (73) 43 18588.

July 15-17 — Ukiah, CA — 4th Solar Energy Expo & Rally, Redwood Empire Fairgrounds (SEER '94). Contact: (707) 459-1256.

August 7-12 — Monterey, CA — 29th Intersociety Energy Conversion Engineering Conference. Contact: (815) 968-0910

August 9-11 — Binghamton, NY — NY State Electric and Gas Fourth Annual NGV Conference. Contact: (607) 762-4021 or (607) 729-2552

Sept. 3-5 — Boulder, CO — "New Renaissance" Festival: Emphasis on the environment and appropriate technologies. Contact: (303) 939-8463

Sept. 10 & 11 — Cedar Rapids, Iowa — Iowa Renewable Energy Expo & Alternate Fuel Vehicle Showcase. Contact: Stan Eilers (319) 365-7314 or Tom Deves (319) 556-4765

Sept. 11-16 — Reading, UK — World Renewable Energy Congress III. Contact: 73 43 18588 United Kingdom.

Sept. 12-15 — Denver, CO — 11th Annual Natural Gas Vehicle Conference. Contact (703) 841-8667.

Sept. 19-21 — Atlanta, GA — American Gas Association Natural Gas Vehicle Conference. Contact: (703) 841-8446.

Sept. 26-30 — Toronto, Ont, Canada — N. American Conference & Exhibition on Emerging Clean Air Technologies & Business Opportunities. Contact: (819) 953-4705.

Oct. 2-6 — Sparks, NV — BIOENERGY '94. Contact: (303) 275-1704 fx: (303) 275-1707 or 275-1717. Western Regional Biomass Energy Program.

Oct. 3-5 — Providence, RI — Sustainable Transportation & Electric Vehicles. Northeast Sustainable Energy Association. Contact: (413) 774-6051.

Oct. 9-12 — Vancouver, BC, Canada — Seventh World LPG Conference & Exhibition. Contact: 403) 263-0450.

Oct. 13-14 — Cape Town, South Africa — World Energy Council, Regional Energy Forum, Mobilizing Energy for Growth. Contact: 27 11 800 5319, South Africa.

Oct 31-Nov. 4 — Aachen, Germany — ISATA International Symposium on Advanced Transportation Applications. Contact: 081 681 3069, England.

November 9-13 — Springfield, MA — 11th Annual Quality Building Conference - Making Sustainable Building Standard Practices: Practical Solutions for Good Business. Massachusetts Monach Sheraton Hotel. Contact: NESEA, (413) 774-6051.

November 28 - December 1, 1994 — San Diego, CA — 1994 Fuel Cell Seminar. The Town and Country Hotel, Contact: Annmarie Pittman, (202) 639-4994, Fax: (202) 347-6109.

Dec. 5-7 — Anaheim, CA — 12th International Electric Vehicle Symposium. Contact: (408) 253-5262.

MEMBERSHIP APPLICATION

YES, I want to join the American Hydrogen Association and help make a transition to clean Hydrogen energy.

Name _____

Address _____

City _____ State _____ Zip _____

Telephone - Home: () _____ Office: () _____

Occupation and/or Areas of Special Interest _____

- | | |
|--|---|
| <input type="checkbox"/> Regular Membership (\$30/Year) | <input type="checkbox"/> Sustaining Membership (\$100/Year) |
| <input type="checkbox"/> Student/Senior Membership (\$20/Year) | <input type="checkbox"/> Life Membership (\$1,000) |
| <input type="checkbox"/> Family Membership (\$40/Year) | <input type="checkbox"/> Corporate Sponsor (\$1,000/Year) |
| <input type="checkbox"/> Monthly Pledge | <input type="checkbox"/> Newsletter Sponsor |

All donations to the **American Hydrogen Association** are **Tax-DEDUCTIBLE** under IRS 501-(C)-3 as a Non-Profit Organization

Enclose check or money order and mail to:

American Hydrogen Association, 216 S. Clark Drive, Ste. 103, Tempe, AZ 85281

"The Xerox-CAN Plan"

Southern California Chapter

The South Coast Air Quality Management District Governing Board voted to co-fund an unprecedented landmark project. The project titled "the Xerox-CAN Plan" will help to put into operation the first-of-its-kind closed loop solar hydrogen generating facility, a hydrogen fueling station, as well as a fleet of clean burning hydrogen powered vehicles on Southern California roads within a year.

Clean Air Now (CAN), a non-profit environmental organization with a 25 year history of pro-activism in Southern California, received funding today through the AB2766 Funding Program, a state funding program which provided funds from automobile registration fees for projects that reduce or eliminate pollution from mobile sources. Funding was approved today for CAN to install a hydrogen fueling station and to convert three vehicles to run on hydrogen.

CAN will be the lead organization directing and managing the project, as well as deploying the project into the marketplace upon completion.

Co-sponsors include: Xerox Corporation, whose El Segundo facilities will host the fueling station, and Hamilton Standard, a division of United Technologies Corporation, a defense contractor that manufactures

water electrolyzers for the Navy Submarines.

Also participating and engineering the vehicle conversions is Advanced Machining Dynamic (AMD) a former defense contractor in San Bernardino. They currently specialize in automotive technology.

This project builds on a joint UC Riverside/SCAQMD Technology Advancement Project that utilizes solar generated hydrogen to power a vehicle converted to run on hydrogen.

The Xerox-CAN project consists of photovoltaic solar cells that will generate electricity. The electricity will be used to perform a process called electrolysis, which will separate the hydrogen and oxygen components of water. The hydrogen will be stored on site and will be used to power a small fleet of clean burning light duty vehicles.


"This is the first time in this country that a private sector entity has taken on such a visionary project" says Alan Lloyd Ph.D., Chief Scientist for the SCAQMD.

Clean Air Now has been notified by the White House Technology Reinvestment Project that the Xerox-CAN Plan is still under consideration for funding. "If funding is forthcoming from that source for the rest of the project, then we will have funding for the solar system and

the electrolyser hydrogen generating facility to be engineered by Hamilton Standard and Solar Engineering Applications (SEA Corp) and we will have put into operation a fully closed loop system.

"This will be an historical occasion for it will mark the beginning of the Solar Hydrogen Economy" said Robert Zweig, M.D. President of the Board of Directors for Clean Air Now, the organization that has been working on the project for the past 3 years.

"We're not talking rocket science here. Most of the project uses off-the-shelf technology that is safe, reliable, clean and efficient," said Paul Staples, Executive Director for Clean Air Now. He went on to say, "Naturally we're very pleased with results of this year's selection process performed by the MSRC (Mobil Source Air Pollution Reduction Review Committee which is responsible for the selection process that the SCAQMD Governing Board votes on), although even without the Xerox-CAN Plan being funded, this year's selections is a vast improvement over last years, its like night and day."

"No funding for oil companies to scrap vehicles or p.r. firms to produce newsletters this year. I'll say it's a vast improvement over last year" agrees James Provanzano, Project Director at Xerox. 



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Happening