

HYDROGEN TODAY

Official Publication of the American Hydrogen Association (AHA)

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Page 1

NEW DIVISION OF THE HYDROGEN ASSOCIATION FORMING IN LATVIA

Following the euphoria of winning back their democracy last August after 51 years of Russian rule, the people of the Baltic country of Latvia are now faced with the day-to-day problems of producing and distributing food, water, and energy. The reemergence of this nation provides a perfect opportunity to introduce proposals for the use of renewable electricity and hydrogen.

Accordingly, plans are now being made to form a Latvian Academy of the Hydrogen Association. This academy will provide educational literature and scientific demonstrations concerning renewable energy resources to help solve environmental and economic problems and assist in the difficult transition from a petroleum to a hydrogen economy.

DONATIONS SOUGHT FOR HYDROGEN DEMONSTRATIONS

By Roy McAlister, AHA President

Cars, homes, buildings, farms, shopping centers, schools, and cities are wanted for conversion to renewable resources. The worldwide Hydrogen Association and the American Hydrogen Association believe the best way to improve the world is to start in our own back yards. If we live cleanly and prosperously using renewable resources, others will want to improve their standard of living and will follow our examples.

Suggestion by example is much more appropriate than pointing out the problem and waiting for the government or someone else to do something. Donations to non-profit organizations can provide important tax deductions and the satisfaction of making a better world.

(Please see "Donations .." on Page 2)

Assisting in the formation of this new international division of the Hydrogen Association are Dr. Michaelis Rudzitis, M.D., from Riga, Latvia; Paul Greenshields from Berlin, Germany, and Marcia Greenshields, AHA member from Tempe, AZ.

As Marcia Greenshields explains, "The Latvian Academy of Hydrogen can provide suggestions and aid in cleaning up a country that has suffered from years of unbridled pollution. Additional programs will explain how to derive hydrogen and carbon from agricultural wastes, garbage, and sewage."

Working in cooperation with the Riga Technological University, the Hydrogen Academy plans to investigate the manufacture of equipment and components used in renewable energy generation and use, including solar Stirling engines, gensets, electrolyzers, and wind machines.

Latvia has strong agricultural and light manufacturing industries, and up to 1940 had one of the highest standards of living in Europe. Rated as the most advanced agro-republic of the Soviet Union, Latvia has been able to maintain a standard of living much envied by the other Soviet republics. In addition, its location on the Baltic Sea and its sheltered Bay of Riga has enhanced Latvia's reputation as the premier resort area of the north.

Unfortunately, the beautiful public beaches where people used to swim are now closed due to pollution. Serious environmental pollution, in fact, is prevalent throughout this nation. There are no emission controls on cars and trucks, nor are there industrial pollution controls.

Marcia Greenshields points out that "in this period of national awakening and reformation, perhaps new ideas can be injected in the Latvian government and economic systems that will help rid it of some traditional wasteful concepts. Latvia is a small country similar in size and popula-

tion to many individual American states. This relative smallness should allow Latvia to begin projects based on the concept of prosperity without pollution as soon as a stable economic system has been established to allow it to determine its own independent future."

AHA DEMONSTRATES HYDROGEN FUEL FROM THE SUN

By Herb Hayden

At recent street fairs and school demonstrations, AHA members from the National Headquarters in Tempe demonstrated the manufacture of hydrogen fuel from sunlight using photovoltaic "solar panels" and an electrolyzer that separated hydrogen and oxygen out of water. This demonstration was part of a new AHA public display being refined for distribution to AHA chapters around the U. S.

The new display includes a bright new AHA logo and a poster-sized illustration of a solar-hydrogen fueled community of the very near future. The display shows many proven solar, wind, and ocean-thermal energy systems, a hydrogen transport ship, and a hydrogen-fueled aircraft.

Also included in the display is a working dish-Stirling engine whirring from the heat of the sun, which educated and fascinated kids and adults alike that have seen the display. Mechanically-inclined visitors were especially attracted to a cutaway model of an advanced-design hydrogen engine on display from AHA member Mel Larsen.

(See "AHA Display" on Page 3)

DONATIONS NEEDED TO BRING ABOUT PROSPERITY

(Continued from Page 1)

The principal source of funding for the Hydrogen Association and its divisions is through tax-deductible donations of money and goods. None of the officers of the Hydrogen Association or AHA are paid; all are donating both time and money to make these organizations possible.

We want to make a better world by converting cars from gasoline to hydrogen. After conversion, cars will be cleaning the air that they drive through. Similarly, we are looking for homes, office buildings, and factories to convert to operation on renewable resources. After conversion, we will publish comparisons of environmental impact and utility bills.

Example of One

Donation Arrangement

Agreements made during the past year concerning the donation of a Cadillac and conversion hardware serve as a model of how such donations can stimulate demonstration programs. A. V. Ottemoeller donated a 1978 Cadillac to the Hydrogen Association; and Trans Energy Corporation of Tempe, AZ, donated underhood equipment to convert the vehicle to run on hydrogen fuel.

The Hydrogen Association accepted the vehicle in an "as is" condition along with \$3,000 for repairs, storage tanks, and operating expenses and relieved Mr. Ottemoeller of any and all responsibility or liability from the further operation, maintenance, and disposal of the car.

Trans Energy Corporation agreed to install conversion components, including hydrogen injection and ignition equipment, storage tanks, and electronic controls for operating the car on hydrogen.

The American Hydrogen Association agreed to make the car available to stimulate development of new chapters and to environmental protection groups for demonstrations.

The Cadillac will be tested to establish the baseline of operation on gasoline and compared to operation on

hydrogen. Since Mr. Ottemoeller expressed a particular interest in having the car clean the air in his home state of Oregon, the Hydrogen Association has agreed to provide the converted Cadillac to the first chapter of AHA to be developed in Oregon; and through that chapter, to school and college officials, the American Lung Association, automobile dealerships, and officials of various cities, counties, and states, as well as to motor pool supervisors and others that are interested in the operation of motor vehicles on renewable fuels. The car will be provided for purposes of demonstrating driveability, fuel economy, reduced exhaust emissions, and for promotional events.

Mr. Ottemoeller's donations provide tax deductions and the satisfaction that a good example will be provided through AHA's Oregon Chapter and others that use the car in demonstrations of *how to clean the air with an automobile*.

In another instance, AHA is working with the World Survival Foundation (WSF) on programs to eliminate pollution. One demonstration program described in earlier issues of *Hydrogen Today* is based on a 1991 Oldsmobile Cutlass that has been provided by WSF for demonstration and racing with hydrogen fuel.

Turning "Lances Into Ambulances"

AHA and WSF believe that realistic solutions exist for preventing further destruction of protective ozone in the stratosphere. Substantial donations are needed to test the theory, including donations of hydrogen-powered ICBMs that are needed to deliver equipment to the stratosphere. In a modern way, this project would be turning swords into plowshares or lances into ambulances.

Many other donations throughout the world are needed to demonstrate how to continue the industrial revolution without continuing pollution. Consider donation of the lease of an office building to a new chapter of the

American Hydrogen Association. This would allow that chapter of AHA to conserve its funds and dedicate them towards various significant demonstration projects, including perhaps the design and construction of a permanent AHA chapter headquarters building that would be operated entirely on renewable resources such as garbage or sunlight.

Making Cash Crops From Waste

Consider also donation of the plant and equipment for converting city sewage and garbage to two new cash crops. Rather than being allowed to rot away to form greenhouse gases, any organic material such as sewage, garbage, grass clippings, and agricultural wastes can be converted to valuable hydrogen and carbon.

Hydrogen extracted from biomass can be used as a much cleaner substitute for gasoline and heating fuels. Carbon derived from these sources can be used in light-weight composite materials, for filter media, and in newly-discovered applications for spherical crystals called "Fullerenes". (See article on "Buckyballs" below.) In addition, future skyscrapers and bridges may be reinforced and prestressed by carbon fibers that replace steel to make stronger, safer buildings.

Why struggle with landfills when important new cash crops can be derived from sewage and garbage?

Prosperity without pollution is a real possibility if we demonstrate it and accept it as our purpose.

Any person that ever wondered "Why am I here on Earth?" can now set that question at rest. We are here to have prosperity.

But true prosperity requires environmental protection.

Achieving prosperity fulfills our intellectual, spiritual, and competitive capacities. Achievement of prosperity needs to be stimulated by self-improvement in our own backyards.

AHA DISPLAY PROVIDES H₂ EDUCATION TO PUBLIC

(Continued from Page 1)

This kind of a display helps tremendously in educating the public about the many technologies that have been developed but too often are not yet commercially available.

Where Did The Solar Hydrogen Come From?

To show how hydrogen can be made from the Sun, AHA needed an electrolyzer to extract hydrogen from water using electricity generated by solar panels. The problem was: Where do you get an electrolyzer on a small budget? Solution: You make it.

AHA members Claude Colbertson and Mike Mueller teamed up with Roy McAlister to put together an electrolyzer made out of parts readily available from K-Mart, Home Depot, and a local shade screen supplier.

For the purpose of the public display, the electrolyzer had to generate and separate for storage and use the hydrogen and oxygen gases extracted electrically from the water in a similar fashion to the way they would be in a real working application. A fine stainless steel screen was used for the two electrodes. "This screen provides a high surface area to help speed the electrochemical reaction," explained McAlister.

A material was needed between the electrodes that would keep the two gasses separate while allowing the process to continue. By experimenting, it was discovered that the "sandwiching" a fiberglass shadescreen insulator between sheets of the steel screen worked reasonably well.

To make the water conduct electricity more efficiently, baking

soda was added as an electrolyte, which worked without causing any hazard concern to the public.

The resulting display has generated a tremendous response from the public. Many did not know that it was possible to make clean fuel from the Sun at all, while most others were surprized to see how simple the actual technology can be.

NEW SOLAR CELL DESIGN COSTS LESS

(From "Nature", Oct. 24, 1991.)

The Switzerland Institute of Physical Chemistry has demonstrated a new photovoltaic cell design that uses less expensive materials in a lower-cost fabrication process. This new type of cell may allow photovoltaic systems to join wind and solar-thermal systems as types of renewable elec-

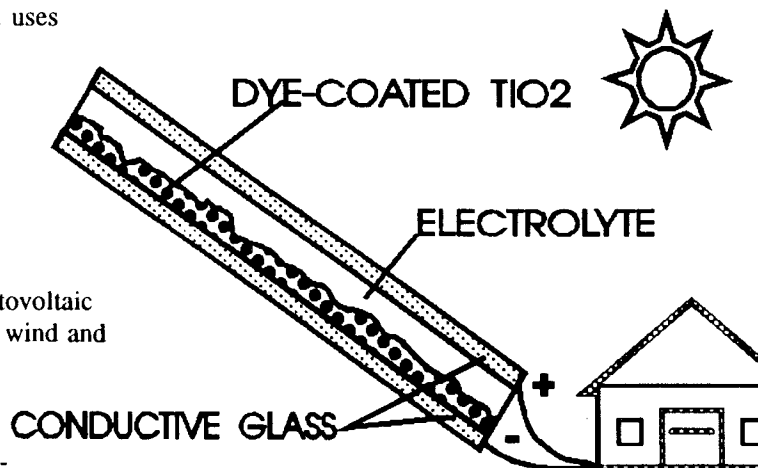
tricity producers that can be cost-competitive with conventional generation sources.

The new design uses titanium dioxide, TiO₂, in conjunction with a reddish-brown "charge-transfer" dye and an electrolyte to turn light into electricity. In testing, the experimental cell turned 7.1% to 7.9% of simulated sunlight into electricity; in diffuse sunlight, the cell yielded a 12% efficiency. By comparison, commercial solar panels made of high-purity silicon have about a 10% conversion efficiency.

The secret to the Swiss researcher's success lies in the enhancement of efficiency by increasing the active surface area.

Previous photoelectrochemical cells have had smooth surfaces that absorbed less than 1% of the light. For the improved Swiss cell, tiny "globs" of TiO₂, 15 nanometers in diameter, were deposited into a very rough, bumpy surface 10 micrometers thick. This leads to a significant increase in active surface area.

The TiO₂ film is transparent below ultraviolet wavelengths, so it would not capture normal sunlight on its own. In order to "harvest" light, a thin layer of a special dye was added. When a molecule of dye absorbs a photon, it injects an electron into the TiO₂ semiconductor. A conducting glass enclosure carries the electron out of the cell into the world as



useful electrical current, and then the external circuit returns the electron to the other side of the cell, where it travels through the electrolyte back to the dye molecule.

Though the new cell has somewhat lower efficiency than current silicon-based photovoltaic cells, the processes needed to make it are much simpler and less costly. The researchers did not make production cost estimates on their experimental design, but the intrinsically simpler manufacturing process involved should mean significantly lower solar cell costs, according to analysts reviewing the design.

Reported by Herb Hayden, P.E.

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(AHA)**

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Editorial:

The views expressed below are those of the author and do not necessarily reflect the views of the American Hydrogen Association. Opposing views are welcome.

CHICKEN LITTLE COTTAGE INDUSTRY

By Jim Gilley

It seems that all the "experts" of our day have found full-time jobs in the "Chicken Little Cottage Industry". Keeping the population in a constant state of anxiety over environmental issues must pay very well.

What newspaper or magazine can be found these days that doesn't contain the obligatory scary story on pollution or other ecological problems?

Some say that our technology is spoiling the planet. If this is so, why can't we use technology to save the planet?

Obviously there must be more money to be made by scaring the public than there is by presenting solutions to the problems we face.

A case in point is the energy problem. The technology needed to free us from the tyranny of hydrocarbon and nuclear energy already exists. By using this

technology, we could begin today to wean ourselves from our addictions to these more problematic forms of energy. Oh, we obviously could not abandon the old ways overnight; but at least we could make a start.

Hydrogen Is The Key

At the risk of "preaching to the choir", I submit that the key to this weaning process is the chemical element Hydrogen. The Earth has an inexhaustible supply of it. We know how to get it and how to store it. We know how to use it for generating electricity.

And yet, despite all this knowledge, Hydrogen is referred to a possible answer *far into the future*.

Could it be that our tycoons have not yet figured out an easy way to glean excessive profits from this technology? Or that once the public understands the processes involved, there will be no way for a few at the top to maintain an effective monopoly on energy supplies?

While we can only speculate on the reasons why the media keeps the public in the dark on the vital subject of hydrogen energy, we do not need to wonder about the effects of keeping people in a constant state of anxiety.

The "Dooms Day Lobby"

A serious backlash is developing. One talk-radio host now refers to the Chicken Little alarmists as "The Dooms Day Lobby". Their shrill testimony is being viewed with increasing skepticism as commerce is suppressed and joblessness spreads across the land.

A Wonderful Technology Can Solve A Myriad of Problems

There is technology available today that would lessen the impact of our presence on this planet while simultaneously stimulating our economy in almost every sector. Using this technology would provide thousands of new jobs while promoting productivity in other manufacturing areas. This

technology could dramatically clean up the air we breathe; it could solve the problem of our overloaded landfill areas. And it would make nuclear power plants totally obsolete, solving the horrifying problem of how to dispose of the spend but still lethal fuel rods.

The benefits of this wonderful technology go on and on. It could eliminate the US balance of payments problems, drastically reduce the country's deficit, improve its security. And on and on.

Too Much Time Wringing Our Hands; Too Little Time Using Our Heads

If all the published environmental news is bad, perhaps it's because the Chicken Littles has spent too much time wringing their hands and too little time using their heads. And maybe it's because our industrial and political leaders have advocated too many band-aid type solutions that have done more harm than good.

It's becoming obvious to thoughtful people that our domestic and world economy is a basket case. We can hardly take care of ourselves, much less help rescue other countries from disaster.

This country used to invent its way out of trouble. What happened to that spirit? Have we been too busy paying attention to the Chicken Littles?

Perhaps it's time we all discredited them entirely so we could focus our media reporting, our education, our industry, and our most intelligent thinking on the possible solutions to our problems.

A Solution Right**Under Our Noses**

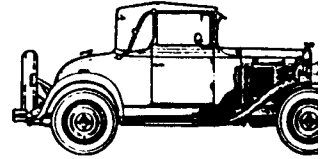
We may find at least one of those solutions is right in our hands, in the water we drink, and nearly everywhere on our Earth ... and even beyond. It's called Hydrogen.

ROUTE 66 CANYONBALL RUN



Environmental and Technology
"Expo"

April 17, 18, 19, 1992



— Featuring —
The History of Transportation

Be part of the historical "1992" 66th Anniversary Celebration of Route 66
and travel along with us on the most famous highway in the United States.

Flagstaff, AZ * Kingman, AZ * Las Vegas, NV



HIGHLIGHTS OF THIS EVENT

Alternative Fueled Vehicles and Fueling Stations
Solar * Electric * Hydrogen * Natural Gas * Reformulated Fuels
Also, Vintage, Classic & Special Interest Vehicles

SCIENCE FAIR

Universities, colleges and high schools will each display one Environmental and Technology Poster and one related Science Fair Project. Popular vote by fair attendees will determine the best poster and science project. The winning poster will be next year's official 1993 poster. Both winners in each category will each receive a \$500⁰⁰ U.S. Savings Bond. Other scholarships and grants will be awarded to outstanding students, schools and non-profit organizations for their participation. Trophies to be awarded to best show cars.

MANUFACTURERS & SPONSORS

Invitation to domestic and foreign automotive and industrial manufacturers to exhibit and demonstrate their latest product developments and nostalgia from yesteryear.
Government and private owners to exhibit their alternative-fueled vehicles.

GUEST SPEAKERS & CELEBRITIES

Invitations to Government & Industry Leaders, Hollywood Stars, Race Drivers and other prominent citizens involved with environmental awareness.

JUDGES & MEDIA

(DOE) Department of Energy — (EPA) Environmental Protection Agency
Automotive and Technology Magazines - Local & National Media

Notes: VIPs and celebrity appearances are subject to availability.
Confirm schedule of events prior to participation.

▲

SCHEDULE OF EVENTS

April 16, Thursday

Call for
convoy
schedule

Note:

Vehicles will convoy (optional) from each State Capitol to Northern Arizona University (NAU) domed stadium in Flagstaff, AZ for the set-up of displays and vehicle positioning after 6:00 p.m. Pre-registration starts at 4:00 p.m.

Displays and Science Fair will be held inside, vehicles will be parked outside next to stadium

April 17, Friday

9:00 a.m.

Flagstaff — NAU domed stadium and parking lot

Registration & ticket sales for events

10:00 a.m. - 10:00 p.m.

Vehicle show, science exhibits and technology presentations of the past, present and future

6:00 p.m. - 10:00 p.m.

50's - 60's Dance Party Sock Hop

April 18, Saturday

9:00 a.m. - 6:00 p.m.

Flagstaff, AZ to Kingman, AZ

All day Science Fair and Technology Show at NAU stadium only

9:00 a.m. - 10:00 a.m.

NAU dome stadium — speakers to address the history of Route 66, the environment and a briefing on the road rally

10:00 a.m.

Road Rally ... Ladies and Gentlemen — Start your engines or "whatever"

Leave stadium area on road rally trip to Kingman via I-40 to Seligman, AZ. Pick up Rt. 66 at Seligman, travel through Grand Canyon Caverns, Peach Springs, Truxton, Valentine, and Hackberry to Kingman Centennial Park

2:00 p.m. (approx.)

Arrive Kingman Centennial Park located near I-40 and Stockton Hill Road exit for check-in, vehicle show and judging contest

Note:

Make advanced reservations for overnight accommodations in Kingman, AZ or Laughlin, NV which is 30 miles west of Kingman via Route 68 located on the Colorado River

April 19, Sunday

9:00 a.m.

Kingman, AZ to Las Vegas, NV

Line up for parade at Centennial Park

10:00 a.m.

Leave Kingman Centennial Park via Rt. 66 (Parade through town)

Note:

There are four choices of routes to Las Vegas from Kingman.

1. Route 93, North across Hoover Dam
2. Route 68, West through Bullhead City, AZ & Laughlin, NV.
3. I-40 Interstate, Southwest through Needles, CA to Rt. 95, then North to Searchlight, NV
4. Old Historic Route 66, Southwest through the Ghost town of Oatman to Topock at I-40 and Route 66. (Caution: Mountain roads, curves and great scenery)

12 Noon - 2:00 p.m.

Vehicle check-in at University of Nevada at Las Vegas (UNLV). Thomas and Mac domed stadium parking lot (tentative) for final judging of vehicles.

4:00 p.m. - 5:00 p.m.

Awards presentation and ceremonies.

FOR MORE INFORMATION:

**American Hydrogen Association
219 S. Siesta Lane, Suite 101
Tempe AZ 85281**

Dan Parmley Sr., President
Diversified Technical Svcs., Inc.
5045 South 33rd Street
Phoenix, Arizona 85040

National Chairman
Route 66 Canyonball Run
Ph: 602-243-1642
Fax: 602-243-1659

ROUTE 66 CANYONBALL RUN

Admission tickets for single events can be purchased at the door
\$5.00 Adults/\$4.00 Students and seniors (55 yrs.+)/FREE Children under 12

For special rates and accommodations relating to your travel plans, call our host travel agent.
— A WORLD OF TRAVEL, 1-800-262-2968 —

REGISTRATION FORMS

General Admission for 3-day Event includes:

One person and a vehicle for the 3-day road rally and admission to the following 3 events:

April 17, 1992/Friday — Science Fair & Sock Hop at NAU

April 18, 1992/Saturday — Road Rally from Flagstaff to Kingman and Car Show at Kingman.

April 19, 1992/Sunday — Parade through Kingman, road trip to Las Vegas for car show & awards presentations.

For more information, call DTS/Rt 66, Phoenix, Arizona, 602-243-1642

Sponsors

For sponsorship of \$100 or more you will receive admission to the 3 day show and road rally April 17, 18,& 19, 1992 for (2) people. Also receive a 1992 Rand McNally Road Atlas, Environmental and Technology Poster and a Sponsorship Recognition Certificate.

(Options)

Advertising booth space in blocks of 10 ft. x 10 ft. at NAU stadium.

Promotional vehicle for show and road rally.

Expanded advertising is available.

For more information, call DTS/Rt 66, Phoenix, Arizona, 602-243-1642

1992 ROUTE 66 CANYONBALL RUN GENERAL ADMISSION

Receive a free 1992 Special Addition Route 66 Rand McNally Road Atlas (\$12.00 value) if payment is received by 2/28/92

Name _____

Address _____

City/St/Zip _____

Phone W _____ H _____

Yr. /Make _____ Mod. _____

Car Club _____

Display Vehicle Yes No

\$40 per person _____ x \$40 = _____

\$45 per person _____ x \$45 = _____

(After 2/28/92)

TOTAL _____

Make Checks Payable to: DTS/Rt 66
5045 S. 33rd St., Phoenix, Arizona 85040

1992 ROUTE 66 CANYONBALL RUN SPONSOR ADMISSION

Receive an extra 1992 Special Addition Route 66 Rand McNally Road Atlas (\$12.00 value) If payment is received before 2/28/92

Co. Name _____

Address _____

City/St/Zip _____

Contact Person _____

Phone W _____ H _____

\$100 or more sponsor _____

\$900/vehicle _____ x \$900 = _____

\$900/booth _____ x \$900 = _____

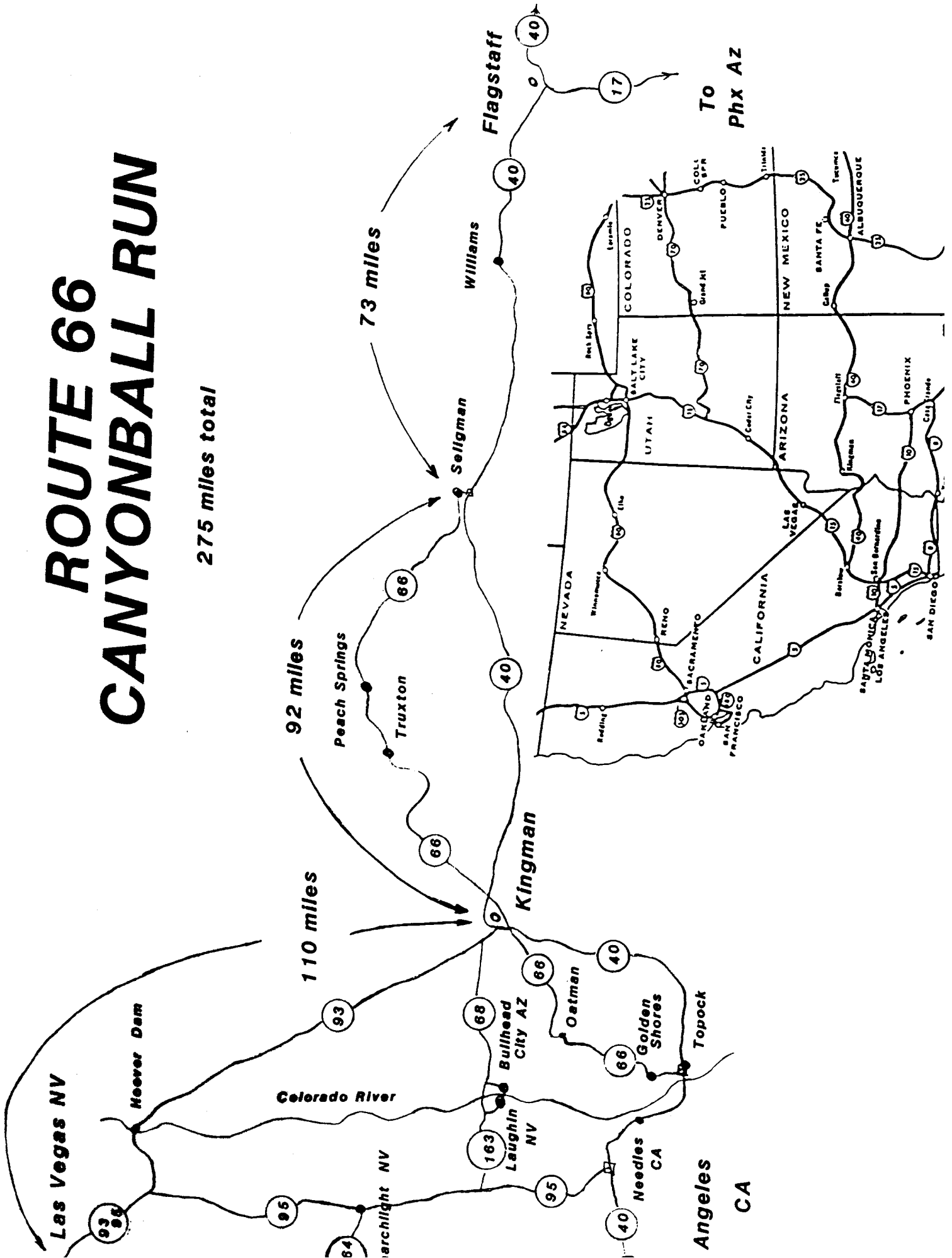
\$1,350 Vehicle & booth _____

Other _____ TOTAL _____

Make Checks Payable to: DTS/Rt 66
5045 S. 33rd St., Phoenix, Arizona 85040

ROUTE 66 CANYONBALL RUN

275 miles total



New Technology Review:

BUCKYBALLS -- "MAGIC" MOLECULES WITH GREAT PROMISE

Researched by Charles Terrey

"The biggest news in chemistry ...", claim some university professors. "A revolution", announces *Popular Science* magazine.

What is the big excitement? Scientists at several of the nation's top universities have discovered a totally different form of carbon. For centuries, we have known about two common carbon structures -- hard, sparkling diamonds, with carbon atoms neatly arranged in little pyramids; and dull, soft, slippery graphite, where the carbon is arranged in layers or sheets of carbon-atom hexagons.

Now, one of the most common elements on Earth can also be put together in an almost unbelievable structure -- 60 carbon atoms forming something that looks like a hollow soccer ball.

This new discovery makes all the old chemistry textbooks obsolete. But far more significant, this new element may provide a virtual "cornucopia of valuable applications", reports *Popular Science*. **Among these is the potential for high-density storage of gases like hydrogen.**

As scientists reporting in *Scientific American* observe, the C₆₀ balls can be packed as regularly "as billiard balls". They crystallize into balls as soft as graphite that when squeezed can become (according to predictions) even harder than a diamond. When the pressure is released, the balls spring back to their normal volume. These balls are extraordinarily resilient; even when thrown against steel surfaces at speeds greater than 17,000 miles per hour, they just bounce back.

These remarkable balls prove, by virtue of their peculiar structure, to be the roundest molecule that can possibly exist.

The official name for this new "superball" molecule is "Buckminsterfullerene", so named because its surface is formed by shapes that resemble the geodesic dome form invented by Buckminster Fuller. Informally, scientists call it "buckyball" or C-60. Its atoms are arrayed in a collection of 12 pentagons and 20 hexagons.

Buckyballs are actually only one of a family of similar molecules with a related geometry but with different multiples of carbon atoms. Chemists refer to the whole family as "fullerenes", and scores of chemists and physicists throughout the world are working at full steam to unravel their properties.

Cost May Approximate Cost of Aluminum

While buckyballs and their many relatives are only produced in small laboratory quantities at the present time, scientists predict that "when the first large-scale applications of fullerenes are found -- perhaps in superconductors, batteries, or microelectronics [or in gaseous fuel storage systems], the manufacturing cost of C-60 will probably fall close to that of aluminum: a few dollars a pound." As Professors Robert Curl and Richard Smalley of Rice University observe, "what has recently been described as the 'most controversial molecule in the Cosmos' is well on its way to becoming a bulk commodity."

Although a great deal of research and testing remains to be done, buckyballs may provide, in their hollow interiors, a very effective and efficient place to store hydrogen and other gases at low pressure and at near ambient temperatures. If this proves to be true, these little "magic" balls may solve one of the most nagging problems with using hydrogen as a transportation fuel. They may well make it possible to store hydrogen fuel at a volume energy density comparable to, say, gasoline in an inexpensive tank.

[Ed. Note: Possibly someday it will be transformed into buckyballs for use as fuel storage tanks, super-strong materials, superconductors, or a host of other high-value applications.] Industries can use the recovered metals and metallic salts."

Is this idea realistic? In the September/October 1991 issue of *Garbage* magazine there are reports of several waste recyclers and landfill operators trying to do more than just "contain" waste. One landfill in Delaware is designed to act as a "biochemical reactor", helping naturally-occurring microbes decompose waste into its basic chemical elements. This "composting" process

(Please see "Landfills" on next page)

AHA MEMBER ADVOCATES ALTERNATIVES TO LANDFILLS

During a recent presentation to Phoenix-area high school students, AHA member Charles Terrey spoke out against a new landfill site proposed alongside the Gila River bed on the west side of the Phoenix metropolitan area.

"We are told by the experts that we must have more landfills. We are told that all we can do with our

waste is burn it or bury it. What I want to tell you is that we do have an alternative. We need to rethink our beliefs and ideas about waste."

Mr. Terrey proposed that we learn to transform what we now call waste into raw material that can be used by industry to support our standard of living and quality of life.

What does this take? A chemical processing plant powered by solar energy can thermochemically transform waste and sewage into its chemical constituents of hydrogen, carbon, and miscellaneous other elements and compounds. Says Terrey, "We can use the hydrogen as fuel and recover the carbon as a building and manufacturing material.

LANDFILLS CAN YIELD WEALTH OF REUSEABLE MATERIALS

(Continued from previous page)

shortens the decay period from decades to years. Another Florida operation pulls recyclable material out of the waste stream, and the remainder is shredded and then composted. To handle the nastier liquid wastes, man-made wetlands made of artificial marshes and lagoons use weeds and bacteria to reduce pollu-

tants to hydrogen-rich gasses and clear water suitable for irrigation.

Furthermore, the National Renewable Energy Laboratory (formerly SERI), in conjunction with Sandia Labs, has been demonstrating the detoxification of hazardous wastes using solar energy. High-energy photons from concentrated sunlight are used with titanium dioxide as a catalyst to break apart contaminated water and chemical wastes. Dioxins, benzene, pesticides, TCE and PCBs are all turned into carbon dioxide, water, and dilute mineral acids and other easily-treatable products. Using solar energy avoids the use of fossil fuels and the unnec-

essary production of greenhouse gases and the pollutants associated with incineration. Costs of these systems are projected to be lower than competing technologies.

"These are examples of basic and practical waste processing systems, each directly or indirectly using only the energy of the Sun to produce useful raw materials and hydrogen-rich fuels," notes Terrey. "These systems can be followed with materials-refining methods to 'close the loop' on our consumption, enabling us to sustain our lifestyle and our economy without wasting our natural environment in the process."

AHA LEADERS ATTEND TWO ENVIRONMENTAL CONFERENCES

AHA leaders attended environmental conferences in Geneva, Switzerland, and El Paso, Texas, during the month of November, 1991.

In early November, Roy and Kathleen McAlister travelled to Switzerland to attend the World Clean Energy Conference.

The McAlisters' trip to Geneva was sponsored by the Adolph Schoepe Foundation.

Later the same month, Demetri Wagner and Roy McAlister attended the Southwest Border States Solar Energy Conference in El Paso, Texas. Highlights of these two conferences follow.

World Clean Energy Conference

This conference was organized for the purpose of preparing statements to be presented at the Earth Summit in Brazil in 1992. The Earth Summit, which is being sponsored by the United Nations, will be the first global forum to mobilize universal plans of action for improving the environment and opportunities in impoverished areas of the world.

Many Energy Alternatives Discussed

At the Geneva conference, considerable controversy was generated by several debates about alternative energy regimes. Discussed were the relative merits of "emission-free" nuclear energy; "clean coal"; oil ("how clean do you want it?"); "plentiful and clean" natural gas; and renewables, including hydroelectric, wind, wave, tidal, solar thermal, photovoltaics, ocean thermal energy conversion (OTEC), and biomass conversions. Eventually, renewable electricity and hydrogen were recognized as the best alternatives.

Even Perpetual Motion!

The McAlisters reported also that there were sideshows by perpetual motion advocates as well, including Stanley Meyers. Meyers claimed to be able to cross America in an ordinary car using his special device and 23 gallons of water for the car. No other fuel or energy input was presumably used. As AHA President Roy McAlister observes, "Stanley is great at sales, but he's terrible at science and truth!"

(Please see "World" on next page)

SW Border States Solar Conference

Papers were presented discussing the free-trade agreement between Mexico and the U.S. and the task of bringing electricity to rural areas of Mexico.

Rural Electrification Programs in Mexico

One object of accelerating rural electrification programs in Mexico is to keep rural populations from coming to Mexico City and other already heavily-populated areas. Some 80,000 villages do not have electricity except for batteries. Mexico imports food. These villages do not have assured water or sewage disposal or paved streets; but what their people want most are radios, televisions, and satellite dishes. The Mexican government will be spending some \$480 million to keep these rural populations away from cities.

Renewable Energy Prospects for Mexico

Mexico claims that it currently imports more renewable energy devices than any other country. Several points of interest concerning the application of renewable technologies in Mexico were presented:

1. The rural electrification program only works if Mexicans are involved in the decision, installation, operation, and servicing of the devices.
2. Texas has \$380 million remaining in their Restitution and Energy Development Funds. They are trying to help at least two photovoltaics manufacturers start new production lines in Texas, with plans to export some of their products to Mexico.

(Please see "Southwest" on next page)

World Clean Energy Conference

(Continued from previous page)

Global Renewal Savings Bonds

Kathleen McAlister was on the Finance Panel investigating ways to finance energy sufficiency without greenhouse gas production. She presented the suggestion of selling "Global Renewal" savings bonds. She envisioned special marketing efforts to various investor groups including women and children. The market appeal to this target group would be saving for a better planet and financing renewable energy projects. "With self interest in a better environment, investor children would be encouraged to learn more chemistry, physics, math, and economics, and, in general, to become more committed students," observed Mrs. McAlister.

\$1.7 Trillion in Annual Damages Attributed To Use of Fossil Fuels

Roy McAlister was on the Objectives and the Renewable Resources Committees. After much debate, the Renewable Resources Committee reached the conclusion that \$1.7 Trillion in annual damages and health costs were traceable to the fossil fuel economy. "Civilization has turned to mass consumerism," concluded the Committee, "and set in motion a geometric progression of man-made changes to the natural ecosphere."

A number of papers supporting proposed solutions to environmental degradation were presented, including OTEC concepts, a multitude of new nuclear fission fuel plants, hydroelectric, wind, photovoltaic, biomass, and solar thermal energy conversion regimes.

It became evident that many solutions exist and that much progress could be made if a program of sustainable development on a global scale could find a way to get beyond the obstacles of political, economic, and scientific interest groups. Education of the general public was considered the most important step in achieving sustainable development.

Hydrogen-Related Projects Announced

At the conclusion of the conference, the Russian delegation announced the intent to design and build hydrogen-powered aircraft; the Greenland delegation announced the intent to supply cryogenic hydrogen from hydroelectric plants when world markets develop; several African delegations expressed the willingness to export renewable electricity and hydrogen; and the Swiss bankers said they were interested in financing projects involving renewable energy.

Next Step: Brazil in June 1992

These recommendations will be presented in Rio de Janeiro, Brazil, on June 1 - 12, 1992, at the Earth Summit.

SW Border States Solar Conference

(Continued from previous page)

- Getting into the free-trade spirit, Mexico has recently passed legislation allowing cogeneration and total energy plants on private lands. The government remains reluctant, however, to allow wheeling of electricity.

Arizona Energy Office Takes Lead

The Arizona Solar Energy Office was on the planning committee and a supporting agency at this conference. Maxine Robertson from this office expressed hope that "energy-related trade with Mexico will be developed and expanded through trade relationships established and rekindled at this conference."

Practical Demonstrations Urged

While at the conference, Wagner and McAlister met with many educators, industrialists, and representatives of rural populations. Professors of several Mexican colleges and universities were pressed to demonstrate practical do-it-yourself solar energy projects. Both AHA representatives urged the professors to place emphasis on passive solar architecture and on making renewable energy systems in Mexico rather than continuing to import this technology.

Many of the delegates at the conference had heard of the American Hydrogen Association and were endorsing of AHA's message -- particularly when it was pointed out that "American" implied both South and Central America as well as North America.

COMING EVENTS

- January 15 - ASU/AHA Chapter Mtg., 7 PM, Student Svcs. Building Amphitheater, ASU Campus, Tempe, AZ**
- January 24 - 24 - Sonoran People's Summit. Contact Susan Ward at (602) 623-9141 for details.**
- February 11 - Southern Calif. AHA Chapter Mtg. Contact Dick Williams at (213) 949-9482 for details.**
- February 19 - ASU/AHA Chapter Mtg., 7 PM, Student Svcs. Building Amphitheater, ASU Campus, Tempe, AZ**
- April 17 - 19 - Route 66 Cannonball Run, A Race for the Environment, celebrating the 66th Anniversary of Route 66 with a World Class Environmental and Technology Exposition, international competition of alternative-fueled vehicles, and science fair.**
- April 22 - Sun Day, 1992. AHA joins Public Citizen (founded in 1971 by consumer advocate Ralph Nader) in launching Sun Day, 1992. This day highlights a major campaign advocating a national energy policy that reduces total energy use by 10% and triples the current contribution of renewable energy technologies by the year 2010.**
- April 25 - 26 - 2nd Annual Solar Electric 500, Phoenix International Raceway, west of Phoenix, AZ.**
- April 25 - 26 - Earthfest '92, Scottsdale Municipal Stadium, Scottsdale, AZ**
- June 22 -25 - Ninth World Hydrogen Energy Conference, Paris, France.**

BECOME A RENEWABLE RESOURCE -- RENEW YOUR AHA MEMBERSHIP NOW

You may be a member who has been with the American Hydrogen Association for a long time, or perhaps you have just recently joined us. Either way, you should know that you are a vital part of AHA ... and that your membership is an essential ingredient to our organization.

Your membership contribution helps pay for something more than the printing and mailing of this newsletter. It helps us provide free information to the public at large, and lets us tell others about non-pollution, renewable hydrogen fuel, and clean solar-based energy. Your membership helps make others aware of the opportunity for a better worldwide economy and a world with a bright future based on technologies and lifestyles of a sustainable civilization. Please keep your AHA membership current ... and help us lead our country and world to a brighter and more durable future.

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

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*A HOLIDAY WISH TO YOU
FROM EVERYONE AT AHA*

The dawning of 1992 marks the beginning of the American Hydrogen Association's third year of existence. We look forward to this new year with enthusiasm and a renewed commitment to making our world brighter and clearer.

May this new year be one for you that truly is filled with joy, prosperity, and good health!

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* * * * *

AMERICAN HYDROGEN ASSOCIATION

*Dedicated to the Advancement
of Renewable Resources*

*219 South Siesta Lane, Ste.101
Tempe, Arizona 85281
(602) 921-0433
Fax: (602) 967-6601*

CONTRIBUTING WHILE SAVING MONEY

The American Hydrogen Association is experimenting with two new approaches for raising funds to carry out our work in education and scientific demonstrations of ways to use renewable resources for prosperity without pollution. One approach is in conjunction with AT&T in which telephone users having average telephone bills greater than \$200 per month can have 5% of each month's bill donated to our organization by AT&T. The other approach is in conjunction with the Nu Skin International corporation. Health care products can be ordered directly from Nu Skin through a toll-free telephone number. Because these direct orders save "store front" and other overhead costs, Nu Skin will donate 30% of the product price to the American Hydrogen Association. Almost everybody can participate in the Nu Skin donation program and many of us can recommend the telephone program to a company that has large monthly bills. Additional details about these programs follow.

AT&T NON-PROFIT ORGANIZATION (NPO) TELEPHONE PARTNERSHIP: This is a program whereby the American Hydrogen Association can accomplish part of its fund-raising goals by helping companies sign up for the special AT&T NPO Telephone Partnership. The company will have lower rates for long distance phone service. And 5% of each month's bill is contributed to AHA as a tax deductible donation. To be eligible the company must currently have long distance phone bills averaging at least \$200 per month.

This is truly a win-win situation. The company gets seven important advantages:

1. **High quality:** AT&T phone service,
2. **Savings:** on long distance calls, no matter what other phone service is now used,
3. **Tax reduction credit:** for the 5% of the phone bill that is contributed to AHA, as a charitable donation,
4. **Publicity:** the opportunity to publicize this as part of the public relations campaign,
5. **Free switch-over:** AT&T will switch the corporation over for free.

American Hydrogen Association
Donation Development Letter
Page 2 of 2.

6. **Smaller billing increments:** currently most companies are charged for their phone calls in 30-second increments; in the NPO program, you are charged by 6-second increments, which can save you money, because the billing is more precise; and
7. **Large return on investment:** it costs nothing whatsoever to do this and many advantages are produced.

NEW SKIN NON-PROFIT ORGANIZATION (NPO) DONATION: New Skin products include products for hair and skin care, shaving needs, deodorants, vitamins, minerals, and food supplements.

An illustrated catalog of Nu Skin products is suggested for placing orders. A \$3.00 donation to the American Hydrogen Association is requested to defray costs for sending catalogs and easy to follow instructions for placing orders by the toll-free number.

All orders placed through the toll free number must identify the American Hydrogen Association's donation account number for a contribution by Nu Skin International of 30 per cent of the order. This donation account number for the American Hydrogen Association will be provided along with the illustrated catalog.

Nu Skin guarantees the products that you select with a money-back, no-questions-asked, satisfaction-guaranteed policy. If you are not completely satisfied with any product ordered, simply return the unused portion and Nu Skin will provide a full refund.

Please help by supplying recommended contacts for the AT&T NPO PARTNERSHIP.

Company Name:
Address

Company Name:
Address

Contact Person

Contact Person

Fill in this form and send a \$3.00 donation for receiving Nu Skin catalogs.

Name:
Address

Donation included: ___ \$3.00 for
catalogs

Telephone () _____

Your recommendations, questions, suggestions, and comments are always welcome.

Sincerely,
Roy E. McAlister, President

SUGGESTED READING ON SOLAR-HYDROGEN

In addition to the books listed on the reverse side of this page, please consider these books and technical papers on energy systems that are available in most libraries.

Compiled by Irv Jorgenson

International Journal of Hydrogen Energy, The Official Journal of the International Association of Hydrogen Energy. A technical journal for engineers and scientists published by IAHE, P.O. Box 248266, Coral Gables, FL 33124.

The Hydrogen Economy, SCIENTIFIC AMERICAN magazine, Vol. 228, No. 1, pp. 13-21, Jan. 1973.

Principals and Applications of Stirling Engines, by Colin D. West. This book gives the history of the Stirling engine and research and development reports by various companies. It includes current and projected economics of Stirling engine systems and is very easy to read.

Wind Power, by Gary L. Johnson. This book focuses on the history of wind systems, from very early to the latest designs.

and includes economics and applications. Chapter 7 includes a lengthy section on the use of wind systems in the Hydrogen Economy.

Solar Energy Handbook, by J. F. Kneider and F. Keith. This book is a comprehensive study of various solar energy systems. Chapter 6 includes a section on Hydrogen Energy storage and use; and Chapter 20 reports on parabolic solar collectors and their cost-effectiveness.

Energy Options - Real Economics and the Solar Hydrogen System. A Technical Summary by J. O'M. Bockris. This book provides an overview of problems facing the Solar Hydrogen System, based on the current state-of-the-art.

The Forever Fuel: The Story of Hydrogen, by Peter Hoffmann, Westview Press, Boulder, CO, 1981. This is an excellent overview of hydrogen energy and its advantages.

Hydrogen Economy, by J. O'M. Bockris, SCIENCE magazine, Vol. 176, No. 1041, p. 1323, June 23, 1972. Though slightly dated, this article provides a brief but excellent summary of the concept of a hydrogen economy.

Join the American Hydrogen Association And Help To Make a Transition To Renewable Resources.

A transition from fossil and nuclear energy sources to solar-hydrogen technologies could fundamentally resolve many of the most serious environmental problems including global greenhouse warming, acid-rain, oil spills, sewage and trash recycling, stratospheric ozone depletion, urban air pollution, or the production of additional radioactive wastes.

Take part in the most important transformation in history. Become a member of the American Hydrogen Association and help make a transition from the fossil depletion economy, to a renewable solar-hydrogen economy that will last forever. Do it for the children; do it to preserve the remaining wild animals that are struggling to survive in the vanishing wilderness areas; do it for yourself; *but do it soon. The time to stand and be counted is rapidly slipping away.* . .

* * * MEMBERSHIP APPLICATION * * *

Yes, I want to join and help make a transition to clean, renewable solar hydrogen energy.

New Member 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"/> Seniors (60 +) Membership (\$ 20/year) | <input type="checkbox"/> Family Membership (\$ 40/year) |
| <input type="checkbox"/> Student Membership (\$ 20/year) | <input type="checkbox"/> Sustaining Membership (\$ 100/year) | <input type="checkbox"/> Life Membership (\$ 1,000) |

Corporate Sponsor (Minimum \$ 1,000/year) Other Gift (specify amount) _____

Signature: _____ Date: _____

Enclose check or money order and mail to: American Hydrogen Association, 219 S. Siesta Ln., Ste. 101, Tempe, AZ 85281

Available from AHA:

HYDROGEN PUBLICATIONS, VIDEOS, AND SUCH

To order, fill out form below, enclose check or money order, and mail to:
American Hydrogen Association
 219 S. Siesta Ln., Ste. 101, Tempe, AZ 85281
 Allow two weeks for delivery.

Specify
Quantity Cost/ea.

HYDROGEN TODAY: Official publication of American Hydrogen Association -- Back Issues. \$ 3.00
 (Please specify which issue(s): _____)

JOURNAL OF HYDROGEN: Quarterly Magazine-format publication of AHA (1st Edition) \$ 3.00

The Solar-Hydrogen Economy, An 8-minute video, A H A, 1990. 14.95
 This VHS-format video concisely illustrates the exciting potential of renewable hydrogen fuel.

H. W. Braun, *The Phoenix Project: An Energy Transition to Renewable Resources*, 1990. \$14.95
 Harry Braun presents and interrelates a wide range of information related to the growing economic and environmental crises resulting from our continued reliance on fossil and nuclear fuels. Most importantly, the book documents the types of solar-technologies that could be mass-produced for large-scale hydrogen production.

Joan M. Ogden, Robert H. Williams, *Solar Hydrogen: Moving Beyond Fossil Fuels*, 1989. \$10.00
 This book is an excellent handbook describing a solar-hydrogen based transportation-energy system, with emphasis on photovoltaic supply. It includes comparisons between alternate sources of energy and their pollution products and costs and proposes a practical path to the hydrogen economy.

Michael A. Peavey, *Fuel From Water: Energy Independence With Hydrogen*. \$16.00
 (Formerly *Hydrogen Home and Auto Fuel Conversion*:-- first copyrighted in 1979)
 This is a technical report of hands-on research and experimentation in hydrogen production, storage, and use. Originally published in the 1970's, this book is still invaluable to the technical individual who wants a specific understanding of hardware.

Ed Phillips, *Crisis In The Atmosphere: The Greenhouse Factor*, 1990. \$6.95
 A plain-talk book written by a meteorologist to explain the important atmospheric changes being observed.

Deborah Gordon, et al, (The Union of Concerned Scientists), *Steering a New Course*, 1991. \$10.00
 An in-depth review of air pollution and alternative energy sources, their benefits and costs.

Specify
Quantity Cost/ea.

Walter H. Corson, *The Global Ecology Handbook: What You Can Do About the Environment*, 1990. \$16.95
 A comprehensive overview of the interrelationships between the environment, economic development, energy policy, population growth, and related issues.

AHA Solar-Hydrogen T-Shirt \$15.00
 Please specify size :
 (Small) (Medium) (Large) (Extra Large)
 AHA Solar-Hydrogen Sport Shirt \$20.00
 Please specify size :

(Small) (Medium) (Large) (Extra Large)

AHA Racing Team Cap \$10.00

Total cost of items ordered above: \$ _____

State & City sales tax (6.5%): _____
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Total cost of order \$ _____

If paying by check, please make checks payable to the **American Hydrogen Association.**

Please send the above-noted items to:

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Signature _____

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NOTE: The net proceeds from these sales go to A H A to help support non-profit activities.