

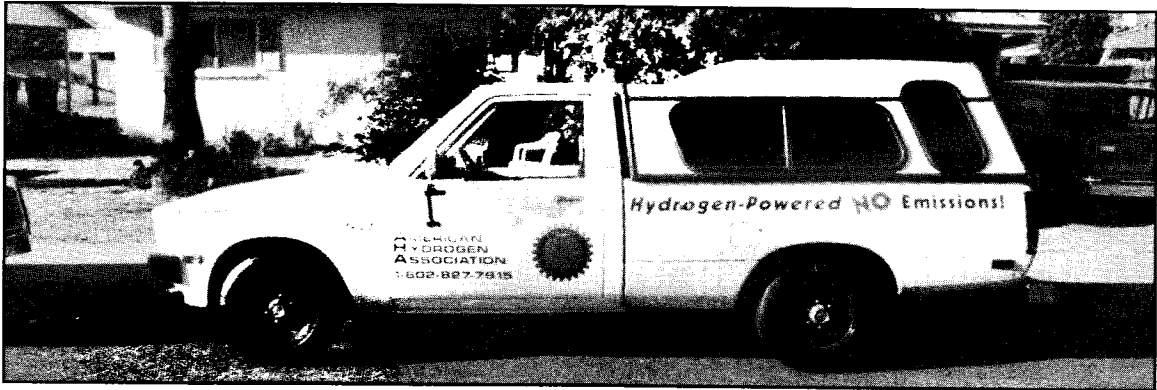
# Hydrogen Today

"Clean Energy For A Better World"

Official Publication of the American Hydrogen Association • 1739 W. 7th Ave Mesa, AZ 85202-1906 Vol. 9, No. 2 1998

## *CLEANING THE AIR FOR ROTARY IN INDIANAPOLIS*

Pollution-Free Planet Report



Originally converted to exclusive operation on hydrogen for Dr. Robert Zweig, M.D. to demonstrate how to avoid respiratory disorders, this 1979 Dodge pickup has been to the far corners of the world. Dr. Zweig determined that the average city dweller has impaired lung function by the age of 12 years. He made extensive studies of carbonaceous substances as causes of lung diseases, and commissioned the pickup conversion to hydrogen so it could serve as a preventative agent against lung disorders.

After proving that an engine burning hydrogen has no emissions of carbon monoxide, carbon dioxide, hydrocarbons, or particulates to cause lung diseases Dr. Zweig directed the American Hydrogen Association to continue the scientific research and public demonstrations. Students of Roy McAlister utilized this research opportunity to help prove that a hydrogen-fueled engine can produce "less than zero" or "minus emissions" by steam cleaning tire particles, diesel soot, carbon monoxide and hydrocarbons from the air that enters the engine.

After completing some 17 years of such service and accumulating over 200,000 kilometers of travel including excursions to universities in faraway China, this venerable hydrogen pickup was due for a facelift. Enter the Phoenix Rotary Club. The Phoenix Rotary Club under the leadership of President Craig Wilson, formed what Ray Smucker suggested should be called the "Pollution-Free Planet" Task Force which appointed Bill Chase to serve as Chairman. The mission of this Task Force is to do everything possible to accomplish Rotary International's ten-year program to Protect Planet Earth. The Pollution-Free Planet Task Force teamed with the American Hydrogen Association to initiate work/study programs and clean-planet business launch groups from the world's most polluted cities.

To make these Rotary developments known around the world, the Pollution-Free Planet Task Force reserved space at the Rotary International annual convention which was held this year in Indianapolis, Indiana. Preparations were made for presenting the "*less than zero emissions vehicle case*" and

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*“technologies for sustainable economic development”* to some 19,000 representatives of 1.2 million members of Rotary Clubs from all over the world. Visitors to the Pollution-Free Planet booth and seminars would be able to learn how existing vehicles in the world’s most polluted cities could be converted to minus-emissions operation on hydrogen which actually cleans the air. In addition, they would learn how to economically make hydrogen from many sources including garbage, sewage and farm wastes to launch economic developments in essential industries and agriculture.

The Hydrogen Pickup got its facelift, including removal of some rough-road wrinkles that had been developed during travels to faraway places. Lou Linxwiler’s company manufactures a kit car (the GT 250 California Spyder) that so nearly resembles the Ferrari classic GT 250, that it was chosen to play the “star car” role in the movie “Ferris Buehler’s Day Off.” When Lou Linxwiler volunteered to help get the Hydrogen Pickup painted and delivered “show ready” in Indianapolis, fellow members of the Pollution-Free Planet Task Force heartily accepted and asked Lou if he could please also safely transport a truck load of other exhibit items, including two solar-powered electrolyzers, advanced hydrogen-storage tanks, two types of regenerative fuel cells, a minus-emissions lawnmower engine that has been converted to run on hydrogen, two types of photovoltaic panels, a solar concentrator furnace, a solar dish genset, and many boxes of printed material to the Rotary International Convention.

At the Rotary International Convention, Rotary delegates from nearly every country visited the Pollution-Free Planet Display and seminars that were given by Craig Wilson and Roy McAlister. Literature selections were provided and discussions were attempted in English, French, German, Russian, Chinese, Japanese, Thai, Spanish and Portuguese languages. Demonstrations of electrolysis cells, hydrogen storage, hydrogen engines, and fuel cell operation were made to show essential technologies of the Solar Hydrogen economy for adding wealth to virtually any farm, community, or industry.

Sign language, including much pointing at components and during operation of the minus-emissions hydrogen “SmartPlug” fuel-injector/spark-ignitor, along with running the hydrogen lawnmower engine and breathing handfuls of the clean exhaust gases proved to be the bottom-line communication that made the Pollution-Free Planet message clear to everyone. Many applied Rotary’s four-way test and affirmed the technologies as advancements for international understanding, goodwill, and peace through a world fellowship of business and professional persons united in the ideal of service above self.

**The Rotary Four Way Test of the things we think, say or do:**  
*Is it the TRUTH? Is it FAIR to all concerned? Will it build GOODWILL  
and BETTER FRIENDSHIPS? Will it be BENEFICIAL to all concerned?*

**FACTS THAT EVERYONE SHOULD KNOW** *(please contact AHA for more facts)*

*Hydrogen can be manufactured by using solar energy and water. It can also be produced from biomass, wind energy, or hydro-electricity and water. When hydrogen is produced by these renewable sources of direct or indirect solar energy from the sun it is called “Solar Hydrogen.”*

*Hydrogen burned as a fuel produces only water and in some instances, traces of oxides of nitrogen. Rain storms produce both, but catalytic reactors on gasoline-powered engines are exaggerating the production of a particularly harmful oxide of nitrogen, which is dinitrogen monoxide or “laughing gas.” These engines running on hydrogen do not need catalytic reactors. Nearly any engine can be converted to minus-emissions operation on hydrogen to clean the air.*

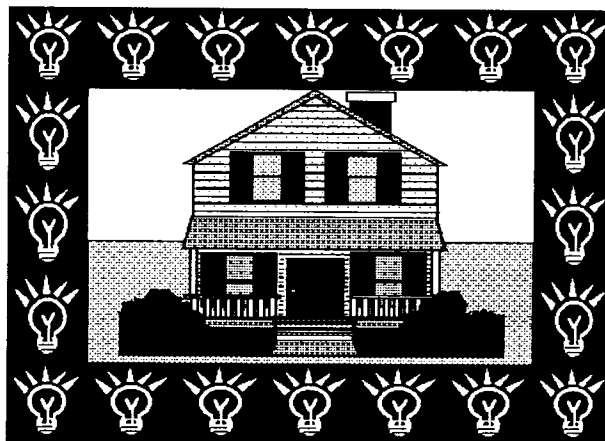
## COGENERATION REDUCES THE COST OF CONVENIENCE

By: Roy McAlister

Countless times each day, persons in industrialized countries turn knobs to cook meals, run appliances, use hot water, and expect automatic control of the temperature and humidity by an air conditioning system. The following graph shows the monthly costs for operating various modern appliances at the electricity cost of \$0.065/KWH and natural gas at \$5.40/MMBTU.

### TYPICAL MONTHLY COSTS

|                                            |      |
|--------------------------------------------|------|
| CLOTHES WASHER                             | \$ 2 |
| MICROWAVE OVEN                             | 3    |
| DISHWASHER                                 | 4    |
| TELEVISION (6 hrs/day)                     | 5    |
| GAS CLOTHES DRYER                          | 6    |
| GAS RANGE                                  | 6    |
| LIGHTING                                   | 7    |
| ELECTRIC CLOTHES DRYER                     | 8    |
| FREEZER (15 cu.ft., man. defrost)          | 9    |
| ELECTRIC RANGE                             | 11   |
| PORTABLE SPACE HEATER                      | 13   |
| REFRIGERATOR (17 cu.ft., frost free)       | 13   |
| DEHUMIDIFIER (10 hrs/day)                  | 15   |
| GAS WATER HEATER (65 gal/day)              | 17   |
| ROOM AIR CONDITIONER (8,000 BTU, 8hrs/day) | 22   |
| ELECTRIC WATER HEATER (65 gal/day)         | 35   |
| ELECTRIC CENTRAL HEATING (heating season)  | 90   |



### **NEED ELECTRICITY, HOT WATER and INEXPENSIVE AC? CONSIDER COGENERATION.**

As shown above, it is much less expensive to have hot water from a natural gas water heater than from an electric water heater. Even greater savings can be provided by preheating water with solar energy or by using the waste energy from an engine-generator that produces the electricity for your dwelling. For most homes, cogeneration of electricity and heat using natural gas or renewable landfill methane at \$5.40/MMBTU can supply electricity for about \$0.05/KWH and enough hot water to meet space heating and domestic requirements. Couple cogeneration with a ground-sourced heat pump and expect to save 1/2 to 2/3 on utility costs.

### **LIGHTING THE WAY TO SAVINGS:**

When possible substitute fluorescent lighting for incandescent bulbs. Compact fluorescent lights are available for most regular incandescent bulb sockets. Up to six times as much light will be provided for the same electricity required by incandescent bulbs.

Avoid long-life bulbs (these are the least efficient type of incandescent light and cost much more than ordinary bulbs). Use the highest wattage bulb for which the lamp is rated instead of several lower wattage bulbs. Illustratively, one 100-watt bulb produces the same amount of light as two 60-watt bulbs but uses 17% less energy.

Turn off fluorescent and incandescent lamps when not in use. Consider an automatic light switch that senses your presence or absence when the ambient light falls below the desired level.

For portable and emergency lighting consider the Marathon Emergency Light from Radnoy Corporation. This emergency light uses a light emitting diode (LED) which will operate continuously for four months on one D-cell battery! The light produced will allow you to read a newspaper in an otherwise completely dark room. It will work under water and is safe for children to use. It is far less expensive than flash lights, candles, or Coleman lanterns in comparisons that require a focused light on a specific task or a long-life (4 months) rescue beacon.

### **WATER BEDS FOR MISERS that set the thermostat for savings!**

If you are really into saving energy consider a solar-heated and star-cooled water bed! During the winter in the day time arrange to use solar energy to heat the water and then insulate it to retain the heat until you go to bed to be warmed by the stored solar energy. This will allow you to turn down the thermostat in the winter and save energy. In the summer, arrange to "aim" radiation from the water bed into space so it can be "star cooled." Insulate it during the day to keep it from being solar heated and you can enjoy a cool heat sink while you sleep.

## **Walter Nernst** **1864-1941**

By: Kathy McAlister

The great Walter Nernst might roll over in his grave, if he had read *"Hydrogen Today"* Vol 8, No. 1, 1998, page 26. Here is a man that wrote equations with Albert Einstein ... he worked on the Third Law of Thermodynamics. He developed equations with F.E. Simon (1893-1956) showing the limiting value of the entropy change accompanying an isothermal reversible process. He spent thirty years doing theoretical research. In the period from 1927 to 1937, the work of both Nernst and Simon finally produced the correct equations for the Third Law of Thermodynamics. A Nobel prize was awarded to him for his experimental and theoretical research. Walther Nernst's contributions allow calculation of the maximum internal cell voltage in a fuel cell. Thank goodness for Walther Nernst and thank goodness he didn't place the loooong distance call to tell me that our electronic printer had not printed all of his famous equation. However, we did get a few calls wanting to know the secret of the equation. We apologize to Walter Nernst's great spirit, the legacy of his work, and to all of our readers.

The formula is:  $E_g = E_g^o - R_u T / n F_y \ln \frac{P_{R_1}^a P_{R_2}^b}{P_c^c P_d^d}$  (Where  $P_a, P_b,$  are partial pressures of reactants a & b;  $P_c, P_d$  are partial pressures of products c & d)

As noted by Nernst, increasing the temperature (T) of the reaction usually decreases the voltage of operation and thus the amount of electrical work that can be done. Conversely, increasing the temperature decreases the voltage required for electrolysis of water because the electrolyzer reverses the chemical processes of the fuel cell. According to Roy McAlister, an energy conversion system could utilize concentrated solar energy to reduce the voltage of electrolysis, cool the hydrogen to ambient temperature, produce higher voltage in a fuel cell, and supply part of the electrical work to the high temperature electrolysis and the remainder to other loads.

Wasn't Walter Nernst fantastic!!! I wonder if he contemplated his formula being used on enthalpy/entropy accountings that would allow the maximum efficiency to be calculated for fuel cells? (Along with Gibbs free energy calculations.)

This brings me around to an "Albert" joke that Walther might have told! Albert Einstein had been traveling from university to university giving great lectures on relativity, when his driver said, "Listen Doctor, you are too tired. I have heard this speech so many times, that I can deliver it for you. Let me do it!" So Albert agreed to take the night off so he could rest in a hotel. The driver combed his hair up on end and gave the speech. The driver delivered a

great speech, with Einstein's German accent, giving the right theories on relativity. Then came the question that he was not expecting. The driver looked puzzled and said, "That is the very same simple question that my driver asked. I gave him some hints and said to work it out. But if you want to visit with him about it, he will be at breakfast with me at the hotel in the morning." And then he bowed and said "good night" and left. The reason I mention that story is, no matter how many times I have heard Roy McAlister, he still has to give the answers to the hard questions. Here is the Second Part of our series from the *Fuel Cell Primer*.

For more information on the American Hydrogen Association (AHA) - Arizona State University (ASU) collaboration contact: Roy McAlister at AHA (see address below) or Dale Palmgren\ Don Kelley at:

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## Fuel Cells (Installment #2)

By: Roy E. McAlister

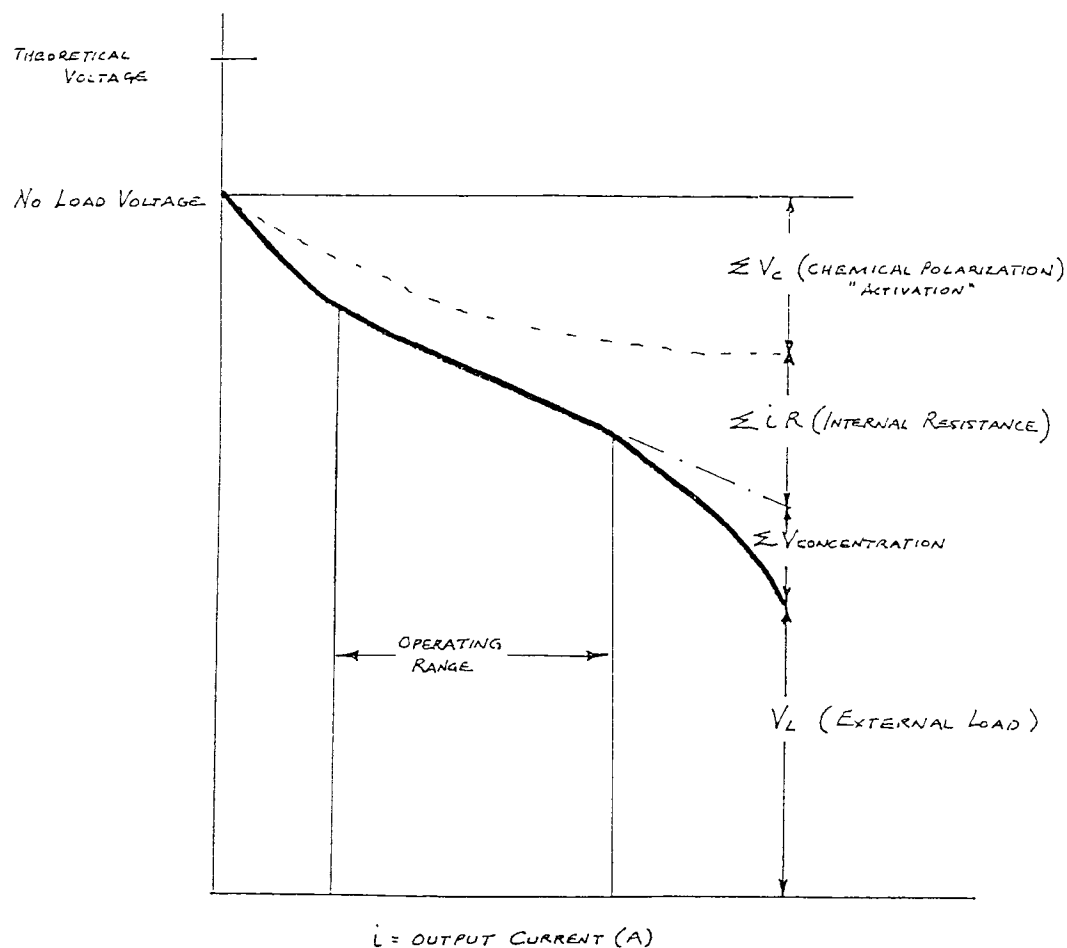
As a practical matter, U.S. engineers generally report overall engine efficiency as the ratio of shaft work to enthalpy at the higher heating value. (What you get to use from what you buy!) In order to make a fair comparison of engines to fuel cells, the equation  $V - m H/nF$  has the value 1.482 volts which includes the maximum possible work including thermal and electrical energy that may be released. (But remember, fuel cells do not utilize the thermal energy and voltage may be reduced by increased temperature.)

Therefore, the fuel cell efficiency ( $N$ ) is simply the ratio of actual operating voltage and 1.482 V:  
$$N_{fc} = V/1.482$$

Only the free energy part ( $\Delta G$ ) of the total enthalpy ( $\Delta H$ ) can be converted into electricity due to irreversible entropy changes ( $T \Delta S$ ), i.e.:  $\Delta G = \Delta H - T \Delta S$

The theoretical maximum potential of the reaction that corresponds to free energy ( $\Delta G^\circ$ ) at 25°C and atmospheric pressure is 1.229 V.

Figure 1.  
Typical Current-Voltage Characteristics



Therefore, the maximum theoretical hydrogen fuel cell efficiency is  $1.229/1.482 = 0.83$ .

The theoretical or thermodynamic potential at conditions different than 25°C and atmospheric pressure is:

$$V_o = 1.229 - (T - 298.15)(S/nF) + (RT/nF)(\ln[P_{H_2}(P_{O_2})^{0.5}])$$

Where:

- T = cell operating temperatures (°K)
- R = gas constant (8.314 J/mol °K)
- P<sub>H2</sub> = ratio of hydrogen pressure and atmospheric pressure
- P<sub>O2</sub> = ratio of oxygen pressure and atmospheric pressure.

The actual cell potential in operation is lower than the thermodynamic potential due to various losses, such as:

- (a) activation losses:
- (b) concentration losses:
- (c) resistive or ohmic losses:

Activation of concentration losses usually occur at both the anode and cathode. Resistive losses are generally due to resistance in the electrolyte and in the contact areas of the electrodes with the electrolyte. The cell potential is found by subtraction:

$$V_{cell} = V_o - V_{conc,a} - V_{conc,c} - V_{act,a} - V_{act,c} - V_{ohm+} - V_{ohm(m)} - V_{ohm-}$$

When no load is connected to the fuel cell (open circuit), no power is being delivered, consequently the potential of PEM fuel cells is usually about 1 V. When the load is connected, the fuel cell potential decreases further as more current is delivered. The electrical efficiency of fuel cells at maximum power conditions is usually only about 30% of the higher heating value of the fuel.

At reduced power densities the fuel cell efficiency may be 40% to 50% as in automotive applications where the average power delivery is only about 10% to 30% of maximum capabilities. This is the opposite of stratified-charge internal combustion engines and gas turbines which produce poorer part-load efficiency than at full load.

An example is the Energy Partners 10KW PEM stack of 40 cells with an active area of 780 cm<sup>2</sup>. This stack is rated for pure hydrogen and air operation at 10 KW continuous output and provides 40% efficiency at 300 kPa and 65°C. Pre-production cost of this well-engineered fuel cell is about \$3,000/KW but in high production the goal is to reduce the cost for stationery applications to \$1,000/KW and to \$100/KW or less for automotive power plants. To achieve these cost-reduction goals it probably will be necessary to operate at much higher current densities and accept lower overall efficiencies.

In the fuel cell, a suitable fuel such as sodium, hydrogen, or carbon monoxide is fed into a porous anode and air, oxygen, a halogen, or sulfur is fed into the porous cathode. Fuel cell electrodes must accomplish three things: Ions must be produced from the fuel or oxidant, electrons must be conducted to the external load, and ions must be transferred to the electrolyte. The electrode must be porous for the purpose of facilitating contact of the electrolyte with the fuel. The porous nature is very critical. If the pores are too large the electrolyte may escape or the fuel may bubble through and be wasted. If the pores are too small there may not be sufficient contact between the fuel and the electrolyte.

Fuel cells are deceptively simple. Consider the following solid-polymer electrolyte type of fuel cell. Against both sides of a special sheet of plastic, called a semipermeable membrane, are pressed two electrode grids such as nickel-plated screen wire. This assembly is housed in a canister that provides for hydrogen to be fed into one of the electrode grids. Oxygen or air is fed to the other electrode. At the hydrogen electrode diatomic hydrogen is broken into atomic hydrogen which transmits an electron to the grid as it enters the semipermeable electrode as a proton.

Electrons from the hydrogen are used in an external circuit that is in series between the two electrode grids. The electrons do work by powering a device such as a light bulb, motor or toaster. Protons diffuse through the semipermeable membrane to the other grid where oxygen has collected electrons that have passed through the external circuit. Protons react with electron-rich oxygen at the oxygen electrode to form water.

Operation of a fuel cell to produce electricity does not require combustion or very many moving parts. Fuel cells may be relatively noiseless and vibration-free devices. As with most fuel cell types, the solid-polymer electrolyte fuel cell has a much smaller metal content than an engine-generator set of equal electricity production capacity.

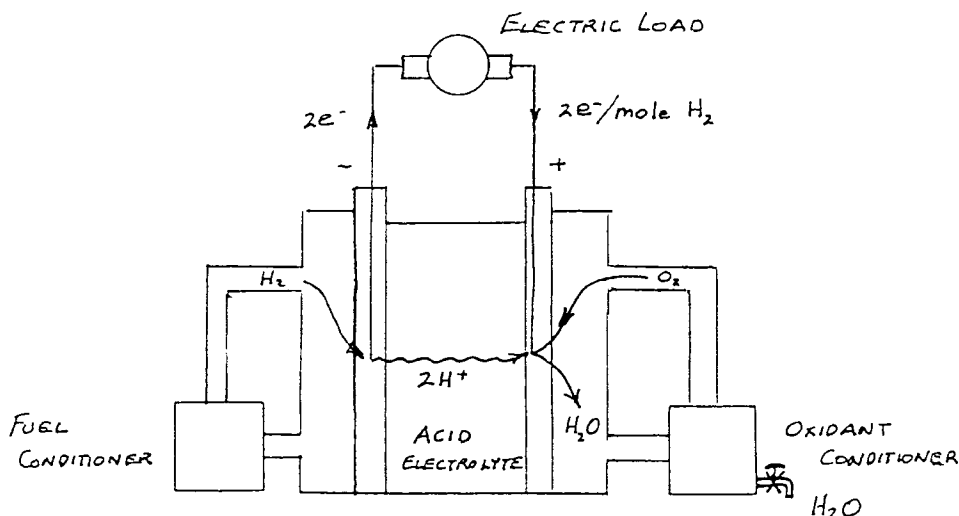
The Table below compares the operating temperatures of several fuel cell types. All of the types listed can use hydrogen fuel but most development efforts have been oriented towards hydrocarbon fuels.

TABLE

| <i>TYPE</i>      | <i>ELECTROLYTE</i>    | <i>OPERATING TEMPERATURE, °C</i> | <i>NOTES</i>                                |
|------------------|-----------------------|----------------------------------|---------------------------------------------|
| Biological       | Sodium Chloride       | AMBIENT                          | Organic Cell                                |
| Proton Exchange  | Semipermeable Polymer | 50 - 100                         | Space Power Development                     |
| Alkaline         | Potassium Hydroxide   | 50 - 100                         | $\text{CH}_4 \rightarrow \text{H}_2$        |
| Direct Methanol  | Sulfuric Acid/Polymer | 60 - 120                         | $\text{CH}_3\text{OH}$                      |
| Phosphoric Acid  | Orthophosphoric Acid  | 190 - 210                        | $\text{CH}_4 \rightarrow \text{H}_2$        |
| Molten Carbonate | Li/K Carbonate        | 630 - 650                        | Carbon Fuel                                 |
| Solid Oxide      | Stabilized Zirconia   | 900 - 1000                       | $\text{O}^{2-}$ exchange; hydrocarbon fuels |

Types of fuel cells vary greatly but all share the commonality of having a pair of electrodes on both sides of an electrolyte where electrochemical reactions are facilitated which results in ohmic losses in the series connection involving the electron path and ohmic losses in the ion path. Another loss is due to polarization of various kinds which is illustrated by having the fuel molecules blocked by ionic charges on the electrode or the oxidant blocked by water or some other product of the reaction on the other electrode. These losses often amount to 25% or more of the energy produced by the chemical reaction. Figure 2 shows the direction of ion travel, characteristic reactions at the electrodes, and other features of selected fuel cell types.

Figure 2.  
Direction of Ion Travel



## ***The Perry Foundation and Energy Partners Join Together To Develop a Renewable Hydrogen Clean Energy System:***

By: C. Renée Cooper

The newly announced Project 3<sup>rd</sup> Millennium (P:3M) combines existing clean energy technologies into a system that eliminates the need for fossil fuels. The goal of this P:3M project is to provide a renewable, zero-emission, energy-producing system that enables a community to be energy self-sufficient. At the end of the project, the prototype system will be transferred to and installed on Lee Stocking Island, Bahamas, home of the Perry Foundation's Caribbean Marine Research Center, to power its research facilities and provide ongoing testing and demonstrations.

The P:3M system converts energy available in the natural environment, sunlight for example, into electricity and water into hydrogen gas. An electrolyzer splits water into its two elements, oxygen and hydrogen. The gasses are reunited in a fuel cell to produce supplemental electricity when energy from the environment is scarce, at nighttime for example.

The proposed system will be composed of an electrolyzer, hydrogen and oxygen storage sub-systems, a Proton Exchange Membrane (PEM) fuel cell sub-system, and a controller power-conditioning unit. The system may be used in conjunction with any renewable power source, such as solar-concentrator gensets, photovoltaic arrays, wind turbines, small hydropower plants, geothermal power plants or ocean current/wave generators.

An added benefit, the P:3M will produce hydrogen gas for use in fuel cell-equipped vehicles and boats. The only by-products of fuel cell use are pure water and heat.

Energy Partners, located in West Palm Beach, Florida, is a PEM fuel cell developer and manufacturer. The Perry Foundation, also located in West Palm Beach, is a nonprofit organization dedicated to pioneering research in the field of marine science and sustainable use and development of natural resources. The other organizations involved in this effort are Treadwell Corp, Trace Engineering, Florida Solar Energy Center, Gee & Jenson Engineering and the Rinker School of Business' Applied Business Research Institute. Treadwell Corporation is located in Thomaston, CT and is an electrolyzer manufacturer and developer. Trace Engineering, Arlington, WA is a manufacturer of power conditioning units (inverters/converters) for renewable, marine, vehicle and utility applications. The Florida Solar Energy Center of Cocoa, FL, is a renewable energy and building research institution, operating under the University of Central Florida. Gee & Jenson Engineers is an architectural/engineering company located in West Palm Beach. Applied Business Research Institute, a part of Palm Beach Atlantic College located in West Palm Beach, is aiding in the business planning for the commercialization of the energy system. A grant from the U.S. Department of Energy provides major funding for this ambitious development program.

For more information on this exciting development, contact the Perry Foundation at (561) 471-7552 fx: (561)-471-7553 . The address is 1501 Northpoint Parkway, Suite 101, West Palm Beach Florida 33407

### ***New Membrane Boosts Hydrogen Production:***

A new membrane that significantly increases the production of hydrogen from the electrolysis of water has been developed by the Kanai Electric Power Co. and Mitsubishi Heavy Industries, Ltd. The membrane coated with platinum and iridium is made from a solid polymer material. A prototype system made with eight membranes having surface areas of 50 square centimeters apiece can reportedly operate for 4,000 hours without suffering performance declines, a characteristic not found in today's membranes.

***Will you ever say, fill'er up with hydrogen? (Salomon Smith Barney advertising campaign.)***

**Yes, when you install a hydrogen tank in your car, farmers will bring renewable hydrogen. (AHA)**



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## *The Union of Concerned Scientists:*

Three cheers for the Union of Concerned Scientists for endorsing hydrogen fuel-cell buses to Congress. The UCS report cites threats to public health from diesel exhaust and lower lifetime costs of fuel cells as two reasons to endorse fuel-cell buses. Recently, California scientists have released disturbing data on Diesel tailpipe emissions indicating a mixture of arsenic, benzene, dioxins and polycyclic aromatic hydrocarbons. Jason Marks from UCS cites that hydrogen and liquid natural gas are viable alternatives that are ready for entering the marketplace.

The California Air Resources Board will vote July 30, 1998, on whether to add diesel to the state's list of toxic air contaminants. You can bet the oil lobbyists will be working overtime on this issue.

## *WIND POWER FOR NEW ENGLAND::*

Green Mountain Power Corporation recently announced completion of 11 wind turbine-generators along with switch gear and a transmission line to the power grid. Each turbine-generator is rated for 550 kilowatts of power which makes this 6-megawatt wind power installation the largest in the Eastern USA.

In the first four months of 1998, some 4.5 million kilowatt hours have been delivered to the grid. As a precaution against icing these turbines have black ice-shedding surfaces. The black surface absorbs sunlight and heats the surface to help make a layer of liquid water that sheds sleet and freezing moisture. To keep the cold from robbing power by thickening the oil in the gearboxes Green Mountain specified a synthetic lubricant that remains free flowing at -40F and there is an option for using some of the renewable electricity for heating of the lubricating oil if needed.

This new wind generating station will displace fossil fuel produced electricity which will lower the carbon dioxide production in New England by 22 million pounds each year. What the world needs now are electrolyzers at the other end of the grid making minus-emissions fuel for hydrogen powered transportation engines.

## *HOW DO DINOSAURS SOUND?*

By Kathy Ann McAlister

Listen to how scientists think the Parasaurolophus dinosaur might have sounded by tuning in the world wide web at <http://www.sandia.gov/media/dinosaur.htm>.

For another perspective, one that can cause all the senses to be stimulated, take off the cap of the fuel tank of a petroleum-fueled vehicle and smell the fumes which will surely include some dinosaur aromas among the 1,000 or so different molecular compounds that will greet you. Then stand behind a diesel or gasoline engine. Listen for the burbs, gurgles, purrs, and roars of engines that can be tuned to the dinosaur digestive noises or reved to the dinosaur rumba. In a day, one car engine will produce enough exhaust gases to fill three large homes. Stand still and dinosaur fumes that are released from 200 million years ago will engulf you.

Dinosaur gas ghosts will be conjured from tongues of flaming fossil carbon that has been buried deep in the earth's coal, oil, and natural gas strata for millions of years. These ghosts will slip into the unsuspecting crowds of nitrogen and oxygen molecules of the atmosphere. Wait awhile and there will be more sound and fury as these greenhouse gases exaggerate the next thunder and lightning storm. Watch out for the dreaded Flood-osaur that rampages down the valleys to wipe out farms and cities. Take care to avoid the Hurricane-osaur that can move across thousands of miles of ocean to devastate coastal areas. Tornad-osaur hides in dark clouds and can quickly swoop down as a 200-mph swirling banchee that rumbles and screams to destroy cars, homes, schools and just about anything else that humans have built. Make preparations for the cloud-o-saur that spits sleet that builds up on tree limbs and power lines to break them down causing black-outs. Find cover from the 40,000 ft high billowing nimbo cumulosaur that sometimes hurls hail the size of baseballs and cantilopes at 100 mph to break windshields and kill animals that have no protection.

**WASHINGTON D.C. "MARCH FOR PEACEFUL ENERGY"  
OCTOBER 24, 1998**

**By: Richard Lasken  
President of DC Solar  
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October marks the 25th anniversary of the oil embargo of 1973. October 24th will mark the start of an international movement to change our planet's energy from the use of fossil and nuclear fuels to alternative and renewable energy sources. The March for Peaceful Energy will take place this day on the mall in Washington, DC in front of the capitol. Not only will this help make a cleaner environment, but help put an end to political disputes over oil and nuclear dumping.

We have been lulled into a false sense of security by low oil prices and a moratorium on nuclear plant construction. But the urgent need to retrofit the existing energy infrastructure still lies ahead. A recent air quality crisis in Europe and nuclear tests in India and Pakistan have rekindled a spirit of activism... a proven effective spirit when all else fails.

Speakers/musical guests, include: Galord Nelson, Scott Sklar, Hazel Henderson, Dennis Weaver, Chief Arvol Looking Horse, Helen Caldicott, Brian O'Leary, Paul Pantone, Jeane Manning, Eugene Mallove, Hal Fox, Peace Pilgrim, Remy Chevalier, Bonnie Reiss, John Nolt, Roy McAlister. The Robert Charels Blues Band, The David Marks Band, Project Exodus, Sharon Perez-abreu are just some who will contribute their time and talent to the march.

Richard Lasken, President of DC Solar in Washington, D.C. is still looking for additional sources of sponsorship. Contributions and organizations or individuals to help the cause by mobilizing people in their specific areas are needed. Director of Communications, Jeremy Cheron of New Orleans, LA., can be e-mailed at ([orleans@wam.umd.edu](mailto:orleans@wam.umd.edu)) or Benjamin Williams at [bfw@wam.umd.edu](mailto:bfw@wam.umd.edu).

***Margaret Ann Isely Foundation:***

By: Laura Del Valle

You are invited to attend the First More Oxygen for the World Conference July 18 & 19th at the Crowne Plaza St. Anthony Hotel in San Antonio, Texas. The primary purpose of this conference is two-fold: (1) to develop a course of action which can simultaneously treat and/or prevent cancer for most people on Earth and (2) to prevent catastrophic climate changes, including stratospheric ozone depletion.

Among the numerous noteworthy presentations will be included: Alden Bryant, scheduled to speak about atmospheric carbon dioxide increases, climate change, and the potential remedy of reforestation and soil remineralization; Roy McAlister, to address the opportunity for renewable resources such as Solar Hydrogen to produce a wealth-expansion economy and to clean the air as you drive; and Gene Almond to illustrate by visual graphs the differential greenhouse effect, the phytoplankton project for recovery of stable atmospheric chemistry.

For more information: (303) 233-1589; fx: (303) 237-7685 or e-mail: [Phytoproj@aol.com](mailto:Phytoproj@aol.com)

**What are you doing with your time? "KAIROS"**

In the Greek language there are two words that talk about time. One is *chronos* and the other is *kairos*. The first has to do with measured time, the duration of things that capture our lives, minute by minute, hour by hour, day by day. From that concept, we have the word chores. It moves from morning to night, it defines our work days, our rest days and our learning days. The other, *kairos*, designates a "right" time, the time of opportunity and fulfillment. It is the *kairos* time that we all seek for fulfillment and meaning in our lives. We can either define our lives by chores, or we can give meaning to our life by the decision to find *kairos* thoughts and deeds.

As work is being accomplished increasingly by machines and we have an ever-growing population, we should now have more time for leisure. Seniors often enjoy leisure for awhile after retirement, then they discover that they have lost the meaning of their life. The same is true with those who work day and night doing chores. These are ways to lose the concept of *kairos* time. We have the concepts of past, present and future. Many American Indian languages have words for the past and present, but not for the future. When we marry the concept of *kairos* and future, we can invest our accumulations and work in greater meaning for our lives.

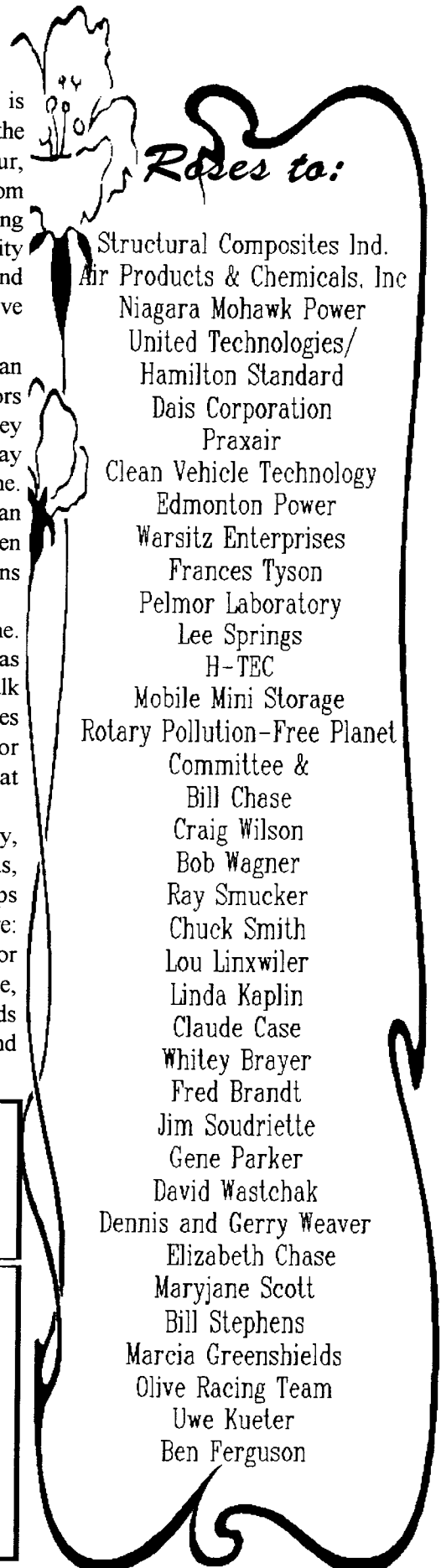
Take a moment of your day and find out how you are spending your time. Then consider that a clean house or shopping for a new car may not be as important as your children's or grandchildren's future. Too often, we talk about energy and the need to prepare a sustainable future, but social issues jump in the way. We have crime, not enough food on the table, poor education, drugs, missing parents. Social issues often give us great consternation.

But when you consider the future without abundant supplies of energy, you can see the need to do more to support AHA, Rotary, Kiwanis, Lions, Engineering Societies, American Lung Association and all the other groups that are advancing renewables. AHA's two major goals for this decade are: creating the demand for renewables and educating the general public/labor force about renewables. When we start thinking about *kairos* and the future, we will replace short-term profit motives with leadership actions towards achieving sustainable prosperity. The reward will be greater satisfaction and you will know why you are here on Earth.

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**THE LEGACY OF THE INDUSTRIAL  
MILITARY COMPLEX AND BIG  
GOVERNMENT** By Sara Enochs

Near Richland, Washington, the Hanford Spent Fuel Nuclear Project has failed to prevent radioactive waste from entering the Columbia River. A product of the nuclear arms race during the Cold War, some 2,100 tons (or 54 million gallons in 177 underground storage tanks) of nuclear fuel contaminants are stored at the Hanford facility. Extensive contamination by nuclear waste and related materials left behind at Hanford after nearly five decades of plutonium production poses danger for those cleaning-up the contaminated area and for public safety in downstream and downwind areas. These wastes will require containment, much bureaucratic supervision, and protection from theft by terrorists for 7,000 years.

The ultimate costs for decommissioning nuclear power plants and storing the radioactive wastes for 7,000 years are unknown but you can be sure that more solar energy would have been converted to more watt hours of electricity if the U.S. had invested in solar instead of nuclear energy.

At Hanford and other nuclear waste processing facilities, spent nuclear fuels, which are not protected for long-term storage in water, have corroded, creating highly radioactive sludge that has accumulated in the storage basins. Because of leaks in the basins, workers risk exposure to radioactive material. If contaminated waste water is released to the soil, the public risks exposure as water moves through the soil towards the river.

It is indicated that radioactive materials carried by water leaking from one or more of the basins has reached the river at least twice in the past. The DOE (Department of Energy) blames the corporations, Westinghouse, Fluor Daniel Hanford and Duke Engineering Services. The DOE has spent some \$450 million on the project and yet not one spent nuclear fuel rod has been removed for permanent disposal. The corporations blame the government, because it is a DOE site.

Another example of the nuclear waste problem is the Savannah River site which has cost millions to study the containment plan. These and other sites will cost untold billions of dollars to clean up.

The nuclear industry is gearing up to sell more nuclear power plants in the U.S. The sales pitch is to reduce greenhouse emissions by reducing our

reliance on coal. (Next to power plants, transportation engines source the most greenhouse gas emissions.) To accomplish the goal of suppling electricity for automobiles, the U.S. would need approximately 300 new nuclear power plants. (About six per state.) Double this for replacing all coal. The cost to taxpayers and ratepayers will be astronomical when disposal of nuclear wastes is accounted. Each nuclear power plant will cost about \$15 billion dollars to build. Supplies of fissionable nuclear fuels are as finite as fossil fuels. We could be held hostage to shortages of radioactive fuels from foreign countries. Even before this new round of nuclear plant construction could be started it must be remembered that the nation's high-level nuclear wastes from existing operations will reach 70,000 tons by 2015.

Taxpayers have heavy construction investments and even larger expected expenses for disposal of each nuclear power plant. Sometimes our DOE did a 50-50 construction cost share. Our Government has promised the nuclear industry that they would take care of the permanent high-level waste storage sites. It is estimated that the taxpayers will pay more than \$7 billion just to build a storage site. The problem is that no State has come forward to allow such storage in their backyard. If this issue were resolved (and it is costing us the taxpayer billions of dollars for on-site storage), we would not have the problem of nuclear wastes going into rivers. We can not afford to have the Columbia River or any other waterway threatened by nuclear contamination. The Federal Government, our States and the nuclear industry have little interest in solving the problem except to demand more money to study and contain the situation. The public interest group Public Citizen said a recent report has revealed the requirement for a \$25.8 billion bailout for the nuclear industry. According to this source, the current Nuclear Waste Fund will fall that much short of covering the costs of nuclear waste disposal. The nuclear industry will be glad to accept that money.

For citizens a big concern is transportation of radioactive wastes through 43 states. Transporting wastes to permanent disposal facilities will eventually move radioactive wastes within a half of a mile of 50 million Americans. Think about it, can your conscience or your pocketbook afford to expand this kind of technology!

By now you could be enjoying pollution-free solar, wind, and wave sourced electricity, solar heated water, and solar space heating if the billions of dollars that were poured into nuclear power plants had been made available for competitive small companies to produce renewable energy. Our political and business leaders could be showing the world our renewable wind, solar, wave, and biomass energy parks that supply clean, renewable, healthy, hydrogen and electricity. Instead the DOE is sent to tout coal and nuclear plants.

## Back When Jim Shrank the Sun ©

By: Kathy Ann McAlister

It was the first day of summer vacation from school. My brother, Jim, and I planned to make bird houses. Jim's class had learned that DDT was causing the bird's egg shells to break before hatching. We were going to save next year's baby birds. DDT was a chemical that Dad and other farmers used to control insects. DDT was called an insecticide, because it killed these pests that ate the crops. Surely better bird houses would solve the problem. Birds are the farmer's friends, they eat bugs.

That first day we gathered old wood shingles and built 4 bird houses. We needed one bird house per tree, so we figured that we would build about 150 bird houses for our farm yard. We got some purple paint that mother had found on sale for \$1.00 per gallon at the hardware store. I think no one in our Swedish Lutheran community would ever buy that color. Our painted bird houses were beautiful complete with a few purple runs. Before we got the hang of designer painting, Mother told our Aunt that our bird houses "looked like raspberry syrup poured over gingerbread houses with bent nails sticking out of the corners ... they are the sweetest, most colorful bird motels."

The next morning we hurried out to build some more bird houses. Dad met us out on the sidewalk and marched us out to the shed. Dad had a flat tire on the pick-up. His usual good nature was ruffled, because he traced the flat tire to look-alike nails from our bird house project. We had used the nails that were large enough to hold the bird houses together but not large enough to split the shingles. It just happened that some of the nails might have dropped to the ground instead of building bird houses. Dad said, "You will not build any more bird houses until we sorted out all the nails, screws, nuts and washers on the farm and put them into the right coffee cans." Dad showed us how he wanted us to sort the nails etc., etc., etc. He taught us how to straighten bent nails. We had bent a few nails learning how to hammer. He said, "Every nail on the farm can be reused. It is important to make sure that nails are never left in the yard for other people to get flat tires." Jim figured out a game to see who could pick-up the most nails in the yard. I won because I didn't want Dad to be distracted. He had enough to do without smashing his thumb changing flat tires.

Dad came by several times a day to make sure no bird houses were being built. We had become expert at organizing years and years of projects that sourced left-over nails, bolts, washers, nuts and wood screws. It took so much time that Jim started to tell wild stories. Jim told me that he had read a book at school about the Indians using buffalo chips (dung) to make warm fires for cooking and heating their tepees. I did not believe him. He said I could see for my self and suggested that we should go out to the cow pasture and pick-up dry cow patties, and see if we could get them to burn. He said "we have plenty of cow patties, just think **we live on an energy farm!** **The cows can make all the energy we need.**" I told him that we couldn't play with matches "you know the rules."

Jim said "I'll bet you they will burn and I can light the fire without a match." I knew something about Indians, they made fires by spinning a stick against another one until the sticks caught on fire. This will be *good* I thought, Jim thinks he is going to rub two cow patties together until they catch on fire. So the bet was on. I couldn't wait to see Jim rub the cow patties into dusty pieces!

So soon after Dad, the inspector, approved our morning production of straightened nails, we were off to the cow pasture. Jim said to gather the cow patties and stack them while he ran to the house. I stacked a few cow patties near the bridge over the creek. He came back with Grandpa's magnifying glass and used it to focus sunlight to a smaller and smaller spot on the corner of a cow patty. There was a magic moment when the intensely bright dot of sun rays made the fibers turn black then glowing red and a fire started. Jim said "now you owe me an ice-cream cone." Soon a neighbor drove by and saw smoke. We saw her hurriedly drive to our house and guessed she would tell Mother but we were busy trying to put out fires that a Kansas whirl wind was rapidly spreading.

Mother was headed down the road, when she saw the fire spreading through the pasture. She ran back to the house and called the volunteer fire department which brought a red fire engine from town. We were standing in the creek under the bridge when the fire department found us. We told them "We had bad luck with a dust devil but we are safe in the water." We had burned the ditch and part of the pasture. I thought that I had my bluff in on my parents and would never get a spanking again because I was a proper young lady. But I was surprised when they both spanked me and told me how much we had scared them. I knew that they were happy to find us under the bridge, but we learned a new slogan. "Safety First." We went around the rest of the day saying, "Safety First."

Mother was busy answering telephone inquiries for days. One time I heard her try to defend our intelligence: *"The kids were discovering energy ... well they are really interested in energy ... No, they actually were not playing with matches ... they were using a magnifying glass on cow patties ... Not to make them bigger, it was to make the sun smaller ... like a white BB ... Well, that's how they started the cow chips on fire ... With a magnifying glass the sun gets smaller... Yes, I am glad they did not think of magnifying Mr. Briggs outhouse ... Oh yes, I am ready for school to start ..."*

Dad decided we probably needed some new chores to keep us out of trouble. The next day he took us to a pig sale. We bought four baby pigs for our 4-H project. Jim was supposed to feed the pigs, and I was supposed to water the pigs. Dad said, "Pigs cannot sweat, so on hot days, you need to spray them with water." I soon found out that this could make four big mud holes that the pigs loved to wallow in.

The gossip eventually got around about Jim "shrinking the sun." A wise old farmer told me to tell Jim to "stop it because the sun might get stuck in the BB size and we all would all freeze to death!"

We usually had at least one big rain each summer that would cause the creek to rise and go out of its banks. It would flood the pasture. Neel, our cousin, was there when it happened, so we asked Mom if we could walk down to the bridge to see if the water was getting close to the bridge. She said, "O.K." Neel said, "Cowboys used to have to take their horses and dogs across flooded creeks." He showed us how swiftly the water was running in the creek by throwing in a stick. Yipper, our dog, loved to fetch sticks. Suddenly Yipper jumped in the raging water to fetch the stick. Yipper was surprised by the strong current and after struggling to come back against the current, he swam to the opposite bank and climbed out. Neel was right about dogs, they can cross a raging river. We were glad Yipper was a strong swimmer. I decided to stay out of the creek, when it was flooded.

The same flood lapped into one of Dad's milo bins. About a week after the water had gone down, Dad scooped out four smelly buckets of milo and set the buckets next to the barn. Jim thought that we were supposed to use that grain to feed the pigs, so we carried the four buckets of milo to the hog house. We used three buckets and left the other one outside of the pig pen. When I went out to water, I saw the pigs walking funnywampus. They were staggering back and forth and making crazy pig snorts. I had seen our white cat, Sweet-pie, stagger like the pigs after the veterinarian had used pain-killer to clean out a gunshot wound. Someone had shot a perfectly round hole through her tail.

As soon as mother smelled the bucket of milo, she knew that the pigs had been given fermented grain and the alcohol was making them "hootey." She told us, that when feed grain and water are allowed to stand and become warm from the summer heat, that the feed could ferment to alcohol. She said, "Alcohol is the work of the Devil." I thought that was strange. She didn't sound like that when Sweet-pie was staggering. When Dad tucked me into to bed, I asked him about "ferment." You mean, you want to know about making alcohol. "It is a little like using yeast to make bread rise. When you have just the right temperature and moisture conditions, the yeast converts some of the flour into alcohol and gas bubbles that are trapped in the dough. So it rises. When you bake the dough, the most of the alcohol escapes. But when grain ferments, the bubbles escape and the alcohol

stays with the water. It is like beer. The beer can be separated by evaporation into water and alcohol called whiskey.” So that is why mom said, “It was the work of the Devil” ... it was whiskey!

I knew about whiskey. When I had the bad cough, Grandma had mixed honey, lemon, and whiskey in a teaspoon for me. It was awful tasting. I felt guilty about sneaking the Devil’s work into the poor pigs’ breakfast, I will never do that again. Dad continued, “You can make alcohol from any kind of grain or grapes or or wastes. For instance, we could make farm fuel. The more crop wastes and garbage the yeast bugs eat, the more alcohol they will make. You can even use the pig or cow manure to make methane fuel which is like natural gas. One day, we will use these farm fuels in our tractors and cars. Someone needs to make engines that run on farm fuels.”

After the episode with the nails, we decided to make our bird houses from coffee and fruit cans. We still had some paint. We could save cans from the school cafeteria so we would be ready for the new spring crop of baby birds. We sold our pigs at the 4-H fair, and we had enough money to buy our own school clothes and shoes. It had been a great summer, but I was ready for school to start.

That first day our science teacher said, “We are going to talk about energy.” The first chapter will be about “Energy on the Farm.” Was she going to embarrass me about the day the volunteer fire department came to put out the cow-chip fire? Fortunately, she showed us a book that started with pictures of fire. The cave people captured fire from lighting that had started forest logs on fire. Later, they learned how to start fires where they needed them. I knew something about starting fires and wondered who invented the magnifying glass.

That night I read a new book about energy. It started by saying that we were going to run out of fossil fuels. In the big cities the big brown cloud was so bad that they could not see the sky on some days. I thought that they should move to a farm. My eyes could not stay open any longer. I ended my prayers saying that I loved the birds and hoped that all the baby birds would be o.k., especially the smart ones that stayed in our purple motels for these fine friends of the farmer.

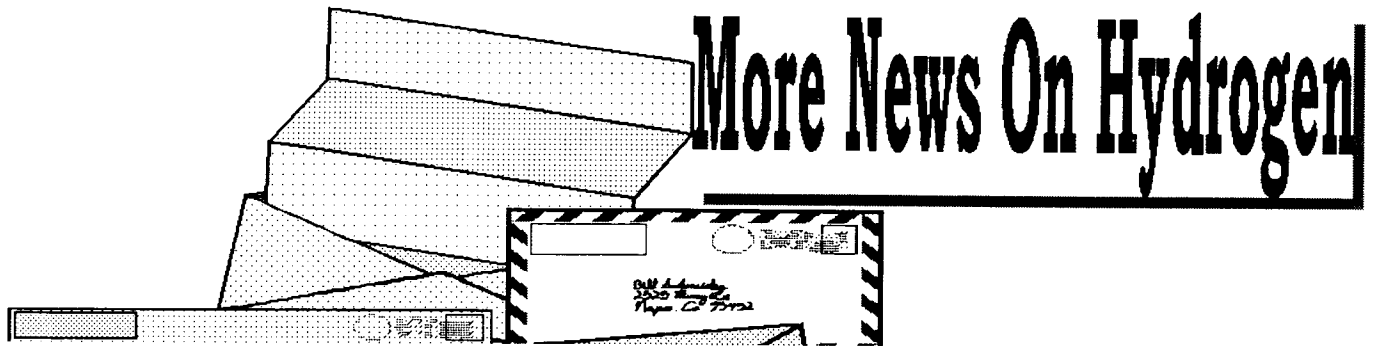
### ***Thanks to the UBIQUITOUS GREEN LEAF*** By: Roy McAlister

The first job of every green leaf on Earth is to split water into hydrogen and oxygen. If you have ever tried to split water into hydrogen and oxygen with a pocket knife, scissors, coping saw, hammer, ax, hack saw, or razor blade you will acknowledge that the leaf that does this job noiselessly and seemingly effortlessly *all day long* is very special. But how does a leaf split water into hydrogen and oxygen?

The key to the leaf’s water-splitting capabilities is in the hint “*all day long.*” Called “photosynthesis” the water-splitting process starts with conversion of light energy from the sun into a low-voltage potential across a cell with water in it. Water is delivered to the cell of the leaf from the roots through the trunk or stem by osmosis. The electrical potential produces a current in the water. As electrical current flows through water, hydrogen ions gain an electron and become hydrogen atoms on one electrode and oxygen atoms from as they give-up one or more electrons on the opposite electrode of each cellular location that forms a minute electrolysis cell.

The leaf retains the hydrogen, which is reacted or synthesized with carbon dioxide that is collected from the atmosphere, to build molecules for making plant tissues such as the cabbage, wheat, apples, and carrots that you like to eat. Oxygen is released to the atmosphere to complete the photosynthesis process. *All fossil fuels were produced from plant tissues or from animals that ate plant tissues hundreds of millions of years ago.*

Green plants are stimulated by increasing amounts of carbon dioxide in the atmosphere. This buildup of carbon dioxide has been due to widespread burning of fossil reserves that held carbon in storage for 100 million to 500 million years. Although green plants have been greatly stimulated, they have been unable for more than 100 years to keep up with the increasing rate that human activities add carbon dioxide to the atmosphere. Humans now burn the fossil equivalent (including petro-carbons like coal, natural gas, and oil) of 180 million barrels each day. Each year, humans search for “the good life” by burning about 10 million years of fossil accumulations.



**NREL device doubles photovoltaic-electrolysis process efficiency** by integration of photo-electric effect with the electrodes of an electrolysis cell. According to Doctors John Turner and Oscar Khaselev the new system is able to convert 12% of available sunlight into hydrogen energy and has the potential of being a low-cost producer of Solar Hydrogen. Current PV-Electrolyzer systems convert only about 4 to 6%. Editors note: Solar Dish Gensets and Electrolyzers can provide over 20% conversion of sun light to hydrogen..

**Did any one notice:** That Daimler-Benz signed an agreement to take-over Chrysler. No doubt, Daimler-Benz will be marketing hydrogen cars but will the U.S. be the best market? Daimler-Benz, Ballard Power Systems and the government of Iceland have signed an agreement to begin pilot production of hydrogen. Initially, a feasibility study on the production of hydrogen using hydro-electric power will be conducted by Iceland.

**Praxair expands Gulf Coast Hydrogen Pipeline Capacity:** Praxair supplies more than 50 refineries and petrochemical plants from its 280 miles of hydrogen pipeline networks in the Gulf Coast, which stretch from Baton Rouge, LA, to the Houston shipping channel. Throughout North America, Praxair delivers more than 400 million cubic feet of hydrogen each day to customers from its major hydrogen pipeline networks in the Gulf Coast; Ecorse, Mich; and Edmonton, Alberta. For more information call Joe Cappello at (203) 837-2073

**New York State Establishes Fuel Cell Institute:** The New York State's Legislature have voted to establish a fuel cell institute starting with a \$500,000 budget. The Connecticut Legislature approved a plan for 5.5% of the state's power to come from solar, wind, sustainable biomass, landfill gas and fuel cells and 7% from hydro, other biomass and trash-to-energy by 2009.

**Tempe, AZ "Environmental Issues Committee" for the Tempe Chamber of Commerce** will meet July 16 to continue discussions concerning hydrogen developments.

**Southwest Renewable Energy Center,** Charles Bensinger of Santa Fe, NM, is working with the **American Hydrogen Association** to develop press releases for environmental and scientific organization.

<http://www.clean-air.org> will soon have a new look. **Cameron Way** is redesigning the web page adding more graphics. You click on an engine and it will operate. I think you will be surprised to see how the engine works.

**Dan Morton**, editor of Southern California Chapter of American Hydrogen Association has an e-mail address for the newsletter: e-mail at [dgvt59a@prodigy.com](mailto:dgvt59a@prodigy.com) For membership call **Phil Hodgetts** at (714) 847-4165.

**DOE has two new intelligence offices**, an Office of Counterintelligence and an Office of Intelligence. This will increase the DOE's coordination with the FBI and other law enforcement agencies to enhance security and combat potential threats. The new Office of Counterintelligence will be headed by Edward Curran from the FBI. The Office of Intelligence will be responsible for foreign intelligence analysis. Notra Trulock will be the Director.



## ***“DOING BUSINESS IN THE GLOBAL ENERGY INDUSTRY”***

***By: Russel E. Smith, Director, Texas Renewable Energy Industries Association***

***Fax: (512) 345-6831; Phone: (512) 345-5446***

***Conference Date: September 15-17, 1998***

Steve McAllister, Session Chair for the “Developments/Trends in Solar Energy” has scheduled speakers on Photovoltaic Manufacturing, system integration and distribution, and expanding the Market. Steve McAllister will give a global perspective of opportunities for solar thermal power. Guest speakers for this session are Gernot Oswald, President and CEO, Siemens Solar Industries; Michael Davis, CEO for Golden Genesis Corp; Dana Mellecker, Sprie Corp; Gerry Braun, Solarex Corp. Steve McAllister is VP of Solar Energy Industries Association.

Randall Swisher, Executive Director, American Wind Energy Association and Judith Carroll, (Co-Chair) Texas Dept of Economic Development will chair the session on “Developments/Trends In Wind Energy.” Invited speakers are Christophe Bourillon, European Wind Energy Assoc.; Begona Lora, Dessarollos Eolicos; Michael Bergey, Bergey Winpower Company, Inc; Johannes Poulsen, Vestas American Wind Technology, Inc; Kenneth Kara, Enron Wind Corporation; Dean Gosselin, FPL Energy Inc.

“Developments/Trends In Biomass Energy” will be Co-Chaired by Thomas L. Rosenberg, American Bioenergy Assoc., Mary Wertschnig, Renewable Fuels Assoc. and Karen Seho, National BioEnergy Industries Assoc. Guest speakers are R. James Woolsey, Eric Vaughn, Dr. Lee Lynd, Dr. Ed Neuhauser, Edward “Ted” Dahill and Ron Menville. This session concerns advanced technology with the Ethanol Industry and the Co-firing of Biomass with Coal; Gas Turbine Systems and Gasification Systems.

Chaired by Vince Zodiaco President of the U.S. Geothermal Energy Association, and Perle Dorr, Director of Outreach Programs for U.S. Geothermal Energy Association, “Developments/Trends In Geothermal Energy,” will include guest speakers Jonathan Weisgall, Richard Campbell, Ingvar Fridleifsson, Daniel Schoechet, Randolph Howard and Phillip Michael Wright. These are the who-who’s of the geothermal industry.

“The Solar Hydrogen Economy - The End of Carbon Waste.” Michael J. Osborne, Texas Energy Coordination Council and Policy Chair of the Texas Renewable Energy Industries Association will be the Chair. Chris Flavin, Worldwatch Institute and Roy McAlister, President of the American Hydrogen Association will be leaders in the session. This session will be on September 17, from 2:00 to 4:00 p.m.

### **Solar Energy Water Pumps**

Most solar pumps cost more initially than engine-powered pumps, but may be far more economical to operate. In the Western U.S., solar pumps are popular for livestock watering and for remote homes and campsites. International aid programs are funding solar water supply projects in India, South America, and Africa.

If you are planning a solar power system for your home, DC pumps can save you money. Some can use as little as 1/2 of the energy of an AC pump running through an inverter. As a result, your entire power system can be smaller and less expensive. To be most economical, systems are carefully sized and to match your needs. To determine the cost of a system, specify your daily and seasonal water requirements, the nature of your water source and the vertical lift required. To estimate your typical daily water requirements consider 10 to 100 gallons per person per day depending on appliances, habits, and conservation measures. Cattle require 10-30 gallons per day in dry weather whereas smaller animals require 1/4 gallon per day per 25 lbs body weight. Chickens require 6 to 12 gallons per hundred birds per day. Young trees in dry weather require 15 gallons per tree.

If your source is to be a drilled or dug a well, what is the well depth, static water level, recovery rate and additional vertical lift required for storage and delivery? If the water is at the surface (river or shallow well) describe the source and vertical lift required for storage and delivery.

SunRise solar-electric submersible pumps are for deep wells and long pipelines. A pump can be powered directly by a PV array of 300 watts. A SunRise pump will lift 4 GPM from 150 feet, 2.5 GPM from 250 feet, or 1 GPM from 600 feet. SunRise is a DC-powered sealed-piston pump, designed for high lift at low flow rates. Retail material costs average around \$5,000 for a complete system. SunRise is a product produced by Dankoff Solar Products, Inc.

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## ***50 Organizations Launch a New Campaign: "WE'VE GOT THE POWER" - RATEPAYERS FOR AFFORDABLE & GREEN ELECTRICITY.***

By: Ken Bossong

Public Citizen is launching a new campaign that is expected to address problems posed by state utility restructuring proposals including subsidies for unsafe nuclear power plants, for storage of nuclear waste, higher electricity costs for consumers, loss of reliable and affordable service, increased reliance on older and dirtier fossil fuel plants, and the marginalization of renewable energy sources.

Its goal is the passage of federal legislation to prevent a bailout... (including issues of anti-trust, health-related claims, and pollution clean-ups) of the electric utility industry and to provide protection for consumers and the environment. The campaign will be formally launched with a news conference by Ralph Nader, Senator Paul Wellstone and Rep. Dennis Keunic. For further information or to participate in the campaign, contact Jessica Vallette (Public Citizen) at 202-546-4996; ext. 323 or e-mail ([vallette@citizen.org](mailto:vallette@citizen.org)).

## ***ANTI-KYOTO BUSINESSES HIRE "PROFESSIONAL MIND BENDERS"***

Kathy Ann McAlister

You usually think of a hit-man as a professional killer out to silence someone. However, in this case the "deplete the fossils" people had their lawyers arrange for funding charitable non-profit trusts that hire mercenaries, often with scientific credentials, to bend minds and kill public education concerning greenhouse gases and climate change including any positive discussion of Kyoto agreements. This development follows the tobacco trusts that were formed for keeping sympathetic scientists well paid and ready to help the smoking cause.

The purpose of the "CO<sub>2</sub> BUILD UP" advocators is to protect the \$60 billion/year now given in U.S. subsidies to fossil and nuclear industries and to restrict or block federal funding of any effort to prevent climate change (e.g. funding for renewables or efficiency improvements). Remember, nuclear plants are built with great expenditures of fossil fuels to mine the ores, calcine the cement, make the steel, and refine the radioactive fuels for fission heating. Many of the nuclear power plants have never supplied as much electricity as the fossil energy used to build them.

It is interesting to note that scientists in the 1930's and again in the 1970's noted a CO<sub>2</sub> build-up and warned of the resulting greenhouse effect on climate change. For over 100 years green plants have been unable to keep up with the rate that CO<sub>2</sub> has been added to the atmosphere. Green plants have been stimulated to grow faster but they have been unable to keep pace with the rate that the industrial revolution spews carbon dioxide into the environment.

Look at what so many of us are doing to contribute to the climate change. An average American drives 12,000 miles per year. For each gallon burned, you will produce about 20 pounds of carbon dioxide which is emitted from the tailpipe. If oil-production and refinery emissions are taken into account, each gallon of gasoline that is marketed results in over 22 pounds of carbon dioxide being added to the global atmosphere. At 15 MPG, a motor vehicle using gasoline will be responsible for production of its weight (4,400 lbs) in carbon dioxide every 3,000 miles. This vehicle will add four times its weight in carbon dioxide in a single year if it travels the average distance of 12,000 miles. Fossil-fueled electric-power plants produce even more carbon dioxide than the transportation sector. Earth's atmosphere now contains 30% more carbon dioxide than at any time in the last 160,000 years. At the present rate of population growth and if the trend to consume more energy per person continues, the amount of atmospheric carbon dioxide will double pre-industrial revolution levels early in the next century.

Despite worldwide exploration efforts since the breakup of the Soviet Union, more crude oil has been pumped than has been discovered. Increasing demand and political instability create an impending crisis. Surely civilization can find a way do better than to follow the directives of mercenary pseudo-scientists as we deplete the fossil reserves and create economic distress along with pollution of the environment.

From Siberia to Java, 70% of Earth's population have found capitalism and demand consumer goods, cars, and homes like the American have. The U.S. boasts that these wonders came from oil, coal and natural gas. But there isn't enough oil for four billion more persons to have U.S. affluence. It is time for Asian leaders to convince them that Solar Hydrogen can provide sustainable prosperity. U.S. mind benders could be helping by showing them how.

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# Events Events Events Events

October 1998 - Tempe, AZ - **AHA Hydrogen Auto Conversion Class**; a two-day short course on alternative fuels. Learn how to have a minus-emissions vehicle. Contact: Kathy (602) 827-7915. Registration is accomplished by returning a completed registration form with a deposit of \$50 or full payment of \$330 (payable to AHA) or \$450 for non-members of AHA. Reference materials will be supplied as part of the price of the class; including: Jay Storer, *Propane fuel conversions* (S.A. Design Books, 1986 and Roy McAlister, *The Philosopher Mechanic*, AHA's class notes. The Propane Fuel Conversion book can be purchased for \$18.00 plus shipping, and the class notes are \$35.00 plus \$3.00 shipping. Class starts at 8:30 a.m. and continues to 4:00 p.m. each day. On the second day, lunch will include a hydrogen BBQ.

A micro experimenter's electrolyzer and fuel cell kit can be purchased for \$169.00 from AHA. **MORE EVENTS!**

July 9-12 - Toronto, Ontario, Canada **"Moving the Economy: Economic Opportunities in Sustainable Transportation"** ph: 416-392-1560 ext. 85854.

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July 12-16 - Orlando, FL **"American Society of Agricultural Engineers Annual Meeting"** fx: (616) 429-3852.

July 18-19 - San Antonio, TX - **"More Oxygen for the World!"** - Margaret Ann Isely Foundation - Crowne Plaza St. Anthony Hotel. Contact: (303) 233-1589; fx: (303) 237-7685.

July 27-29 - Trabzon, Turkey - **"TIEES-98: Second Trabzon International Energy & Environment Symposium"** e-mail: ties-98@ovms02.blm.ktu.edu.tr or Prof. Dr. Sadik Dost'e-mail sdost@me.uvic.ca fx: (250) 721-6051 or Tel: (250) 721-8900 (Canada)

July 20-23 - Scottsdale, AZ - **"AZ-1st Nationwide Federal Fleet Manager Workshop."** 888-696-5646.

Aug 11-13 - Costa Mesa, CA - **"Society of Automotive Engineers Future Transportation Technology Conference"** Ph: (724) 772-7148.

Sept 13-17 - Houston, TX - **17th Congress of**

**the World Energy Council"** fx: (202) 331-0418.

Sept 15-17 - Austin, Tx - **"Renewable Energy In The Global Marketplace"** Contact: Russel E. Smith; (512) 345-5446; Fx: (512) 345-6831.

Sept 19-20 - Iowa City, IA - **"Iowa Renewable Energy Expo and Alternate-Fuel Vehicle Showcase"** - Johnson County 4-H Fairgrounds, Contact I-Renew: (319) 338-3200 e-mail irenew@jgc.apc.org

Sept. 20-25 - Florence, Italy **"World Renewable Energy Congress"** fx: 44 0118 961 1365 UK.

Oct 4-8 - Madison, WI - **"BIOENERGY 1998"** - (312) 407-0177; fx: (312)407-0038; e-mail Fred Kuzel fkuzel@cglg.org www.cglg.org/bioenergy98

Oct (ASU-East is making a new brochure - but save a week-end in October) - Mesa, AZ - **"Hydrogen Auto Conversion Classes"** Contact: Kathy McAlister, (602) 827-7915; fx: (602) 967-6001 e-mail aha@getnet.com http://www.clean-air.org

\* Nov. 16-19 - Palm Springs, CA - **"1998 Fuel Cell Seminar"** Ph: (202) 973-8671.

\* Dec. 3-5 - Phoenix, AZ - **North American Electric Vehicle & Infrastructure Conference"** Ph. (415) 249-2690.

\* 1999

\* July 5-8, St. Petersburg, Russia - **"Hypothesis III, Hydrogen Power(Thermal and Electrochemical) Systems International Symposium"** Contact: Dr. T.N. Veziroglu & V.P. Ras - O.M. Nefedov e-mail:hypothes@efa.apmath.spbu.ru www.apmath.spb.su/hypothesis

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## GREETINGS FROM AHA

- Yes, I want to join AHA, or give a gift to help make a transition to clean Hydrogen energy.
- Yes, Enroll me in the Electrochemistry and Fuel Cell class.
- Yes, Enroll me in the Renewable Hydrogen Production class.
- Yes, Enroll me in the Automotive Conversion class.
- Yes, Enroll me in the Sustainable Economy Investment Opportunity class.
- Yes, I want to buy Hannah & Sara's Hydr O Bile for \$14.95, plus \$2.00 postage:
- Yes, I want to buy "*Renewable Energy Experts & Advocates*," published AHA price & surface shipping in the USA of \$15.00: check enclosed.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone - Home (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_ Office (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

- Regular membership ( \$39/year)    Corporate/ Institutional/Membership ( \$2,500)   Life Membership (\$1,000)
- Student & Senior ( \$25/year)    Sustaining Membership ( \$100/year)    Auto Conversion or Genset Class \$50 Deposit
- American Hydrogen Association Foundation donation: \$ \_\_\_\_\_

Consider a life income gift. Make a tax advantaged gift to AHA while retaining income on the capital for life.

For details contact George O'Connor, Fund Director

All donations to The American Hydrogen Association are Tax Deductible to the extent allowed under IRS 501 (C) 3 as a non-profit Organization. Enclose Check or Money Order and Mail to:

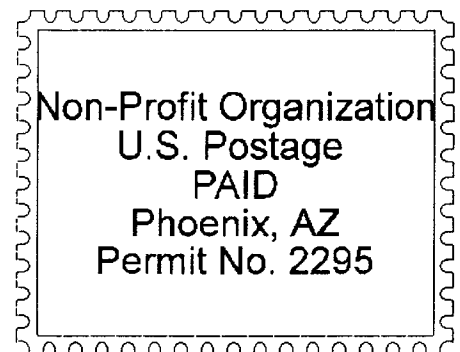
**American Hydrogen Association, 1739 W. 7th Ave, Mesa, AZ 85202-1906**

Phone: (602) 827-7915 Fax: (602) 967-6601 e-mail: [aha@getnet.com](mailto:aha@getnet.com)

[www.clean-air.org](http://www.clean-air.org)

## The Hydrogen Association

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