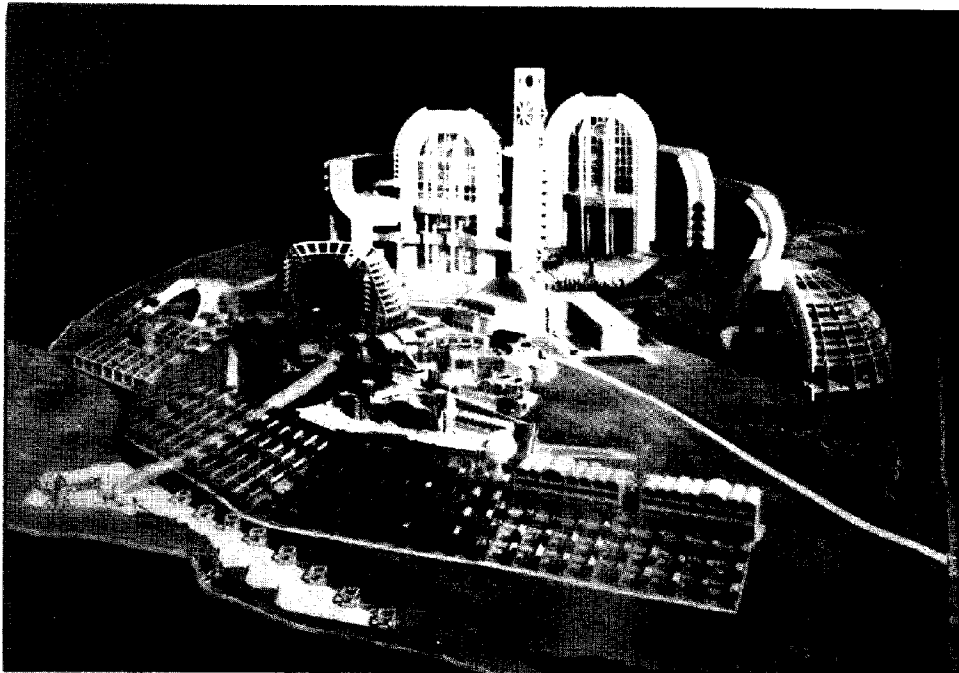




Hydrogen Today

"Clean Energy For A Better World"

Official Publication of the American Hydrogen Association • 216 S. Clark Drive, Suite 103 • Tempe, AZ 85281 Vol 6, No. 1 1995



Paolo Soleri's Concept of Small Cities.

Bonus Issue!!

- 3 -

- AHA To Produce Calendar - 4 -
- Larsen RADAX Engine - 5 -
- Oceans of Energy - 7 -
- Zero Emission Transporter
- Oil- Can We Afford to Burn It? - 8 -
- Be Healthy By Building Tilth - 12 -
- Inside the AHA - 22 -
- Upcoming Events and more...

Arcosanti & AHA Team Up On Energy Project

- John Vernon

The Cosanti Foundation and the American Hydrogen Association (AHA) are collaborating on a plan that could make Arcosanti completely energy self-sufficient on renewable energy.

AHA has proposed a system for Arcosanti which will generate electricity from sunlight using a solar-thermal conversion process. A water/hydrogen/oxygen system which will produce electricity at night and on cloudy days is also part of the proposal.

The main feature of the plan is a densely situated complex of forty Genset dish units which will convert sunlight into electricity. These units, similar in appearance to large satellite dishes, would be installed a half mile from the main site,

north of the access road in full view of the highway. The proposal calls for Arcosanti to utilize a newly designed state-of-the-art unit which is capable of producing 35 kilowatts of power per unit. These new units, which will most likely be supplied by a major foreign manufacturer, will potentially meet Arcosanti's planned power requirements to the year 2050.

A backup system to the solar-thermal conversion process will use excess electricity from the Genset units to split water into its base elements of hydrogen and oxygen. The hydrogen and oxygen will be captured and stored, and it can be re-combined at night or on overcast days to produce energy and thus continue to supply Arcosanti with electricity when

Continued, page 2

AHA To Raffle SUNS TICKETS

- By: John Vernon

The American Hydrogen Association has kicked off one of its Spring 1995 fund raising efforts with a raffle of tickets to a Phoenix Suns game.

AHA is raffling off four (4) choice location tickets to the April 23, 1995 game between the Phoenix Suns and the Seattle SuperSonics. Tickets for the raffle cost \$1 each or six tickets for \$5 and they are being sold by AHA members throughout the State of Arizona (If any members in other states wish to get some, please see instructions for requesting tickets below). Each ticket contains a coupon redeemable at any Arizona Whataburger, and AHA would like all of its members to join them in

Continued, page 16



Hydrogen Is The Safest And Cleanest Fuel

Arcosanti

continued from page 1

the sun is not shining. The hydrogen and oxygen can also be used by Arcosanti for other purposes on-site such as cogeneration, foundry operations, welding, transportation, cooking, etc.

The plan also includes the installation of a biomass conversion plant capable of converting Arcosanti's organic matter, garbage and sewage into hydrogen and carbon material. The carbon material can be converted into structural carbon and used at Arcosanti or sold as a raw material. The hydrogen can be used by Arcosanti for a multitude of purposes.

In addition, the project will include a simple but cost effective cogeneration system which will incorporate AHA's patented PSI system which allows it to employ a variety of natural gasses as a fuel. Plans call for the cogeneration system to eventually be fueled strictly by the hydrogen gas produced on-site at Arcosanti by the biomass system and from the Gensets.

As an additional benefit, waste from nearby communities such as Cordes Junction and Mayer could also be brought to the site and converted into hydrogen and structural carbon for Arcosanti's use. Hydrogen produced from the biomass system will be used to fuel two hydrogen powered passenger vans which will serve Arcosanti (conversion to be provided by AHA), the foundry and kilns, the cogeneration system, and it will also provide fuel for cooking and heating at Arcosanti.

As a possible supplement to the Gensets and the biomass system and the cogeneration system at Arcosanti, the project is also looking at a limited role for some other renewable energy sources such as high efficiency wind machines or photovoltaic panels to determine if they might be appropriate at the Arcosanti site.

Finally, to take advantage of the outstanding educational and research opportunities inherent in the project, a team of at least

five university students will be supported full-time on the energy project for up to two years. These university students will be recruited from all over the world and they will live and work at the Arcosanti site during their tenure on the energy project at Arcosanti. It is also expected that several universities and public utilities will assist and support AHA and the Cosanti Foundation with educational programs and seminars on the project once it is completed.


The advantages of the proposal for Arcosanti are many. Excess energy produced can be sold to utility companies, providing Arcosanti with a source of additional revenue. The system produces no pollutants, even vehicles exhaust and emissions are pure steam, and it will use one of our most abundant natural resources - the sun - to provide clean and efficient energy on-site for all of Arcosanti's needs into the next century.

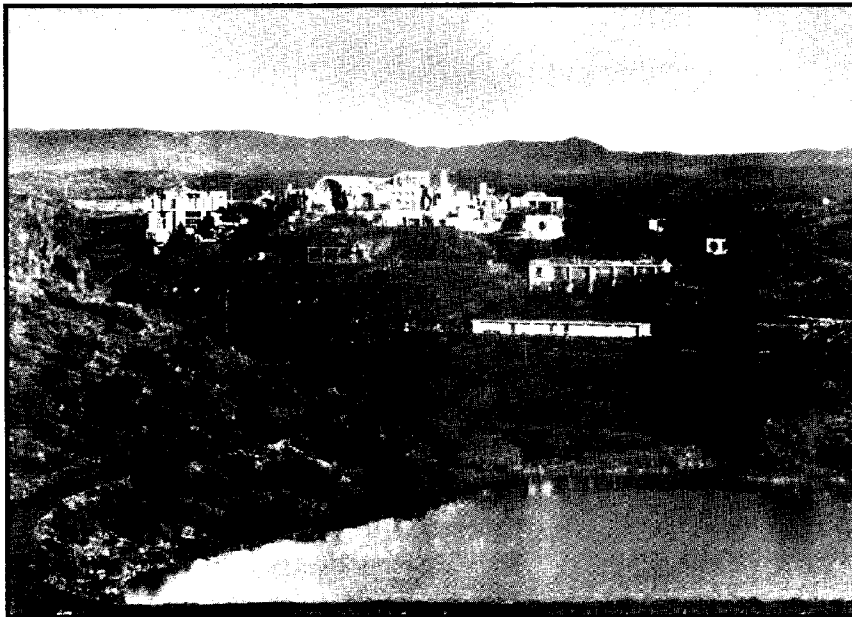
The project could attract more international attention to Arcosanti. "It's very exciting both from a scientific point of view and from the point of view of Paolo Soleri's concept of arcology" said Roy McAlister, President of AHA. "Energy people from around the world will be interested in this project because it will be the first large-scale solar-thermal system to provide the total energy requirements for a community of up to 5,000 people from natural and renewable sources."

The project is proceeding on a three-year schedule, with the first year slated for fund raising, staffing, planning and organization, and the next two years for installing the system. AHA and the Cosanti Foundation have joined forces to take the lead in raising the \$8 million in funding needed to construct the system. Several sources of financing have already come forward and expressed an interest in funding the project, and the financial details and full project staffing for the project are expected to be completed within the next four to six months.

The project, which has been named "SolArco", is a milestone for AHA, and represents a major step forward in the promotion of renewable energy and the realization of a large-scale working

prototype of a renewable energy production complex based primarily on solar-thermal, hydrogen, and biomass technologies. AHA will provide project and technical management on the project, and plans call for AHA to maintain a continuing presence on-site following completion of the project so as to provide maintenance on the systems. AHA will also coordinate and provide educational and public information services and demonstrations at the Arcosanti site involving renewable energy and the specific energy systems which will be in operation at the site.

To learn more about the Arcosanti energy project you can contact Lori Carroll at Arcosanti at phone number (602) 632-7135, or write to Arcosanti, Attn: SolArco project, HC 74, Box 4136, Mayer, AZ 86333. 



Land Available for Solar Dish Gensets.

Many Thanks to Claude Culbertson...

— Clare VanAusdal and Roy McAlister

When you are converting an automobile to hydrogen or natural gas, you definitely need the services of a good welding shop. Without it, the task could be next to impossible. While converting a Nissan Sentra to operation on gaseous fuels including hydrogen, hythane, and methane, it became obvious that many items would need to be fabricated and welded. On this particular project, the tank was larger than the opening of the trunk, so we had to cut out the spot welds of the back-lite panel and fold it back so that the tank would slip-in. The bracketing needed to be welded to the frame of the car. And there were many smaller brackets to be made for mounting components under the hood.

Claude Culbertson owner of Shaw's Welding, a very capable welder, sheet metal fabricator, and member of AHA, secured the container brackets to the vehicle frame. These brackets prevent damage from road hazards, secure the tank against slippage, loosening, or rotation and they must withstand a static force equal to eight times the weight of a fully pressurized tank. The tank was placed over the rear axle in a position as far away from any rear impact as possible. The tank

valves were protected from physical damage by using the vehicle structure and valve protectors. Overboard venting through a thermally activated valve was provided to relieve the tank contents to a safe outlet in case the vehicle is involved in a fire that threatens the integrity of the storage tank. A high energy absorbent foam was secured in the rear quarter panel of the car to absorb the energy of a potential collision.

In addition to Claude's thoughtful and expert development of brackets and fixtures for making the Nissan conversion practical, he has built numerous special test stands for engine tests at AHA. We have been greatly assisted by Claude's work and leadership in proving that we can achieve prosperity without pollution.

1989 Nissan Emission Test Results — March 24th, 1995		
	Allowable	Actual
Carbon Monoxide	30.0	0.0
Oxides of Nitrogen	3.0	0.0
Hydrocarbons	2.00	0.09
Dept of Environmental Quality Vehicle Inspection Program		



A white styrofoam model used to measure the fitting of the truck. Notice the welds on back-lite panel...panel folded back to tank would slip in.



Clare VanAusdal & Claude Culbertson finally install the tank.

AHA To Produce 1996 Calendar

The American Hydrogen Association (AHA) has begun work on a calendar for 1996. The calendar, which will be the first one ever produced by AHA, will feature full color photographs, sketches or drawings highlighting renewable energy themes.

The calendar will also feature important and historical dates in renewable energy as well as upcoming events, conferences, etc. related to renewable energy.

Please help us make this calendar a success. Send us your photographs and any suggestions you might have which we can consider for use in the AHA calendar.

These calendars will go on sale in the Fall of 1995, and they are expected to provide additional revenue to AHA to help support many of our programs and activities.

Sponsors NEEDED! Hydrogen Today needs sponsors to help pay for publishing costs! Please contact Kathy McAlister at (602) 921-0433

Remember, sponsorships are Tax-Deductible!

Hydrogen Technology

The Larsen RADAX Engine of Melvin James Larsen, Inventor And Designer

— by: Roy McAlister

A novel two-stroke engine with stratified-charge combustion has been designed to set a new world record for thermal efficiency. It utilizes the fast-burn characteristics of directly injected hydrogen to rapidly develop maximum cylinder pressure at the beginning of the power stroke. This helps avoid the negative torque characteristics of slow burning fuels in conventional crank-shaft engines that start the burning process during the compression stroke.

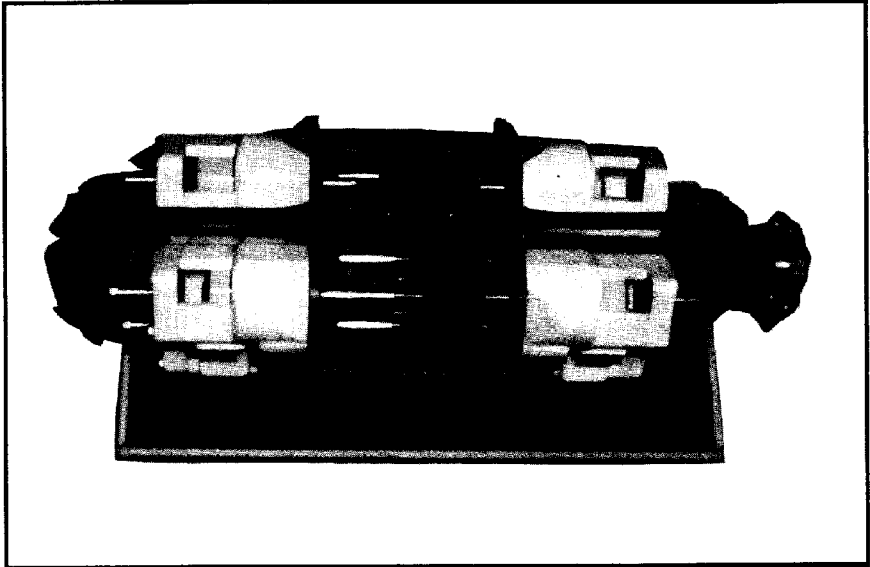
Four cylinders oppose four cylinders in this "TWIN-FOUR" configuration to provide an inherently balanced operation. Piston thrust is converted to rotary motion much sooner in the expansion cycle and with a longer torque arm than with crank-shaft expansion systems.

A rotary cam that provides three piston strokes per cylinder per revolution, produces maximum torque at the time that maximum temperature and pressure exist in the combustion chamber. These features combine to produce unprecedented smoothness, an output shaft speed that is one-third the piston frequency, higher fuel efficiency, and greater power per weight than with conventional engines. Consider the results:

PERFORMANCE: 300 HP at 2,000 RPM; 195 LBS COMPLETE

Mel Larsen began his career building advanced aircraft in the America's strategic research and development programs to provide air superiority during World War II. Mel helped develop a secret flying wing aircraft that was all magnesium. This program pioneered the development of inert-gas arc welding, which was later called *heliarc*.

Eventually, Mel helped pioneer many more manufacturing processes to



Cut-away model of the RADAX engine, showing the axially-aligned cylinders, the central drum-cam, and the power output shaft. Additional details are in U.S. Patent #4,834,033.

produce his novel aerospace designs. Numerous U.S. military aircraft from World War II to Desert Storm have utilized Mel's innovations or their derivatives. Mel produced composite designs for early experiments in radar-transparent aircraft, special materials for resisting abrasion in helicopter rotors, and the tooling to produce key components made from composites for the Voyager, an aircraft that flew non-stop around the world.

Mel decided to design the Larsen Radax Engine after years of time behind high performance piston engines as a pilot and aerospace designer. Mel was troubled by the fact that at top dead center, crank-articulated engines provide no torque. He reasoned that it would be more efficient to use the heat developed by combustion at the time the pressure and temperature were at maximum values rather than wait (while energy drains away) for the crankshaft to rotate and the piston to travel downward to develop a substantial torque arm.

His answer was the use of opposing

pistons and a cam drum to move the pistons through three cycles per revolution in a way that provides essentially maximum torque at the time that maximum temperature and pressure exist in the combustion chamber. Eventually Mel improved the design to specifications noted above. Bench tests on key components show the distinct possibility of setting a new world record for thermal efficiency by Mel's novel engine design which utilizes the fast and efficient burning characteristics of stratified-charge hydrogen.

Presently the engine is being assembled from test components machined from aerospace alloys and ceramics. Castings for the opposed cylinders are being supplied by Arizona Castings, a leading supplier of precision sand castings. The cam drum was machined by computer-controlled milling at Ferguson Cams.

We wish you great success Mel Larsen in your tireless work to advance heat-engine technology.

Oceans of Energy

— by Roy McAlister

A recently graduated physicist from Germany specializing in the storage of solar energy visited the AHA laboratory in Arizona. He has been researching the use of sea water to produce hydrogen. In 1991, Uwe Kueter started his quest to learn how to harness and store the vast energy potentials of solar radiation and ocean water. Here is what we learned in our interesting interview with Mr. Kueter.

As a student of physics under Dr. Peter Koske at Kiel University, Institute for Applied Physics in Kiel, Germany, Mr. Kueter became intrigued with the concept of using sea water to produce hydrogen for storing solar energy. Soon, Mr. Kueter was testing the concept from a barge in the North Sea near the port of Buesum, Germany. Following this, the project was expanded to the Natural Energy Laboratory of Hawaii at Keahole Point on the island of Hawaii as part of a cooperative effort between Kiel University and the University of Hawaii. The intent is to demonstrate to an island economy what could



be done with the vast Pacific Ocean and constant Hawaiian sunshine.

Mr. Kueter indicated that he was intensely interested in improving the technology of sea water electrolysis because in the future renewable energy will become more important as an energy supply for our daily life. Compared to the possibility of using tides and geothermal energy, solar radiation is the most powerful alternative-energy source we have. It can be used in a direct or indirect way.

The wind and the different characteristics of the ocean like the waves, the currents, the salinity or the temperature gradient between deep and surface water, all caused by the sun, are known as indirect energy sources.

Semiconductor solar panels (solar photovoltaic cells) are one way of converting solar radiation directly into a usable form of electrical energy. The main problem with solar energy is not the primary conversion but storage and transportation.

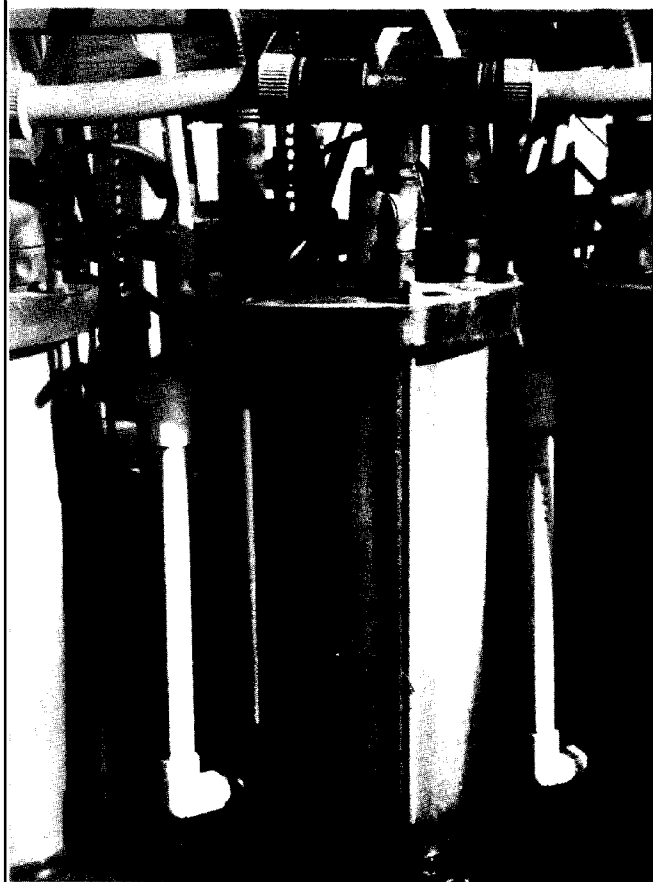
The Kiel-Project is designed to explore storage of solar energy by production of hydrogen gas from seawater by electrolysis. At present the main components of this small plant are solar cells and electrolysis cells. The project investigates the technical feasibility of the interaction between the solar cells and the electrolyzer to produce hydrogen in an efficient and cost-effective way.

The electrolysis unit is run by direct electrical current provided by the solar cells. An important aspect of the project has been to examine the use of seawater as an electrolyte for the electrolysis process.

Kiel-Project

By running this small plant, hydrogen is released at one of the electrodes (the cathode) as a result of the water decomposition. It then can be collected and stored, transported and used in engines, fuel cells, and in chemical processing.

Continued, next page

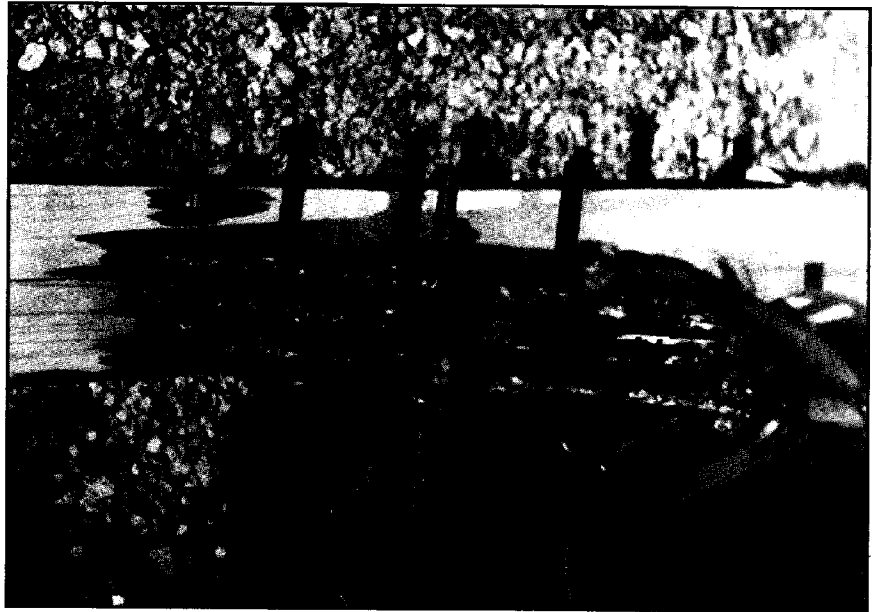


Continued from previous page

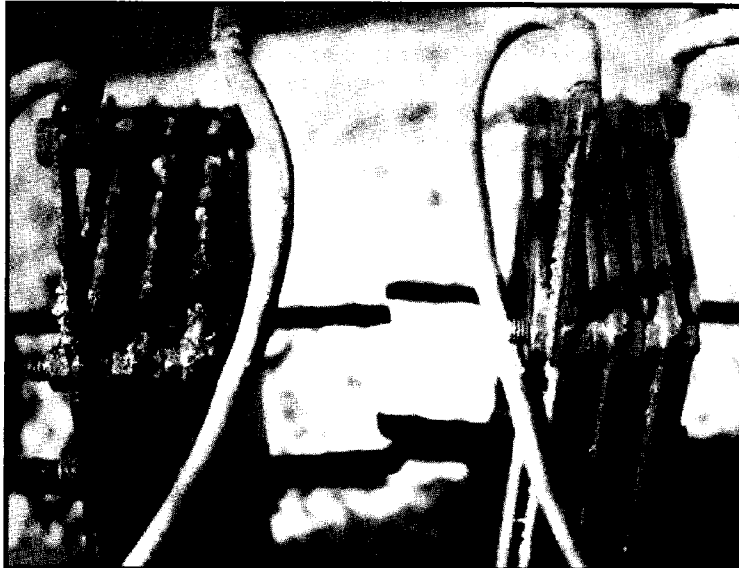
One of the advantages of producing hydrogen from electrolysis in combination with solar cells is that the entire process only contains two steps of energy conversion. The solar radiation is converted into electrical energy by the photovoltaics and then into chemical energy by the electrolysis, producing hydrogen gas, which is easily stored or transported.

The Kiel-Project has selected iron or steel electrodes for both the cathode and anode plates that form a unit cell of a seven-plate stack that is housed in a cylindrical polyvinyl chloride vessel. These components are shown in the accompanying pictures.

Iron plays a helpful role in the process. At the anode plate of each unit cell, iron is galvanically sacrificed and enters solution



Sacrificial Action of Iron Anodes




Seven-Plate Electrode Assembly

or is sloughed off as various hydroxide compounds. This is advantageous in two ways because the sacrificial action of the iron anode lowers the applied voltage requirement for electrolysis and inhibits the release of chlorine or oxygen gases. Only hydrogen bubbles up from this electrolysis process that uses iron electrodes and sea water. This greatly simplifies the design and operation of the Kiel-Project electrolyzer.

Conventional photovoltaic panels and electrolyzers would achieve an efficiency of 3% to 7% using the same photovoltaic panels. Mr. Kueter's work shows that an overall efficiency of about ten percent has been achieved for conversion of solar energy to chemical potential energy in the hydrogen produced. This does not include the energy required to produce new sacrificial iron anodes. Mr. Kueter envisions using scrap iron and steel for the electrodes.

Please help us welcome Mr. Kueter as a

new member of the American Hydrogen Association. He is interested in networking with other AHA researchers, particularly concerning approaches to provide renewable energy on a worldwide basis. We wish him and the Kiel-Project great success in continuing this research. 

The Hydrogen Association
 dba The American Hydrogen Association
 in the United States

AHA CORPORATE OFFICERS:
 President: Roy E. McAlister, P.E.
 V.P. Research: Harry Braun
 Secretary: Kathy McAlister
 Treasurer: Michael Muller
 Accountant: Steven L. Loney, C.P.A.
 Newsletter Sponsorship: Kathy McAlister
 Bookkeeper: Ann Chase

Hydrogen Today
 Official Publication of the
 American Hydrogen Association (AHA)
 216 South Clark Drive, Ste. 103
 Tempe, AZ 85281
 (602) 921-0433 • FAX (602) 967-6601
BBS (602) 894-8403

Printed in U.S.A. Copyright © 1995 AHA
 Reprinting is permitted with credit given

B&B PRINTERY 4214 South 36th Place
 Phoenix, Arizona 85040

Helping You Look Your Best
 (602) 437-3610

*Friendly Courteous Service
 Tailored to your specific needs. Stop
 in for a quote on your next job or
 call 437-3610*

Recycled Paper Available

- Letterheads
- Envelopes
- Business Cards
- Carbonless Forms
- Labels
- Rolodex Cards
- Door Hangers
- Note Pads
- Newsletters
- Flyers
- Brochures
- Announcements
- Posters
- Folders
- Raised Printing
- Graphic Design

Energy Partners's Genesis Zero Emission Transporter

Operating on Hydrogen Fuel Cell:

A joint venture between Energy Partners, Inc., Western Golf Car and Telesis Cogeneration announced the completion of the Genesis Zero Emission Transporter, a low speed concept cargo vehicle designed to address California's increasingly stringent vehicle emission regulations while overcoming the shortcomings of battery powered electric vehicles. The vehicle, which uses a chassis supplied by Western Golf Car, a proton exchange membrane (PEM) fuel cell power system supplied by Energy Partners and engineering support supplied by Telesis Cogeneration, is an all electric, zero emission vehicle powered by hydrogen fuel.

The Genesis, which will be unveiled at the Expotrans '95 Conference in Palm Springs February 16-18 will carry eleven passengers comfortably for up to three hours and requires only fifteen minutes to refill its hydrogen fuel tanks. Conceived to address a niche market consisting of limited power electric utility and passenger

vehicles, the Genesis uses a 7.5 kilowatt fuel cell power plant to propel up to 2500 pounds at speeds in excess of 15 mph. Additional concept designs aimed at small electric cargo platforms and grounds maintenance vehicles are being prepared by the joint venture.

The Genesis relies of PEM fuel cells as opposed to batteries to produce its power. PEM fuel cells are electrochemical devices that produce electricity from hydrogen while producing no harmful emissions. Fuel cells are recognized as leading candidates for reducing pollution and reliance on foreign fuel sources.

"Although widely demonstrated in larger transportation systems, this is the first application which holds potential to introduce PEM fuel cells to a commercial market at any early date. The Genesis vehicle is the joint ventures response to the need to take fuel cells from the laboratory to the street. This limited power electric vehicle market holds great potential for the partnership to create a driver to rapidly ramp up production and

reduce cost of the fuel cell power system," said Ed Trilica, President of Energy Partners.

Energy Partners, Western Golf Car and Telesis Cogeneration joined forces in the fall of 1994 to respond to a growing interest in the Coachella Valley region of California and California as a whole for the introduction of clean energy technologies. The partnership brings together the talents of established companies in the field of PEM fuel cell power system design, limited power electric vehicle production and power system engineering.

The Genesis is a first generation concept vehicle which forms the base of an anticipated line of limited power utility vehicles for passenger and utility applications. The group has received a commitment from the City of Palm Springs, California and its Regional Airport for five vehicles plus a hydrogen refueling station which will be used to demonstrate and evaluate the commercial feasibility of the product.

OIL - Can We Afford To Burn It?

— By: Ray Babina and Roy McAlister

Walt Stewart, a Los Alamos National Laboratory scientist, once remarked *that burning oil was like burning Rembrandt's paintings to make light for reading a newspaper*. Reading the Sunday paper including supplements could use Rembrandt's entire contribution of masterpieces! Virtually no one would advocate burning Rembrandt's masterpieces, but are we doing something equally wasteful.

Modern America depends upon oil to generate more income from non-fuel products than from all the fuel sales. About 6% of the oil produced in America is used for non-fuel petrocarbon products. This creates more revenues than the sale of fuels made from the remaining 94%.

According to reports from major oil companies such as Exxon Chemical Co., 100

gallons of fuel oil sells for about \$100. This amount of oil can be refined into gasoline and diesel fuels or it can be processed into more than \$3,500 worth of non-fuel products. Here is a typical mix of non-fuel products made from 100 gallons of crude oil: 47 gallons of lubricants, 41 white polyester shirts (65% polyester, 35% cotton), 910 pairs of pantyhose or 9 small TV cabinets, 13 plastic garbage cans, 46 sweaters or 11 blankets, polymer for 2 automobile tires or 27 bicycle tires, fiber reinforcement for 4.6 full-size auto tires, and 30 large toys made of injection molded plastic. (You can look around and find wonderful carpeting, cabinet tops, roofing, siding, cosmetics, pharmaceuticals, paint, fine clothing, automobile parts, medical appliances, and many other

examples of valuable goods and products that were derived from oil and that will produce *more than \$3,500* in sales revenues.)

Most of these \$3,500 worth of products can be recycled and repeatedly returned to service in improved designs that will probably be worth much more than \$3,500. Recycling usually requires much less energy than the original product production. Who knows, but what masterpieces on par with the works of Rembrandt will be painted with oil paints on canvas made from recycled pop bottles. How can we justify burning oil when the present and future values of non-fuel products far exceed the revenue received for one-time use as a pollutive fuel?

Be Healthy By Building Tilth

— By: Kathy McAlister

Hard red winter wheat is the staff of life for those of us that eat toast or cereal for breakfast, a sandwich for lunch, and have dinner rolls. This remarkable grass grows through the winter in harsh wind-swept areas of the U.S. Midwest, in central Canada, Germany, Russia, Australia and Argentina. It withstands blowing sand, lives through freezing winds and snow storms, provides winter pasture for cattle, and then in the spring produces beautiful wheat seeds that are harvested for making flour for countless recipes from bread to gravy. Wheat is grown on top soil that has taken millions of years to develop. Now that it is time to prepare the machines for cutting wheat, we realize that this is the season for gardening and row-crop farming. It is time for reflection and possible changes in the way we look at treating top soil.

Americans came to a continent with a particularly valuable natural resource. Top soil. Top soil is a mixture of fine sand, gravel, clay, and organic materials. The organic materials bring the vitamins, enzymes, and miracles of life including bacteria, fungi, bugs, worms, and countless other interdependent creatures.

Immigrants from Europe and Asia found much of the North American continent covered with several feet (often more than ten feet in thickness) of wonderful top soil that received optimum rainfall and teamed with nutrition. This green continent invigorated the air with oxygen released from green plants that covered the land from sea to shining sea. For eons these green plants developed the rich top soil that we use to grow crops.

But much of this renewable top soil has been lost by breaking it up and exposing it to erosive wind and water. Rivers that once ran clear clean water have remained muddy for most the last two centuries as top soil is eroded to the oceans. U.S. farmers lose a remarkable amount of top soil each year. To fill lakes and the continental shelves at the present rate *U.S. farms lose an annual average of about 5.6 tons of top soil per acre*. This means that about six pounds of top soil are lost for every pound of food grown on U.S. farms. Many other countries lose even more top soil per pound of food due to more desperate farming practices.

For every calorie of food, we eat about ten calories of fossil energy is spent in tilling the soil, planting, fertilizing, herbiciding, harvesting, grinding, refrigerating, canning, drying, packaging and cooking the food. The rapid growth of the Earth's population supported by fossil fuels has resulted in intensive farming practices that have used all but 50 years of top soil as it is "mined" for food. Not only are we depleting fossil fuels, we are running out of top soil.

Top soil is the beginning of the food chain that provides minerals that the human body needs for growth and metabolism. Poor top soil has resulted from essential mineral depletion and erosion at rates that exceed the rate that top soil can be rebuilt. Millions of tons of the most fertile top layer of the land are lost due to over tillage of the soil which destroys native ground cover. The chemicals used to kill weeds and

bugs, and over use of harsh fertilizers continue top layer destruction. The result is that America is headed towards a crisis because of soil depletion.

Fertilizers feed the plants but plants also need trace minerals that we take from the soil when we send crops to market and the garbage and sewage is imprisoned in land-fills or sent to the oceans. Many of these trace minerals are catalysts in the plant/soil relationship. Carbon serves many roles including acting as a sponge for hosting gas- and water-based reactions in the soil. As a result of the miraculous chemistry in the soil region of the Earth's surface, rain water and carbon dioxide from the atmosphere are united by solar energy in green-plant photosynthesis long with lesser amounts of nitrogen, iron, calcium, magnesium, phosphorous, sulfur and a host of trace elements into wonderful carbohydrates vitamins, and fiber. We need to be aware of what it takes to rebuild the top soil that which we are losing with each crop.

One of the ways this can be accomplished is by composting and replacing essential minerals in the soil. Soil that is supporting plant growth usually needs nitrogen (N), soluble phosphorous (P_2O_5) and potassium usually as potash (K_2O) as nutrients. But productive soil also needs lesser amounts of trace minerals like manganese, cobalt, carbon, selenium, molybdenum, and chromium. Sometimes natural nutrients are recognized as wastes. For instance, 100 lbs of fresh cow manure contains 0.5 pounds of N; 0.2 pound of P_2O_5 ; and 0.4 pounds K_2O ; many trace elements depending upon the food the cow was eating, and 85 pounds of water. Manure spreading is a lost art.

Become more familiar with soil building by improving the *tilth* of some low productivity soil in your neighborhood. In order to get started, packaged chemical fertilizer can help you become familiar with the remarkable results of nurturing the soil. Start with a ratio of about 1-2-1 (1 pound nitrogen, 2 pounds phosphate and 1 pound potash) or 10-20-10, or 5-10-5 for house plants and flowers. All commercial fertilizers are approximately 1-2-1. Too much nitrogen fertilizer will stunt or "burn" your plants. Calculate the amount needed for in square foot (ft^2) which is based on about 1 pound of N per 1,000 square foot.

A 100 pound bag of 5-10-10 (for gardens) contains 5 pounds of N and will grow most crops for one season in a 5,000 sq. ft. area. So, 50 pounds of 5-10-10 will provide the recommended level of at least three fertilizer nutrients for a 50 foot by 50 foot garden. If the needed trace minerals are present and the soil is kept moist but aerated, lush green plants will grow. Start Composting to learn more.

Manure, shredded paper, garbage, compost, sawdust, sewage sludge, weeds, grass clippings, crop residues, and cover crops are all organic matter that can be used to add trace minerals along with needed structure to help water and air penetrate the soil which is necessary for good "tilth" or crop-growing

characteristics. If green plants are growing it is good sign that there is other life in the soil. Bacteria, fungi, worms, bugs, and spiders will be at home in your healthy soil.

AHA talks a lot about biomass (garbage and sewage sludge) and how we can use it to make hydrogen. The remaining biomass needs to be made into top soil. *Sewage sludge is a good source of organic matter and nutrients, but can present serious problems for farms and home use.*

1. Use only sludge which has been composted at high temperatures, or in aerobic... or anaerobic confinement long enough to kill dangerous pathogens. Anaerobic processes kill disease organisms that cause illness to animals and may blight your crops. (Plant composting is easier.)
2. Even after composting, sewage sludge usually contains some concentration of heavy metals and organic compounds which may pose long-term health problems if they accumulate in the food chain. To avoid these problems:
 - a. Keep composting soil pH lower than 6.5 by adding air which helps keep pH high.
 - b. Plow, or turn compost to break it up for greater exposure to the atmosphere and sunlight.
 - c. Don't use composted sewage sludge on roots or leafy crops such as lettuce, chard, parsley, or spinach that are to be served raw.
 - d. Don't use excessive amounts of sludge. Test for build-up of heavy metals like mercury and lead to know what may be excessive.

Sludge and garbage could become new cash crops for making hydrogen and carbon products in addition to building better top soil.

KBS
Copier Service, Inc.
"SPEED" Is Our Middle Name!
2123 S. Priest - Suite 205
Tempe, Arizona 85282

Keith Bolton FAX 602-894-4021
Pager 401-6321 Phone 602-894-4012



In Arizona and much of the desert Southwest you often see caliche (cemented or partially cemented layers of soil high in Ca CO₃); this type of soil is often sealed by halogen salts and clay) ... and has little resemblance to top soil.

BE HEALTHY BY BUILDING TILTH

So how do you compost to make good top soil out of problematic caliche?

Make a compost stack 4 feet x 6 feet (long) and stack the pile to about 4 1/2 feet tall with vegetable matter. Make a layer of yellow (straw from wheat, oats and etc.) cuttings from your plants, followed by a layer of green cuttings. Then seed it with organic soil that contains the proper bugs (organic micro-organisms borrowed or purchased from another organic gardener) ... and earth worms that break-down the composted layers of yellow and green. Dry twigs and straw provide air pockets and will also eventually break-down into soil. For faster break-down, you can add bone meal. Sprinkle each layer lightly with water for proper moisture. Repeat that yellow-green-organisms-water until the stack is about 4.5 feet tall. To maintain moisture, you will need to sprinkle the complete stack with water as often as need depending upon climatic conditions ... do not soak your composted stack but keep it slightly moist.

If you are at the right temperature and moisture conditions, you will notice no objectionable smell and the temperature will remain warm even during colder weather. In the beginning do not add animal or human manure to this compost unless you have made special provisions for killing pathogens with heat or U.V. Avoid fats and oils because they will not break-down at the same rate as vegetable matter.


Turn this stack with a pitch fork about every month to six weeks. It takes about six months to become soil. This is good exercise and it will help you get acquainted with the chemistry and physics of making soil nutrients

naturally. Then at the end of the compost cycle, sift the organic matter through a screen. Or, you may need a coarser screen called a grisly to remove larger twigs, rocks and glass).

Get the plot ready for building top soil by *double digging* your garden down to about 12 to 18 inches ... like you were plowing a field one spade at a time and then loosen the soil by a twisting action of the fork. Add your new top-soil nutrients from the compost pile after the soil is properly turned. Mix the composted nutrients into the soil.

A variety of plants and herbs in your compost pile will give you good minerals for the soil and a more nutritious food chain. For instance you will be adding black carbon needed for the water based reactions. This is one reason farmers burn stubble fields. (sometimes we wonder if Roy McAlister, president of AHA, isn't promoting the American Carbon Association - fossil fuels are hydrocarbons, garbage and sewage are hydrocarbons, farm and forest wastes are hydrocarbons ... he shows how we need to save carbon for more valuable uses instead of having it go out the tail-pipe of our cars or into the air from coal plants and sewage disposal plants).

Carbon is needed in the soil for high quality crops along with better yields. We can break-down the sewage sludge into hydrogen for use as a clean fuel. This releases nitrogen, carbon, and other nutrients that can be returned to the land for building better top soil. Black soil usually signifies higher carbon and/or iron content. Black soil captures more solar energy to increase the rate of metabolism of all life forms in the soil. Plants grow faster and yield more at harvest.

Happy gardening or farming in a more wholesome and renewable way! It is one of the most important things humans can do to avoid the crisis of top-soil depletion. We do not have much time to reverse an ominous trend of top soil depletion. 

Concentrated PV Cells Bring Solar Power Into Realm Of Commercial Viability:

— By: Ann Chamber, Assistant Editor, Power Engineering/February 1995

Integrated high-concentration photovoltaics (IHCPV) have achieved a solar conversion efficiency greater than 20 percent in a 2,000-W testbed array installed at Georgia Power Co.'s Shenandoah Environment & Education Center, near Atlanta, GA. This potentially low-cost solar technology established a new world record for commercial-scale electrical energy conversion from sunlight.

"This performance is significant because it establishes the viability of a technology that promises cost-effective electricity generation in a utility scale system," said Dr. Edgar DeMeo, Electric Power Research Institute (EPRI) manager of renewable alliances. "High volume production will put IHCPV on the fast track toward cost-competitiveness with conventional electrical generation."

AMONIX Inc., Torrance, CA, built the system, and also recently shared a "1994 R&D 100 Award" with EPRI and others for developing the advanced high-concentration solar cell that is the heart of the new solar device.

Unlike flat-plate solar modules using large areas of solar cells and operating at a fixed tilt toward the sun, the IHCPV system uses low-cost plastic concentrating lenses to track and focus sunlight into small-area solar cells. By concentrating sunlight 200-500 times, such systems can substantially reduce the amount of silicon cell material needed to generate a specific quantity of electricity.

"IHCPV technology is capable of meeting the cost goals set by utilities for a commercial solar energy system - \$1.50 per watt of installed capacity or six cent per kilowatt hour of generated electricity," said Vahan Garboushian, AMONIX president. "The technology can be competitive now for rural electrification applications such as isolated villages in

developing countries or high value distributed installation in this country."

A 20-kW demonstration system is under construction for utility evaluation at Arizona Public Service's Solar Test and Research facility in Tempe, AZ. Additional utility test sites are planned this year.

(See Hydrogen Today, Vol 5, No. 2, 1994, pp. 2-3)

Several technological breakthroughs over the past few years led to the current system. Earlier high-concentration cells suffered performance degradation after exposure to the sun, but today's cells overcome the problem through radiation hardening developed for space satellites. Also, fabrication costs were reduced through an EPRI-patented design for creating "integrated arrays" of cells, concentrator lenses and array structure.

The integrated array structure was designed by Scientific Engineering Inc. Montgomery, AL, which teamed with AMONIX for commercialization of IHCPV systems.

Another unique solar cell project that uses very thin layers of crystalline silicon is the goal of a three-year, \$2.8 million effort funded by the Department of Energy's National Renewable Energy Laboratory. Under a cost-shared contract, AstroPower of Newark, Del., will develop a solar cell that uses much less material than conventional ones, incorporates light-trapping to increase the amount of sunlight converted and employs monolithic interconnects for lower costs. Solar cells are currently made using silicon-wafer technology. The new technology will produce cells in large areas by directly growing thin layers of silicon on a ceramic substrate. The goal is to get solar power's cost to \$1 per watt.

Bringing Power to the People...May 13th

— by: Global Objectives

Global Objectives (GO) is a non-profit organization based in Phoenix, AZ. The goal is to educate the community about poverty, protecting our natural environment and cultural diversity. GO is recognized as a Non-Governmental Organization (NGO) by the United Nations and are also on the NGO roster of the Commission on Sustainable Development.

GO will be holding "An Alternative Energy Conference: Bringing Power to the People," on May 13, 1995 at the City Council Chambers in downtown Phoenix. Speakers will discuss alternative energy solutions and give demonstrations on current technologies.

As you know, GO cannot do all of this work by themselves. AHA will be at this event. They need your help. If each of us gets involved, we will have the resources needed to continue some really important work for our community, our state and our planet. For more information call Margie or Michelle at (602) 230-2357; fx: (602) 230-0630.

Gas Development Resources, Inc.

Gaseous Fuel Development and Utilization

**"Developing American Fuels
for a Clean Tomorrow"**

Natural Gas, Hythane, Hydrogen, LNG, LH₂

8480 East Valley Road (602) 772-6000
Prescott Valley, Arizona 86312

The Ehrenberg Vehicle


— By Charles Terrey

Gus Ehrenberg is a man of vision. He is a Cal Tech engineering graduate, now 81 years old. He has had a lifelong interest in automobiles and is old enough to remember many of the early developments including electrics, steam, and various internal combustion engine driven varieties. He realized early that motor vehicle designs evolved from carriages and wagons. These designs were tied to what the blacksmiths could build. As early as the 1940's Gus was thinking about how a vehicle would be designed if more advanced principles of physics were applied to the engineering of the automobile.

In 1981, at the age of 67 he enlisted the help of the Cinnamenson, New Jersey High School Advanced Physics Instructor, Mr. Oliver W. Perry and his students in the building of a developmental vehicle. The one year project turned into a 13 year development in which many sponsors contributed over 1 million dollars to the advancement of Gus's concepts. The result is an engineering platform which can be used as a laboratory for the development of a hybrid electric vehicle. It has long been Gus's dream to apply nonpolluting hydrogen fuel to power an automobile with an electric propulsion motor in each wheel.

In November 1994, ASU engineering professor Don Kelley and his engineering class expressed interest in assisting with the development of the Ehrenberg hydrogen-powered electric vehicle. Typical to AHA's educational programs, this one is tied to on-job training for a renewable future. It is expected that this vehicle will help prove the potential for a family vehicle that performs well and has a range of more than 150 miles on the hydrogen energy equivalent of one gallon of gasoline. *(Editor's Note: Chuck Terrey has traveled to Pennsylvania and brought the Ehrenberg Car along with various test gear to Arizona. Special thanks to Chuck for this much appreciated extra effort to assure the safe delivery of the Ehrenberg project. If would like to help on this project please send donations to the AHA offices. Traveling expenses were near \$3,000. Each phase of development will have added cost.)*

The vehicle contains many innovative ideas that makes it more efficient in its use of energy than conventional vehicles. Each of its four wheels is driven by a series-wound electric motor. This permits generation of electricity during braking or down-hill motion. The energy can then be stored in a flywheel and used for acceleration or up-hill climbs. The vehicle also has a special independent suspension on each wheel which permits it to use much harder tires with lower rolling resistance, improved handling, and better ride characteristics. The Ehrenberg vehicle is ideally suited to the development of the New Generation Vehicle that will exceed the 80 miles per gallon specified by the Government for the NGV.

The Ehrenberg concept can apply a fuel cell or a small internal-combustion engine/generator for primary electricity production. Flywheel technology makes it practical to use a much smaller engine without loss of performance compared to today's higher-performance cars. We are all looking forward to providing continued assistance to Gus Ehrenberg in his quest to develop the Super NGV. 

The Gasoline Approach

— By: Marie Davis

We are about to take another hit. According to Popular Science magazine April 1995 page 38 Honda has come up with a system that uses a SECOND and larger catalytic converter and an improved computer system to pass the 1996 California Ultra-Low-Emission Vehicle (ULEV) standards while still using gasoline.

According to the article hydrocarbons, nitrous oxide and carbon monoxide emissions are reduced by 90 percent over today's pollution standards. This is based on using the reformulated gasolines that will be available in California in the year 1996. The additional cost for the new system should be about \$1000.

I say that they are just fooling themselves into believing that gasoline can actually be clean. The problem ... is that there are no emission restrictions for pollutants such as Toluene (a solvent) or Formaldehyde (a preservative) both of which are carcinogens; or the host of other unhealthy and potentially lethal gasoline ingredients.

Now a thought about money, \$1000.00 doesn't sound too much for this advancement except for one thing. Most cars on the road today are carrying approximately \$2000.00 worth of emission devices already. Besides the initial costs there are repair costs (ever need to replace a catalytic converter?) and hidden costs that add up at the pump in reduced mileage and horsepower performance. Instead of wasting money on trying to clean the un-cleanable, take that money and replace the root cause... the fuel. All of us then can breathe easier.

Can we really afford another add-on? Remember, it is garbage in... garbage out.



The Ehrenberg vehicle arrived in time for Engineering Week at Chris-Town Mall.

AHA Launches Charter Membership Campaign

The American Hydrogen Association kicked off the first phases of its Charter Membership campaign in November, 1994.

The Charter Membership package features an attractive brochure about AHA along with a cover letter from the AHA President, a videotape, an insert outlining "Facts You Should Know" about hydrogen, and a description of the various Charter Membership levels which AHA is offering.


Charter Membership levels in AHA vary according to the size of the contribution made. Charter Memberships start at a minimum of \$500 for the basic Charter Member. All in all, eight different Charter Membership levels of support are available to individuals who want to seriously support education, development, and progress in the transition to renewable energy. Charter Membership levels in AHA are:

- Earth – \$500 or more
- Meteor – \$2,500 or more
- Star – \$5,000 or more
- Nova – \$10,000 or more
- Comet – \$50,000 or more
- Galaxy – \$100,000 or more
- Universe – \$250,000 or more
- Infinity – \$1,000,000 or more

In order to encourage donors to become Charter Members, AHA is offering some very attractive Charter Membership "packages" which consist of various benefits, privileges, and gift items which supporters will receive when they become a Charter Member of AHA.

Of course, AHA is also encouraging people to join as regular members. Regular membership levels are still available as follows:

- Student/Senior Membership: \$20 per year
- Regular Membership: \$30 per year
- Family Membership: \$40 per year
- Sustaining Membership: \$100 per year
- Corporate or Institution Membership: \$1,000

As a member of AHA *you can help!* You can talk to individuals, organizations, and businesses you know and encourage them to consider becoming a Charter Member of AHA. Remember, the minimum contribution is \$500 and be sure to stress that their contribution will be *fully tax deductible* and that it will provide support towards education and the development of hydrogen and other renewable resources throughout America. As a member of AHA *you can also help* us recruit new general and student memberships as we work to expand our membership in every state, and *you can help* in our campaign to establish Chapters in cities and states across the country. Contact us at (602) 921-0433 to refer us to someone who would be interested in supporting renewable energy by becoming a Charter Member of AHA. We will send a Charter Membership package to them right away. 

Inventor Suggests Solution For Chernobyl Dust Problem

— By Roy McAlister

On April 26, 1986, the Chernobyl nuclear power plant had an incident that gripped the world with fear of nuclear power. Meltdown of the reactor caused the world's worst peacetime nuclear disaster. This disaster could be a much larger source of pollution if the radioactive dust within what remains of the Chernobyl power plant is allowed to escape.

The threat of radioactive dust escaping from the infamous Chernobyl power plant has captured the imagination of William Culbertson, an inventor from Tempe, Arizona. The Chernobyl facility has remained a ticking time bomb after spewing radioactive particles around the world, shortly after the gas cooled reactor was damaged by meltdown and fires in 1986. Radioactive dust covering interior areas will be puffed into the atmosphere when the weakened building collapses. This poisonous cloud of radioactive particles could be an even greater environmental problem than the original accident.

The Chernobyl facility was weakened when the nuclear fuel became overheated and melted through the reactor containment system. The building and furnishings were burned by the fires that followed. Radioactive debris and dust cover the interior surfaces and many volunteers that have tried to deal with the meltdown and clean up have died of radiation illnesses.

Bill Culbertson's suggestion is to fill the **entire building with plastic foam**. Bill envisions spraying the interior of Chernobyl with the liquid urethane mixture used to make foam roofing. This mixture will expand and incorporate the dust particles into the layers formed by the sticky mass as it foams. As the building collapses the foam will be crushed but the dangerous dust will remain bonded and encapsulated within the foam mass. This will make the disposal safer and prevent the escape of radioactive particles.

When asked about patenting the suggested solution, Bill said he hoped there would never be another place where it is needed. A multimillion dollar prize offered for plans to safely dispose of Chernobyl has gone unclaimed. Bill said he has sent a letter to Alexei Tupolev, the famous Russian aircraft designer and would like to have the authorities that are in charge of dealing with the Chernobyl clean up to contact him about his suggestion. (AHA: (602) 921-0433 or fax: (602) 967-6601.)

The American Hydrogen Association Presents – Clean The Air As You Drive

AUTO CONVERSION CLASS

In order to accommodate out-of-town visitors that wish to enroll in our vehicle conversion class, we are providing this very popular course in two day-long sessions.

In addition to showing you how to utilize hydrogen to clean the air as you drive, this course consists of a general introduction to the use of alternative fuels including hydrogen as a booster fuel, methane, and propane along with demonstrations of the actual practice of converting a vehicle to operation on alternative fuels.

Our goal is for everyone that attends this course to gain the knowledge and confidence to safely accomplish conversion of a vehicle to alternative fuels or to inform an experienced auto mechanic. We provide a guide to locating parts, dual-fuel conversions, performance issues, safety issues, and answer questions about small, medium, and large engines.

The cost for all of this is only \$225 for the weekend course. A deposit of \$50.00 is required to hold your reservation.

Please advise of any special food preferences that you may have. Our course includes a BBQ lunch that is cooked with clean burning hydrogen. No dinosaur fumes in this meal!

The next class will be held whenever we can get at least 10 people to sign up.

For more information and to receive a schedule of upcoming classes please contact:

THE AMERICAN HYDROGEN ASSOCIATION
216 SOUTH CLARK, M.S. 103
TEMPE, ARIZONA 85281
602-921-0433 • FAX: 602-967-6601

The American Association for Fuel Cells Newsletter

– Tom Dickerman

The American Hydrogen Association is a sponsor for the American Association for Fuel Cells. You can learn more about molten carbonate fuel cells, developments in ceramic and solid-oxide fuel cells. The Northern California chapter of AHA, along with National/International AHA encourages the fuel cell technology in ways that provide opportunity for entrepreneurs while assuring that the Association stays funded. For further information on membership write: 50 San Miguel Avenue, Daly City, CA 94105. Join today.

The Micro Solar Hydrogen Experimenter's Kit

– By: John Gotthold,

Director of Technology, Warsitz Enterprises

The Northern California Chapter of the American Hydrogen Association has received a wonderful benefit from one of AHA's corporate sponsors. Warsitz enterprises has responded to the need for hands-on educational tools and produced an experimenter's kit for learning about electrochemistry and renewable hydrogen energy conversion processes.

Learn to run your world on *starlight and water* by capturing solar energy and turning it into electricity with the Micro Solar Panel. Use the electricity to dissociate water into Oxygen and Hydrogen, with the Micro Electrolyser. Turn the Hydrogen back into electricity and water vapor with the Micro fuel cell. Use the electrical output to drive the Micro motor. Demonstrate the entire Solar Hydrogen Energy system to amaze students, friends, neighbors etc., or prove to your mother-in-law or favorite teacher that you amount to something.

It is a most unusual hobbyist project with far-reaching implications. Exchange ideas, improvements, and experimental results with other educators, hobbyists, and experimenters through the American Hydrogen Association's BBS at (415) 494-3116, 8N1, 1200 to 14,400 BAUD under "FUEL CELLS."

All the devices are of *see-through* construction so that all of the components and gas flows are visible. It operates very quietly, because it has no moving parts, except the electric motor rotor and fan. The kit comes with complete safety and setup instructions along with an explanation of the principles of operation. Replacement PEM membranes, other parts, and supplies are made available to kit owners at low costs. Be sure to register your ownership when you receive your kit.

The cost of the Micro Solar Hydrogen Energy Kit is just \$149.00 plus \$5.00 for shipping to most of the USA. Inquire about shipping to more distant places. It is a complete set of Hydrogen Energy components that work together to make an experimenter's kit. You will receive a photovoltaic panel, a KOH electrolyzer, a PEM fuel cell, an electric motor, a fan, a kit to make KOH electrolyte for your electrolyzer, along with the tubing and insulated wire cables needed to set up your micro solar hydrogen system. It converts the energy in sunlight, the primary source of all energy on the Earth, and water, the most abundant source of hydrogen on Earth, into Hydrogen and Oxygen and then converts the Hydrogen back into water vapor, heat and electricity to provide process heat and to drive an electric motor.

Send a check to AHA today to place your order for this Micro Solar Hydrogen Experimenter's Kit.

Hydrogen The Clean Cure

— By: Marcia J. Greenshields

No matter what we believe takes place after our body has quit functioning, most of us, when near death or contemplating it, want to look back at our lives to feel the satisfaction of knowing that:

"I accomplished something. My existence had purpose beyond my personal existence. I helped to make the world a better place for all living things. I left a legacy of unselfish acts."

The world is in desperate need of people whose legacy will be to usher in the solar-hydrogen economy, in which the air, soil, and water will no longer be degraded by the burning of fossil fuels, in which carbon will take its rightful place as a building block, rather than as a destructive additive to the atmosphere.

Those of you who are knowledgeable about renewable resources can help create PROSPERITY WITHOUT POLLUTION by focusing now on what must take place to make that achievement. The first step is to join the American Hydrogen Association. Basic membership, however, is only the beginning. We need to move up to a higher level, for instance, to a Sustained Membership, while also encouraging others to join. AHA must have the membership base needed to call for real and necessary changes in education, energy policies and our economy.

At the onset of WWII, the U.S. called on industry to create the greatest production of war materials in history. If a majority of Americans demanded a change to an economy based on renewable energy, we could set about production of renewable energy "machines" on a scale that would ensure PROSPERITY WITHOUT POLLUTION in this country.

Prosperity without pollution is a concept in the minds of every member of AHA. It is our responsibility to share with non-members this level of higher expectation, because keeping it to ourselves will not create a loud enough voice for the coordination of what must

be done to stimulate the greatest gross national product ever to come out of the industrial revolution.

Sustainable energy independence should be everyone's goal. Without a collective effort, the air, soil, and water will continue to deteriorate, and all life on earth will continue to suffer.

Look around. The signs of deterioration are everywhere. Our economic ills reflect an energy policy which makes no sense. To spend ONE BILLION DOLLARS EVERY FIVE DAYS on foreign oil, rather than for renewable energy produced in this country while creating jobs and a healthy environment, is incongruous, yet the majority of the people are unaware of the alternative.

It is therefore up to every member of AHA to be a teacher and to put our money where our mouth is. A financially solid, non-profit organization working for the good of everyone is infinitely powerful, and a person needn't be a rocket scientist to discern that.

We have the answers to the problems plaguing this country. Political leaders in Washington, D.C. wouldn't be in gridlock were it not shackled by the economic nearsightedness of those in power and the ignorance of those paying the bills. Let's redirect the focus of our expenditures. If everyone who spends \$300 a year on the lottery spent just \$30 to join AHA, "solar-hydrogen" would be household words meaning the friendlier, more-prosperous future.

The TWO BILLION DOLLARS + spent EVERY DAY on so-called health care could be better spent if more of it were spent for preventative measures such as becoming sustainably energy independent, because the air, soil, and water would no longer be polluted. Buy a friend or relative an AHA membership instead of a throw-away gimmick for a present. Instead of spending \$100 on sneakers made

GOOD CLEAN COMPETITION

— *Racing idea*
by Clare Van Ausdal


AHA Vehicle Conversion instructors are starting a program for clean go-cart racing. \$1,500 will provide you with the thrill of racing and the satisfaction of knowing that you are leading the clean trend in competitive racing.

These H-cart racers will be identically constructed to allow clean racing to get started with all participants using an equal design. As soon as we have orders for 10 H-carts we will start building them. They will sell loaded with hydrogen ready to run for about \$1,500 each, FOB AHA headquarters.

If you would like to participate as a sole owner or co-sponsor for a H-cart, please contact Clare Van Ausdal at AHA.

So racers, order your H-cart racers, start your engines, and find your place in history as you clean the world.

outside the USA, spend \$100 and buy memberships in AHA for three friends.

There are a hundred ways each of us could increase the good that AHA is doing, and thereby take greater steps toward a better future for us all. We can help right now, *when it is most needed*, rather than wait and take the chance that by the time we do look back, we won't want to face the truth of what we left behind. 

Thank you Photocomm for donating photovoltaics for the wonderful solar music boxes that Marie Davis made to celebrate our five year anniversary. Marie's music boxes were especially prized by music affectionatos that appreciate the need to adopt renewable energy practices. Thank you Photocomm, thank you Marie, and thank you music lovers for buying the solar music boxes. If you would like to purchase a solar music box, the cost is \$15.00.

ECOLONOMICS- Notes On What Interesting Members Of AHA Are Doing -

— by Roy McAlister

Dennis and Gerry Weaver are practicing what they preach. Having entertained millions in his outstanding roles in television serials and movies, Dennis Weaver and his beautiful wife and health guide, Gerry, are showing us how to live in harmony with nature.

The Weavers have built an Earthship. As the Weavers' philosophy goes it is important to make better use of things that ordinarily go to waste. Their home in Colorado is made from recycled tires, aluminum cans, and many other materials that are blended into an Earthship. And it is a charming result that shows how good it is to practice the three R's ... Reduce, Recycle, and Reuse.

Solar energy powers their Earthship. Solar energy is utilized in their passive solar mass heating system, for active water heating, for day lighting, and it powers their greenhouse project that removes carbon dioxide and adds invigorating oxygen and moisture to the atmosphere. They grow much of what they eat within their Earthship.

Earthship is the Weavers' living laboratory for discovery of what works in their search for a more satisfying life. It is an example of what Dennis Weaver calls "Ecolonomics" which is the study of science, ecology and economics. He envisions graduates of Ecolonomics bringing environmental protection into the main stream of industry and commerce.

Weavers' support and encouragement of education for profitable environmental protection has been acclaimed by science and industry. Ecolonomics is offered as a course of study leading to a Master of Science degree at Colorado State University.

To learn more about Earthship, how it was built, what it looks like, and what it means to live in harmony with nature, order a copy of Dennis Weaver's Earthship video from the American Hydrogen Association.

The Weavers are Charter Members of the AHA.

New Paradigm — Are We Ready For A Paradigm Shift?

— By: Priscilla Atyeo

It is commonly observed in philosophy of science, that newcomers to any discipline are the ones most likely to make important new discoveries. Long-time practitioners have a vested interest in the accepted paradigm. In many cases, their whole careers have been devoted to expanding upon the currently accepted set of practices and to the theories that support these practices. Sometimes more and more complex theories have evolved in order to maintain the status quo. There seems to be no limit to rationalization of irrational practices.

During medieval times, it was accepted that the earth was the center of the universe. Medieval church philosophers used this to support teleology, the theory that everything in existence was provided by God for the sake of man. As science advanced, it became more and more difficult for scientists to account for their observations within this framework. When Galileo advanced a theory accounting for what seemed contrary to

teleology, he was tried for heresy. Tycho Brahe bequeathed his observations to Keppler, but begged him not to use them to prove that the earth moves around the sun. Ultimately, these paradigms were discarded, but not without sacrifices. And even today, some have clung to this theory and developed complex mathematical equations and rationalizations that support the paradigm of earth as the center of the universe.

Today, in a similar way, corporate America and the U.S. Government have a vested interest in fossil fuel. The world banks, backed by the United States, are urging Mexico to pledge its fossil fuels to support loans to its economy; in this instance, fossil fuel replaces gold. Many businesses and governments have based their financial stability on a fossil fuel standard even though fossil fuel is finite and not renewable. They have a vested interest in a fossil fuel economy even though this fuel pollutes the environment, causes inflation, and wars. De-

spite evidence of the difficulties this is causing, corporate America insists upon relying upon fossil fuels and virtually denying the wisdom of adopting renewable resources.

Any change has to be driven by people that decide to act independently of vested interests in the status quo. It is difficult for people dependent upon a paradigm to understand the problems it causes or to find solutions. The task of finding alternates to fossil fuels and practical solutions to the energy problems must fall to grass-roots movements led by people outside of America's fossil-fuel paradigm. Only these people can entertain the clear vision necessary.

Margaret Mead summed it up: "*Never doubt that a small group of thoughtful committed citizens can change the world; indeed is the only thing that ever has.*" So, thank you for your thoughtful committed work to create sustainable prosperity without pollution.

New Organization Formed in Europe To Promote Use of Renewable Energy

Brussels, Belgium: EUROFORES (European Forum for Renewable Energy Sources) has been established to facilitate the use of renewable energy resources in Europe. The new organization is an outgrowth of the "Action Plan for Renewable Energy Sources in Europe" conference held in Madrid last March. Primary sponsors of both the new organization and the conference are Foundation Canovas del Castillo and its president, Rob Piquer; the European Commission; the European Parliament's STOA Programme; and the collaboration of the Spanish energy authorities.

EUROFORES aims to coordinate efforts by a variety of European entities to increase the use of renewable energy. The forum aims at a "greater coordination and consensus between all involved including: institutions, in the promotion of renewable energy through the coordination with other "converging initiatives" such as the European Solar Council, UNESCO's World Solar Summit Process and organization such as Eurosolar.

Governing board of EUROFORES will have as President, Mr. Piquer; vice president, Anastasios Mandelis, Greek Secretary for Energy; and Eryl

McNally, a member of the European Parliament.

"All activities should lead to the organization of a new conference in 1996 which will keep the spirit of the Declaration of Madrid through the setting up of ambitious but realistic targets aiming to substitute 15% of conventional primary energy demand in the European Union by renewable energy by the year 2011."

For information on EUROFORES, contact: Carlos Roblas Piquer, European Parliament, Rue Belliard 97-213, Office RMA 217, B-1047, Brussels, Belgium. Fax: 32-2-2849771.

SUNS RAFFLE

continued from page 1

thanking Whataburger for their support. Be sure to tell them you're a member and supporter of AHA whenever you visit a Whataburger restaurant.

The drawing for the Suns tickets is scheduled to be held during the 25th Anniversary of Earth Day on April 22nd, and the lucky winner will be contacted by AHA that same afternoon and told they can pick-up the tickets at the Will Call window at America West Arena on the day of the game.

Many Arizona members of AHA will be receiving a small packet of tickets to purchase and/or sell for AHA. Selling these tickets can be fun, but members are also encouraged to get involved and assist AHA with the raffle in order to help make the fund raising event a financial success in support of AHA's work.

To learn more about the raffle, or if you would like to obtain additional tickets from AHA, you should contact Kathy McAlister at AHA's National Headquarters at (602) 921-0433. Additional tickets will be mailed to you immediately upon request.

Your Exhaust Components -OR- Are You Being Gassed?

Gasoline and MTBE exhaust components are:

Toluene
Ethylene
Propylene
Isobutylene
1,2,4-Trimethylbenzene
2,2,4-Trimethylpentane
p-,m-Xylene
1,3,5-Trimethylbenzene
Isopentane
1,3-Butadiene
4-Methyl-2-Pentene
P-Cymene
O-Ethyltoluene
O-Xylene
1-Butene
Formaldehyde
Toxic emissions are defined as the sum of the benzene, 1,3-butadiene, formaldehyde and acetaldehyde emission rates.

In a report released in December 1993, EPA has concluded that there is unlikely to be a substantial risk of acute health symptoms

among healthy members of the public receiving "typical" environmental exposures under temperate conditions. However, EPA says it is possible that there are more sensitive members of the population who would respond and that higher concentrations than those used in the human clinical studies could cause effects.

Animal studies have shown developmental effects from repeated exposures to high concentration of MTBE. Human developmental risks cannot yet be defined quantitatively. However, based on the concept that a short-term exposure during a critical period of sensitivity can potentially cause a developmental effect. EPA says, there is potential risk for developmental toxicity if human exposure exceeds 48 milligrams per cubic meter, which would include some gasoline fill-up scenarios.

MTBE is not unique among gasoline constituents in having

Continued, next page

Rescission Bill — Targets Solar And Renewable Energy:

— Thomas L. Rosenberg

A rescission bill that cuts more than \$150 million from energy efficiency, renewable and other clean energy programs from the fiscal year '95 budget, will come up for a vote before the House Appropriations committee around March 1st. Rescissions target money appropriated but not yet spent. Two Appropriations subcommittees, Energy & Water and Interior, passed the rescissions earlier this week. Appropriations committee chair, Bob Livingston (R-Louisiana), is directing the rescission campaign, and wants a floor vote by March 11.

The proposed rescissions would cut into several clean energy programs at the Department of Energy:

- \$35 million from solar and renewable programs.
- \$ 6 million from environmental health and safety.
- \$15 million from biological and environmental research.
- \$45 million from non-defense environmental restoration & waste management.
- \$58 million from energy conservation

Despite the federal budget squeeze, Walker, a longtime hydrogen advocate, is using his new power to push a bill, the Hydrogen Future Act, that would earmark \$100 million in

federal funds for hydrogen research and development projects over the next three years.

The House of Representatives passed a similar bill last year, but it ran out of time in the Senate. This year, prospects are good that the legislation will get through both chambers and be signed by President Clinton.

The only good news for clean energy activists is a \$21.75 million cut in fossil fuel research & development. The advanced neutron subsidy was cut by \$7.5 million.

While reducing the deficit is important, clean energy programs that protect the environment, reduce our dependence on foreign oil, increase U.S. competitiveness in global energy markets and create jobs should not be sacrificed. The federal government should support clean and emerging technologies like solar. It does not make sense to further subsidize dirty, established and wealthy industries like oil, gas, coal and nuclear energy. YES...for renewables.

President Clinton will be making an important announcement on Earth Day ... Could it be?? Renewables.

Exhaust

Continued from previous page

environmental effects in laboratory animals. The potential of the mixtures and the effect of individual components of gasoline to cause developmental toxicity must be considered and weighted against potential added risk from MTBE in order to provide a complete analysis.


It is concluded that there is no significant carcinogenicity public health hazard from the addition of MTBE, although SOME HAZARD IS POSSIBLE AND SHOULD BE FURTHER EVALUATED. The current carcinogenicity assessment supports a hazard classification of "possible" human carcinogen, based upon limited animal evidence.

MTBE is added to gasoline, which itself (gasoline) has a

whole-mixture hazard classification of "probable" human carcinogen and a relatively low estimated potency. Although what effect the addition of MTBE has on the carcinogenic activity of the oxyfuel mixture is unknown, the MTBE component itself seems to be no worse than the non-oxygenated gasoline mixture.

Symptoms: Headache, eye irritation, burning of nose/throat, cough, nausea, dizziness, spaciness.

US-EPA phone (202) 233-9010 ask for report: EPA Clears MTBE of Serious Health Effects Charges.

Don't you think that we need a truth in advertising and labeling? 

Solar Tax Credits for Arizona

The Arizona Department of Commerce Energy Office, working in conjunction with Arizona Solar Energy Industries and other groups, is developing rules and consumer protection safeguards for the state's new up-to-\$1,000 tax credit for solar energy equipment purchases.

A 25% credit on state personal income tax for purchases of solar and wind-power equipment went into effect January 1, 1995. The tax credit was created by the legislature last year.

As currently envisioned, future eligibility for the credit would depend on whether the equipment met certain performance standards and whether the system had been installed by a technician certified by the state to perform such work. These safeguards are being contemplated as a result of lessons learned from a previous solar tax credit that was in effect during the early 80's.

For more information, phone the Energy Office at (602) 280-1402

On The Road To Sustainable Transportation — Cornell University Hybrid-Electric Competition Vehicle Will Be Fueled By Compressed Natural Gas

— *By: Tom Pollak*

Students from Cornell University in Ithaca, NY have built a new hybrid-electric vehicle (HEV) fueled by compressed natural gas (CNG). This is the school's third HEV built from the ground-up for national competitions and the first designed to operate on CNG.

Cornell's 1995 vehicle, the "Tempest", will compete in the Department of Energy Advanced Student Hybrid Electric Vehicle Challenge (DASH) in Los Angeles starting March 27th. This year the team will also compete in the Tour de Sol sponsored by the Northeast Sustainable Energy Association which will be held May 20-27th.

All of the entrants in the 1993 and 1994 Challenge competitions were powered by liquid fuels, either gasohol or alcohol. The Cornell HEV team along with sponsors New York State Electric and Gas Corporation (NYSEG) and Consolidated Natural Gas Company of Pittsburgh, petitioned for a rules change for the 1995 DASH competition to permit the use of CNG. The Cornell HEV will be the first vehicle to compete using a gaseous fuel.

The Cornell HEV contains an alternate power unit (APU) which generates electrical power from natural gas and is just large enough to move the vehicle at constant highway speeds while simultaneously recharging the batteries. Peak power needs for acceleration and grades are met with power stored in batteries. The batteries can also be used to operate the vehicle without the use of the APU for times when zero emissions would be required. The APU is not connected to the wheels mechanically.

The Cornell APU consists of a 0.993 liter Suzuki 3-cylinder engine modified to operate on low-pressure natural gas. The engine is mated to a

Fisher alternator to produce the 14.6 kW minimum output needed at a steady 3000 RPM.

Fuel is delivered to the engine after two stages of pressure reduction from a maximum of 3,000 psi contained in the vehicle's fiber-reinforced composite CNG cylinder. Emissions control is accomplished by adjustments to the fuel ratio, timing and modifications to the engine as well as by the addition of a Chrysler Corporation CNG three-way catalyst.

Electricity produced by the APU is managed by a power and data control network which routes power to the drive motors or to storage in the vehicle's Trojan batteries. Throttle response resembles the 'feel' of a conventional vehicle by the use of an electric motor control systems (EMCS). Both the energy and data management systems and the ECMS are student designed. Regenerative braking is used to recover some of the power that would otherwise be lost as heat in the disc/drum brake equipment.

The Tempest HEV has a thermal management system for the passenger compartment to provide for driver comfort. An innovatively designed Carnot refrigeration cycle heat pump that directly consumes about 1kW of power is able to provide 2303 watts of heat and 1954 watts of cooling!

The first stage has been the advancements in the hybrid-electric platform in order to realize overall system efficiency gains compared to the present automobile configuration. The second stage is the public's acceptance of the CNG-fueled hybrid-electric as the vehicle of choice.

Finally, with the acceptance of a gaseous fuel for vehicle operation, the transition to hydrogen will be a matter of good economics. Carbon based

compounds have too much value to society to be used 'once-through' as combustion fuels. Additionally, the use of a renewable, carbon-free fuel for the bulk of personal transportation will alleviate many problems caused by fugitive hydrocarbon emissions and atmospheric carbon gasses, aldehydes and acid precursors.

Since the desire to be mobile is part of human nature, the question of how to accommodate this desire arises. We can define a mass transit system as the means of getting as many people and their cargo, to as many places as they want to be, when they want to be there. By that definition, our system of automobile travel qualifies as a mass transit system. The problem is that our system is not sustainable because of the inefficiencies and the undesirable by-products. The Hydrogen-Hybrid is too important to the future for it to be anything but inevitable.

Editor's comment:

Good luck to the Cornell HEV Team - there is a lot more at stake than this year's competitions!



**Arizona Welding
Equipment Co.**

*Hydrogen & Other
Industrial Gases*

Main Warehouse &
Office Location

4030 W. Lincoln St.
Phoenix, AZ 85009

(602) 269-2151
FAX: (602) 278-8607

Letters

Dear AHA,

Sorry about my neglect in sending membership dues for 1994. We had a hectic year between work woes, moving and the birth of our son, Tristan. I appreciate your forbearance on my behalf. Enclosed, please find a money order for my membership for 1994 and 1995.

Benita and I would like to find some property with a creek to set up a hydroelectric-hydrogen homestead. When we become rich and famous, we'll be asking for technical assistance in setting up an electrolyzer/fuel cell combination as a shunt load/gen set when the NiCads are full.

My students this year are more enthusiastic about clean, renewable energy. We're planning a steam turbine project for science class, which will be used to turn an alternator and power an electrolyzer. The only drawback (from a pollution standpoint) is having to burn wood in the boiler to create steam, but the idea is to utilize waste heat from a woodstove flue to co-generate electrical energy, which we can store as hydrogen.

I'm looking forward to hearing from you in the future.

*Respectfully,
Robert L. Scott, Jr.
1/22/95*

Dear AHA,

On behalf of the students, parents and teachers at Madison Simis Elementary School, I would like to express our sincere gratitude for your presentation on Thursday 16, 1995.

AHA's pick-up truck which was powered by Hydrogen and Solar Electricity, made a very graphic display for all of us. Your scientific explanations and hands-on experiment presented to the fourth grade classes at Simis were also very interesting. Copies of any follow-up science or language arts work will be gladly forwarded for your records.

Your time and efforts and great personality were appreciated by all!

*Thank you again.
Lisa J. Dent
PS's Environmental Education Committee
Madison Simis Elementary School*

Package Gas Services
Air Products and Chemicals, Inc.
4625 South 36th Street
Phoenix, AZ 85040-2903
Tele. (602) 437-0144
Fax (602) 437-3130

Expanding Along The Centerline

Dear Dr. McAlister,

I read with great interest your article "Search for the Oldest Hydrogen Cylinder" published in the Volume 5, No 3, 1994 issue of Hydrogen Today which, through the miracle of modern communication technology, reached my desk today.

As designers and suppliers of industrial hydrogen plants, we are often asked to justify the use of carbon steel for piping and devices containing hydrogen, the concern being embrittlement and to a lesser extent "seepage". While we can point to codes (API, etc.) to justify our material selection, it occurs to me that the anecdotal evidence in your article, written by an authority on hydrogen, would add to our arguments.

Could you please advise if reprints of the article are available or, failing that, provide us with permission to reproduce/copy the article or excerpts of it for distribution to potential customers. Thank you.

Yours very truly,

*The Electrolyser Corporation LTD.
Ian D. Scott
President*

PS In your penultimate paragraph you advise that "...hydrogen pipelines made of carbon steel tubing are expanding." I trust that on closer examination it will be found that it is the use of such pipelines, rather than the pipelines themselves, which is expanding. If it is the latter, the premise of the article must be in danger.

Answer: Thank you for your inquiry. Regarding expansion of carbon steel tubing pipelines for hydrogen service, please note that the reported expansion has been along the centerline.

Upcoming Events . . .

Land Office Hosts 6th Annual AVF Market Fair & Symposium

— *By: Ron Calhoun and Jeff Long (512) 463-5339*

The 6th annual AVF symposium will bring together more than 3,000 influential alternative fuels industry leaders and exhibitors to discuss new ideas and the latest technologies in alternative fuels. In addition, the economics of fleet conversions and other issues such as benefits to the trucking industry will be analyzed during several panel discussions.

"All the citizens of North America are increasingly aware of the consequences of unclean air. I am pleased to welcome government officials and business people from our neighboring countries so that we might work toward a cleaner, safer environment in a mutually beneficial way," Garry Mauro, Texas Land Commissioner, said.

Mauro said we know medical professionals, like Mary Nichols, Assistant Administrator, Air and Radiation, for the U.S. Environmental Protection Agency, will be on hand to discuss this serious issue associated with pollution. Nichols will provide the opening day keynote address on the environmental benefits of using alternative fuels to improve

air quality and public health. The Minister of the Canadian Environment, Land and Parks, Mr Moe Sihota will deliver the Keynote address on May 2 at 9:10 a.m.

This year's conference will also highlight an International Pavilion to welcome participants from Mexico and Canada. Mexican Consulate Dr. Miguel Angel Orozco Deza and Canadian Consul and Senior Trade Commissioner Warren Maybee will give welcoming remarks at the International Pavilion. The welcoming reception will be held on May 1, from 5:15 to 7:00p.m. at the Austin Convention Center. All participants are welcome to attend.

The General Land Office is also sponsoring a design competition encouraging graphics designers to propose a universal logo for alternative fuels emphasizing their benefits to the domestic economy and the environment. Deadline for entries is March 31st.

Call DeeAnn Denton, Conference Coordinator at (512) 463-7607 or 1-800-6-FUEL-99.

BIG LOSSES OR BIG GAINS - Its your future

— *by: Kathy McAlister*

At the U.N. Conference On Global Warming that started on March 28, 1995 in Berlin, Mr. G.O.P. Obasi, head of the World Meteorological Organization reported that "an increasing number of extreme weather-related disasters" has convinced him of the need to greatly reduce emissions of greenhouse gases such as carbon dioxide and methane. Richard Keeling, chief underwriter for Lloyd's of London, and other top European insurance representatives have reached similar conclusions and urge increasing concern about environmental catastrophes. Keeling stated that insurance companies lost over \$20 billion because of Hurricane Andrew in 1992. Bankers also showed up at the Berlin conference. Mr. Tony Sampson manages for the National Westminster Bank of London, he said that environmental change is a serious business issue.

However, discussions of greed and hardship bogged down the first days of a two-week U.N. conference on slowing global warming. This meeting of 130 nations was designed as a follow-up to the 1992 Earth Summit in Rio de Janeiro, Brazil. There, delegates adopted the Convention on Climate Change, which forces industrialized countries to reduce carbon dioxide emissions to 1990 levels by the year 2000.

Carbon dioxide, a by-product of fossil-fuel combustion, is the most common greenhouse gas, which traps solar energy in the atmosphere. 127 Nations ratified the Rio accord...the U.S.A. signed when President Clinton took office. But U.S.A. rejects

any tough targets and timetables until "scientific-uncertainties" are resolved. It was NASA (our own premier scientists) who provided early scientific results on atmospheric accumulations of greenhouse gases and ozone depletion.

Saudi Arabia, Kuwait and other wealthy oil producers say that reducing CO₂ emissions would devastate their economies by cutting off their source of income, the sale of oil. World fossil reserves are being depleted at an ever increasing rate. Within a life time, most of the world's oil reserves will be converted to carbon dioxide. Oil Producing and Exporting Countries have about 77% of the known oil reserves which now measure about one trillion barrels. The U.S. is the world's largest oil consumer and the U.S. economy hemorrhages at the rate of about one billion dollars every 5 days to pay for imported oil. The U.S. is dependent upon foreign oil imports for 60% of the oil that is burned.

In the U.S., utility power plants produce more carbon dioxide than any other source. The U.S. produces about 38% of the world's man-made carbon dioxide emissions. This compares with about 7% for Germany and 6% for Japan.

We need a continental-scale invention to provide sustainable prosperity and curb pollution. Renewable Energy Parks using wind generators in Canada and the Dakotas; solar thermal gensets in the sunbelt and Mexico;

continued back page

Important Dates of AHA:

- AHANationalMeetings:** (Third Wed of each month): Roundtable discussions: (Like AHA's first meetings) Conference Room B: Student Service Building at Az State University: 7:00-9:00 p.m. Contact: Roy McAlister (602) 921-0433
- Southern California Chapter** of AHA monthly Meeting: Contact: Dick Williams (800) 854-5225.
- AHA - Silicon Valley Chapter:** BBS@(415) 494-3116 (1200 to 14,400 BAUD, 8N1) Phone/fx (408) 738-4014: Monthly meetings:
- April 97** - Washington, D.C. - **SOLAR '97** - Solar Energy Industries Association (SEIA) and the American Society of Mechanical Engineers - "26th American Solar Energy Society Annual Conference, the 22nd National Passive Solar Conference and SOLTECH. Contact: Becky Campbell-Howe (303) 442-3130, Fx (303) 443-3212.
- April 7-9** - Los Angeles, CA - "Fifth Annual Eco Expo West".
- April 9-11** - Atlanta, GA - **1995 Clean Air Vehicle Conference Expo & Grand Prix** - Galleria Center: Clean Air Vehicle Association: (404) 237-1980.
- April** - Asheville, North Carolina - **25th American Solar Energy Society Annual Conference & the 21st National Passive Solar Conference.** Contact: Becky Campbell-Howe (303) 442-3130, Fx: (303) 433-3212.
- April 9-12** - Phoenix, AZ - **Pointe at Tapatio Cliffs - Marketing Conference** - American Gas Association (703) 841-8573.
- April 9-13** - San Antonio, TX - "SOLTECH '95" Hyatt Regency - Contact: Solar Energy Industries Association, 122 C Street N.W., 4th Floor, Washington D.C. 20001: (202) 383-2600; fx: (202) 383-2670.
- April 10-12** - Dallas, TX - **Gas Mart '95 - Natural Gas Intelligence:** (703) 318-8848.
- April 18-20** - Chicago, IL - **AMERICAN POWER CONFERENCE;** Chicago Downtown Marriott; Contact: Illinois Institute of Technology - Craig Moritz (713) 621-8833 fx: (713) 963-6284.
- EARTH DAY: April 22, 1995**
- April 21-22** - Phoenix, AZ - "EarthFest '95" Arizona Center (9:a.m. - 6 p.m. Friday - 9:a.m. to Noon on Sat) Contact: Valley Forward Association (602) 240-2408.
- April 22** - Sedona, AZ - "Pollution Solutions", Earth Day Celebration, Red Rock State Park; 8:00a.m. to 5:00p.m.; Contact: Barbie Hart (602) 282-6907; fx: (602) 282-5972.
- April 22** - Phoenix, AZ - "Earth Day 25th Anniversary"; Contact: K. John Sanford, P.O. Box 40103, Phoenix, AZ 85067-0103 or James Bailey (602) 266-8044.
- April 29-30** - Phoenix, AZ - **COWnty Fair Time Environmental Expo** - Contact: Sandy (602) 252-0717.
- April 30-May 2** - **Alternative Vehicle Fuels Market Fair & Symposium:** TOPTEC; Austin Convention Center; Texas Conservation Funds/Texas General Land Office: 800-638-3599.
- May 7-10** - Orlando, FL - **National Association of Fleet Administrators Annual Convention & Exhibition:** Orlando Marriott World Conf. National Association of Fleet Administrators: (908) 494-8100.
- May 8-10** - Shanghai, China - **1995 International Conference on Energy & Environment;** Contact: Prof Zhi-Hang Chen, Tel: 86-21-5434883 fx: 86-21-543-1258.
- May 9-11** - Downey, CA - **1995 North American Gas Efficiency Exposition & Conference** - So Cal/Gas Niagara Mohawk Gas: (310) 498-8160.
- May 13** - Tucson, AZ - Catalina State Park - "Tucson Solar Potluck"; Contact: Toby Schneider (602) 292-9020.
- May 15-19** - Lakewood, CO - "13th NREL Photovoltaics Program Review Meeting" Contact: Jeri Wagner (303) 275-4317; Fax (303) 275-4320.
- May 20-27** - Waterbury, CT to Portland, ME - "Seventh Annual American Tour de Sol" Contact: NESEA (Northeast Sustainable Energy Association) 50 Miles Street, Greenfield, MA 01301; (413) 774-6051.
- May 23-24** Atlanta, GA - SAE's The Future of the Diesel Engine - TOPTEC; Ritz Carlton, Buckhead: Society of Automotive Engineers: (412) 772-7148.
- May 23-25** - Boston, MA - **New England Automotive Show** - Baysie Exposition Center: England Automotive Show: 800-798-4842.
- June 12-15** - Selangor, Malaysia: University Kebangsaan Malaysia @ Bangi - **First International Conference on Advances in Strategic Technologies;** Contact: Faculty of Engineering: +03-8293400/8293402; fx: +03-8252546; E-Mail: CAST@ENG.UKM.MY
- June 23-25** - Amherst, WI - **Midwest Renewable Energy Fair** - Portage County Fairgrounds - P.O. Box 249, Amherst, WI 54406; (715) 824-5166 - Christine Hulet, Executive Director
- June 26-29** - Cassino - Gacta, Italy - **Hydrogen Power Thermal & Electrochemical Systems International Symposium;** Contact: S.P. Cicconardi: +39 (776) 299-521, 311-082, 299-527; fx: +39(776) 310-812.
- July 9-13** - Montreal, Canada - **New Materials For Fuel Cell Systems International Symposium;** Contact: Prof. O. Savadogo Tel: (514) 340-4725; fx: (514) 340-4468.
- July 15-20** - Minneapolis, Minnesota - "Solar '95" - "10,000 Solutions: Paths to a Renewable Future". Contact: Becky Campbell-Howe (303) 443-3130, Fx (303) 443-3212.
- August 9-14** - Washington D.C. - **Intersociety Energy Conversion Engineering Conference;** Contact: American Society of Mechanical Engineers, 345 E. 47th St., New York, NY.
- July 11-14** - Istanbul - Turkiye - ECOS'95 "Efficiency, Costs, Optimization, Simulation & Environmental Impact of Energy Systems"; Contact: Prof Y. Gogus, Tel: ++90 (312) 210-1000 Ext. 2596; fx: ++90 (312) 210-1113.
- July 16-21** - Henniker, New Hampshire (USA) - **Gordon Research Conference on "Hydrogen-Metal Systems";** Contact: Dr. Robert Bowman, Tel: (818) 812-1603; fx: (818) 812-8070.
- August 10-11** - Calgary Alberta, Canada - **Gas Fair Canada-** Contact: 800-517-6221.
- August 11-13** - Willits, CA - REDI (Renewable Energy Development Institute) "Conference '95" (707) 459-1256; Fax (707) 459-0366.

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

Notice Regarding Acknowledgments

— by: Roy E. McAlister

Corporate sponsors of American Hydrogen Association are acknowledged in Hydrogen Today. In instances, sponsorship consists of goods and services in addition to monetary support. No endorsement of any specific product or service is intended by the sponsorship acknowledgments provided in Hydrogen Today.

The American Hydrogen Association operates a laboratory in which products and services that support or relate to advancement of renewable resources are tested. Test results concerning products that have been tested are available after release by sponsors that provide products for testing.

Please inquire to the American Hydrogen Association regarding

corporate sponsorship and listing of products that have been tested by our laboratory.

As a benefit to new corporate sponsors, the American Hydrogen Association provides one free white paper on a subject of mutual interest. If your company needs a research or position paper on a topic relating to renewable resources, please contact us to initiate the process.

Its Your Future

continued from page 22

garbage and sewage biomass to produce electricity and hydrogen near cities; will be linked through the electricity and gas pipeline grids. Hydrogen on the way to transportation, electricity, and industrial markets can be stored in depleted natural gas fields.

It is shortsighted and foolish to waste U.S. leadership on defending dependence upon fossil fuels. Rolling back carbon dioxide emissions to 1990 levels is hardly worthy of U.S. scientific, manufacturing, and leadership capabilities. We can lead the world in achieving prosperity without pollution or we can continue to rationalize why we remain hooked on oil.

What is important is that grass-roots people do what is necessary to facilitate development of prosperity without pollution...because meetings like the ones in Rio de Janeiro and Berlin will continue to rationalize the need to burn fossil fuels. Grass roots people can equip their tractors, trucks, and cars to operate on renewable hydrogen. This will make a market for farmers (the grass roots people that bring the bread, eggs, and milk to sustain civilization) to bring hydrogen for transportation and carbon to make better wheels, bridges, airplanes, and golf clubs. The U.S. economy needs the equivalent of 1,000 new millionaires each week to make renewable fuel for overcoming the addiction on foreign oil that costs one billion dollars each week.

The choice is ours. Do we want to remain hooked on oil and are we willing to continue to sacrifice environmental quality? Or do we want to support the equivalent of 1,000 new millionaires each week to develop sustainable prosperity without pollution? Every one can make their car, back yard, farm, or school the subject of a renewable resources project. We can make a better world by converting one small project at a time. Pretty soon, all of the small projects are the renewable, clean, peaceful, and fulfilling world.

Editor's note: Kathy McAlister and Heather Devich represented AHA at the Rio Earth Summit Conference. They continue to write about what they learned from the Conference and events that have followed.

THE HYDROGEN ASSOCIATION
216 South Clark Drive, Ste. 103
Tempe, AZ 85281
USA

Non-Profit Org. U.S. Postage PAID Phoenix, AZ Permit No. 2295

Printed on Recycled Paper in the U.S.A.

ISSN 1081-1273