

Hydrogen Today

"Clean Energy for a Clean World"

Official Publication of the AHA

Vol. 3, No. 2 March/April/May 1992



Members of the "Adopt-A-Car" task force of AHA have spent the past month refurbishing the historic Robert Zweig hydrogen-powered pickup pictured above. See article on page 5.

New U.N. Book Promotes Hydrogen For Fuel Cells

A draft of a United Nations-commissioned book on renewable energy concludes that the prospect of increasingly stringent emissions standards makes fuel-cell vehicles the most attractive alternative transportation fuel option for the world community.

The book, "Renewable Energy: Sources for Fuels and Electricity," describes hydrogen, methanol, and ethanol as the three most promising alternative fuels for electric power generation by utilities.

Review copies of the book are being used to provide input into preparations for the United Nations Conference on Environment & Development (UNCED), which is being held this month in Rio de Janeiro.

The United Nations Solar Energy Group for Environment & Development commissioned the book,

which will be published in July or August by Island Press.

The book strongly endorses the development of fuel cell vehicles, which will require several years of technical development, as an attractive alternative to battery-powered electric vehicles. The energy source of a fuel cell is the fuel tank, which could be quickly filled with hydrogen, avoiding any long recharging time. According to the book, **a hydrogen fuel cell vehicle would be about three times as energy-efficient** as a comparable vehicle with a gasoline-powered internal combustion engine.

The editor added that battery technology has not advanced nearly as fast as the electric drive-train technology for fuel cells. In addition, cars powered by fuel cells are expected to perform like electric battery-powered cars.

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EPA Suggests Carbon Taxes

Carbon taxes are economically attractive because they distribute the cost of emissions control across carbon-emitting sources. So suggests the U.S. Environmental Protection Agency (E.P.A.). A carbon tax is a broad-based tax on the use of fossil fuels in proportion to their carbon content. The E.P.A. claims a carbon tax would be easy to administer compared to other options for reducing emissions because primary production of fossil fuels is easy to identify.

Continued on page 3

Third Annual Meeting of the National Hydrogen Association

By Herb Hayden, P.E.

On March 18, 19, and 20, Washington, D.C. was the site of the Third Annual National Hydrogen Association meeting, where exciting new developments in hydrogen and solar energy technologies were presented by many of America's leaders in the field. Researchers and representatives from the National Renewable Energy Lab (NREL), NASA, the U.S. Department of Energy (DOE), the Electric Power Research Institute (EPRI), regional governments and many universities, businesses and other research organizations attended the conference to share their work and their views on the topic of earth-saving hydrogen energy technologies.



Lora Kimble of Energy Partners exhibits their hydrogen fuel cell designed for cars.

The National Hydrogen Association, or NHA, is comprised of industry, research and business members fostering the development of hydrogen technologies and promoting pollution-free hydrogen in the energy field.

"Hydrogen produced from biomass, wind, and solar photovoltaic resources will be the ultimate, abundant, renewable-based energy form. A long-term national energy strategy, using sustainable and abundant sources, will eliminate national dependency upon both limited and politically volatile fossil fuel supplies," according to NHA publications. "The use of hydrogen is compatible with nature, rather than intrusive. The National Hydrogen Association believes that the world's energy problems are everyone's problems, and the time to act is now."

It was apparent that much technical, political and industrial progress is being made. Most exciting were the advancements in fuel cells designed to generate electricity directly from hydrogen, both from Energy Partners, Inc., and from H-Power Corporation in partnership with Rolls Royce, and also advancements in the production of hydrogen and electricity directly from sunlight by researchers at NREL and the SEA corporation.

Also exciting were visionary presentations by David Scott, Director of the Institute for Integrated Energy Systems at the University of Victoria, Canada, and U.S. Representative Robert A. Walker (R-PA), Vice-Chair of the Science, Space and Technology Committee, who described the clear need for renewable energy in our economy.

Dan Desmond, Executive Director of the Pennsylvania Energy Office, described how they are testing Hythane in natural gas vehicles. Frank Lynch of Hydrogen Consultants, Inc., explained that this is a mixture of 5% hydrogen in natural gas that can reduce exhaust emissions enough to meet or beat the Ultra Low Emission Vehicle Standards.

Amory Lovin, well-known champion of energy efficiency, encouraged NHA members to develop alliances with the environmental community to grow popular support for fighting pollution.

Somewhat less encouraging were presentations by DOE's Advanced Utility Systems Program Manager Russel Eaton and NREL's Hydrogen Program Coordinator William Hoagland regarding the past usage of millions of dollars under the well-intended Matsunaga Hydrogen R&D Act.

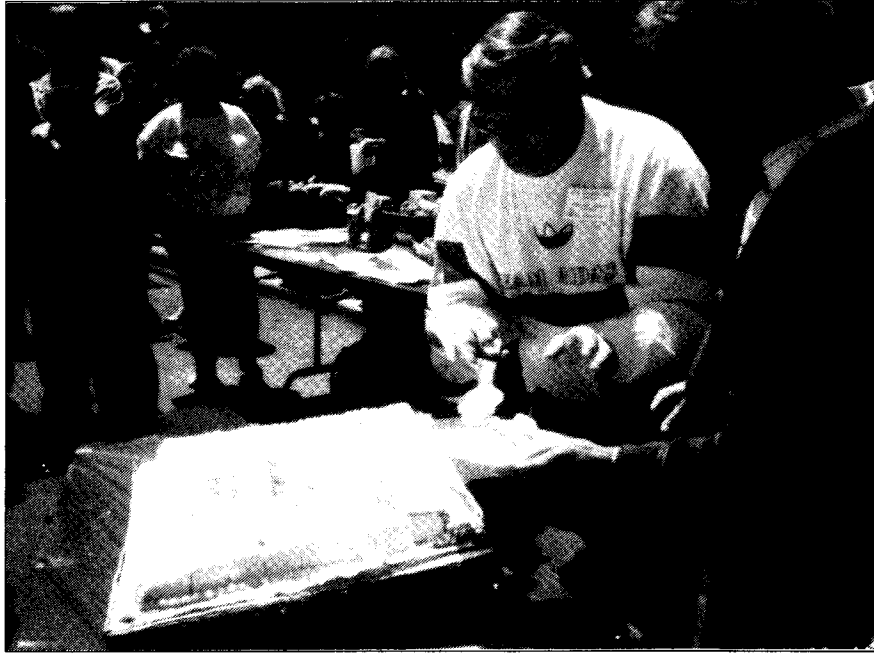
One was left with an uncertain question as to whether the only major federal funds targeted to hydrogen energy were being effectively applied. In balance, however, Hoagland made clear that NREL did remain focused on the renewable production and storage of hydrogen while suffering under severe budget reductions.

In general, the conference was full of professional enthusiasm, and new national momentum for progress seemed to be building. Our own Roy McAlister, the President of the American Hydrogen Association, introduced the AHA as the newest member of the NHA.

"Examine the word prosperity," said McAlister. "We need to put out-of-work people and factories on the job of bringing in the hydrogen economy. We need to replenish the natural gas fields with hydrogen. The reason to do it is environmental protection. We need to milk the cow, instead of eating it. We have the resources, and if we have the mind to, we can bring up prosperity without pollution."

But instead, according to McAlister, we are changing the environment by adding carbon dioxide to the atmosphere. McAlister describes the atmosphere as a giant heat engine, and by adding carbon dioxide which traps heat, the atmosphere gains more energy which then appears in storms. "Let's not fail to heed the warnings," he said.

Additional details about the conference are available from the AHA office in Tempe, AZ, which can be contacted at (602) 921-0433.



Dan Parmley of Diversified Technologies Incorporated cuts the cake with Calder Chapman, Mayor of Williams, AZ, during the welcoming ceremony for the Route 66 Canyonball Run and Environmental and Technology "Expo" held at Northern Arizona University. AHA members attended this event, held in April, and sponsored the award-winning LaserCel 1 vehicle. See article on page 5.

GLOBALCON '92...

By Tim Murphy

The 15th annual GLOBALCON trade show and convention, sponsored by The Association of Energy Engineers, was held in San Jose, California, March 25-26. I flew to San Jose for the event.

The newly-formed Silicon Valley Chapter of the American Hydrogen Association (AHA) had a presentation booth there, which was a great success for the new Chapter. Many potential members were contacted, and others got information on how to start chapters in their own area.

GLOBALCON included about 150 booths; and, notably, well over 50% of them dealt with the "clean up after fossil fuel" industry. All exhibitors had some environmental angle, either obliquely or in terms of energy efficiency. The most active booth was AHA's. It was quite gratifying; we didn't stop talking about it for two days. It is remarkable how you can bring a rational person from merely realizing hydrogen exists

as a combustible fuel to accepting it as the replacement for fossil fuels, in literally just a few sentences.

About 3,000 attended GLOBALCON. I personally spoke with about 150 individuals, ranging from engineering students (10%), to working engineers (50%), to analyst/scientist "types" (30%), to non-technical folks (10%). I received no arguments over the rationale of a solar hydrogen economy. All categories of individuals listed above expressed interest in transportation sector applications of hydrogen.

Significantly, the students generally had no familiarity with solar hydrogen details. The mechanics involved, once explained, were readily picked up, and I was glad to see the light come on for them. Mainstream engineering education, obviously, does not dwell on environmental trade-offs.

The working engineers were a bit more familiar with the concept

Carbon Tax

Continued from page 1

A carbon tax would fall most heavily on coal, which has the highest carbon dioxide content per unit of energy released. Oil and natural gas have a high content of CO₂, but taxes would fall less heavily on these fuels, according to an E.P.A. draft of "The Efficiency Value of Carbon Tax Revenues." Hydrogen, hydroelectric, wind, solar and nuclear-based fuels contain no carbon and so would have no carbon tax.

According to the EPA, the effect of raising the prices of fuel due to a carbon tax would be:

- 1) to depress real income, thus reducing consumption of all goods;
- 2) to induce consumers and producers to substitute carbon-free or less carbon-intensive energy sources for carbon-intensive ones;
- 3) to substitute energy-saving goods and processes for energy-intensive ones; and
- 4) to stimulate research, development and adoption of less expensive substitute technologies.

than the students and had more theories on related governmental conspiracy and collusion. Safety aspects seem to predominate the concerns of professional engineers. Building energy-system applications were also of interest. The analytical/scientific "types" were well aware of the concept and felt it was inevitable. Several of them had stories about taking a financial beating when the Reagan Administration "pulled the plug" on renewable energy. A twenty-year implementation plan for a Hydrogen Economy seemed feasible to them.

All said, GLOBALCON '92 was a success for the Silicon Valley Chapter. It is gratifying to experience the support people have for the solar hydrogen concept. It shows that public education is indeed the best tool we have right now. And I found the Silicon Valley Chapter staff, though new to their jobs, highly dedicated and extremely competent.

Solar/Electric 500 Accident Grabs Attention

The Solar Electric 500 Race held this April in Phoenix, AZ, was halted when the battery-powered Geo race driven by James Worden for the Solectria Corporation suffered a battery failure four laps from the finish. The vehicle's battery, which was of Zinc-Bromide chemistry, apparently was charged beyond its design capacity. This led to the excessive buildup of bromine gas in the battery system. A gas-handling hose in the battery system eventually failed and released the bromine gas into the driver's compartment, exposing the driver until he was able to skid the vehicle to a stop and dive out.

Along with the driver, fourteen track officials and racing crew members were hospitalized as a

precaution and released in good condition within hours. The driver was admitted in serious condition but was released three days later.

More than 40 entries ran in this year's race, more than double the number from the 1991 race. Speeds were up to 90 miles per hour, much faster than last year.

The first place trophy was awarded to Solectria and subsequent prizes were awarded to other vehicles according to their position at the time of the accident, because the race was not completed to its full planned duration as would have normally been done in a more conventional auto race. This led to unofficial comments of protest by some competitors that Solectria unfairly

benefitted by the breakdown, as they believed that the Solectria car would not have held the lead to the finish.

Many attending commented that batteries that can release toxic chemicals should not be used in Electric Vehicle (EV) applications, for the obvious reason that such an accident would create a hazard to the public. Even lead-acid batteries contain sulfuric acid and lead, both of which can be toxic.

While some of the batteries raced use relatively safe materials, the accident underscored the need for continued testing of new technologies proposed for public use and the very high importance for avoiding toxic chemicals and hazardous conditions in the design of all energy systems.

Wellstone Senate Bill 2020: Sustainable Energy Transition Act

By Herb Hayden

Senator Paul D. Wellstone of Minnesota will reintroduce the Sustainable Energy Transition bill in next year's Senate session with the goal of tripling the production of energy from renewable resources.

"This legislation takes a grassroots approach to energy policy by promoting a transition to sustainable energy use through state and local efforts to save energy and develop renewable energy resources," states Senator Wellstone.

"Polls show that Americans are concerned about climate change and our dependence on imported oil, and our decline in economic prosperity. This legislation would establish a multibillion dollar trust fund to support sustainable energy transition efforts, developed by the states with Federal support and guidance. The objective would be programs in each of the 50 States aimed at a 20-year goal of reducing energy use by at least 10% and tripling renewable energy production."

Each state, or regional consortia of states, would develop a twenty-year Sustainable Energy Strategy, including an assessment of the technical potential for renewable energy production and alternative plans for achieving them, market place barriers, and social, economic and employment impacts of the alternatives. Life-cycle and external costs are to be considered in the technical options. The state would also develop a short-term assessment and an Energy Transition Program detailing the state's proposed actions for the next five years to achieve the goals established in the Strategy.

Each state will receive money based partially on population, and additional incentive funding based upon their performance in achieving energy efficiency and renewable energy goals. The bill proposes to fund these efforts by repealing the passive loss exemption to the alternative minimum tax, for \$300 million per year, and phasing out the depletion allowance for oil, gas, and coal, for \$1.2 billion per year, and an excise "carbon-based" tax on the production or importation on coal, oil, and natural gas for \$4.2 billion per year.

"When phased in over three years, the small carbon-based tax would amount to roughly one-half penny per gallon of oil. For that small cost, there will be benefits in saving consumers money and creating jobs, and these technologies will establish the U.S. as a leader in sustainable energy technologies," Wellstone said. [Ed. Note: Related article on page 1.]

States will be required to provide 20% of the funding, and local governments must be allocated at least 20%. All funds must be spent on energy efficiency and renewable energy projects.

The bill would also direct the Secretary of Energy to support state research and development efforts and related courses at community colleges and vocational-technical institutions, and would establish an Energy Transition Information Clearing House within the federal Department of Energy. Finally, the bill would authorize states to adopt energy efficiency standards for automobiles and appliances stricter than Federal standards.

LaserCel 1: A Great Little Hydrogen Fuel-Cell Car

By Jennifer Sauwe

Imagine being stuck in rush-hour traffic. As you inch along, all you hear is a soft purr all around you. You have the window open to breathe in the fresh air. . . there's no smelly fumes or noxious exhaust gases making you choke and giving you a headache. You look around at the clean, blue sky and the clear view. . . you can literally see for miles.

Doesn't sound like the traffic jams you've sat in lately? But in the not-too-distant future, this may be what we can find. No more smog, no noisy engines, no choking exhaust fumes from fossil-fuel-eating cars and trucks. These

were my thoughts as I experienced my first ride in a hydrogen fuel-cell car last month. It was an exhilarating but very quiet ride. The car is "LaserCel 1," an experimental and demonstration vehicle built by the American Academy of Science of Independence, Missouri.

LaserCel 1 was "in my neighborhood" last month for the First Annual Canyonball Run, a rally and exhibition that started in Flagstaff, AZ, and ran along Route 66 through Williams and Kingman then on to finish at Las Vegas, NV. The event featured alternative-fueled vehicles, and the star of the show was this innovative little car.

LaserCel 1 is a converted postal delivery car with right-hand steering. It is electric-powered, so it only produces a quiet humming sound of an electric motor. The car can comfortably cruise at 55 MPH and currently has a range of 120 miles (which I understand will soon be expanded). What is really special about this car, though, is that the electricity, that runs it doesn't come from batteries; it comes from a hydrogen fuel cell, a device that uses hydrogen to produce electricity and pure water.

LaserCel 1 was developed by the American Academy of Science, under a grant from the Pennsylvania Department of Energy. It was brought to the Southwest by a team headed by Dr. Paul Cherry (shown in the photo with the car in Las Vegas). The vehicle

was sponsored at the Canyonball Run event by the American Hydrogen Association, funded by a special donation from Demetri Wagner. LaserCel 1 won the SPECIAL VEHICLE AWARD for the event.



and running pure water through it, this specially-designed fuel cell will act as an electrolyzer, separating the water into its hydrogen and oxygen constituents. All you have to do is plug the car into a source of electrical power at night, charge up a tank of hydrogen for the next day, and sail past any gas station as you drive along.

[Ed. Note: As exciting as this vehicle design is, we should, to be precise, point out that for a truly smog-free design, it is not enough just to have a car like the future LaserCel described above. The power plant producing the electricity must also do its job with clean renewable energy, like solar hydrogen. The resulting system will then, indeed, be a Zero Emissions system.]

In later, still-under-development versions of LaserCel, a special "reversible" fuel cell is contemplated. In this vehicle, the water produced by running the fuel cell can be stored in a tank and later recycled to supply hydrogen with the same fuel cell running "in reverse." By hooking the fuel cell up to a source of electricity

LaserCel 1 is an important step forward, and we are very appreciative of the American Academy of Science and Dr. Cherry for bringing the car so we could see it. We are particularly grateful to Demetri Wagner for his financial support, which made the visit possible.]

Historic H₂ Pickup Rebuilt by AHA

The white hydrogen-powered pickup pictured on the front page of this issue of *Hydrogen Today* has been extensively rebuilt by members of the "Adopt-A-Car" task force of AHA. The Dodge D-50 mini-truck, originally developed by Hydrogen Consultants, Inc., for AHA member Dr. Robert Zweig, and the American Lung Association (ALA), has been driven around the Southwest U.S. (particularly in Southern California) for several years powered exclusively by hydrogen. The truck demonstrates the viability of hydrogen as the ultimate, clean transportation fuel that enables the truck's engine literally to steam-clean the air passing through the engine as the truck drives down the road.

The truck has been presented at many schools, universities, and expos. A combination of hard use and careless handling at some of these demonstrations had taken its toll; and a complete engine overhaul and rebuilding was required. Those volunteering to rehab the vehicle and incorporate modifications to improve performance included Claude Culbertson, Richard Stark, Claude Van Ausdal, and Roy McAlister. These volunteers contributed hundreds of dollars in materials and supplies and many hours of caring work to this project. ALA also provided financial assistance to the rehab project.

It is available to chapters of AHA, ALA and other groups interested in environmental protection and the advancement of safer, cleaner transportation. "Unfortunately," notes McAlister, "we will have to require a substantial security deposit; this vehicle represents an important milestone in the development of hydrogen energy for practical use. Too many times in this historic vehicle's lifetime, it has been seriously abused. We need to insure that it will be carefully preserved as the historic archive it truly is." For more details, contact AHA.

Presidential Candidates Views on Energy and the Environment

Energy America, a coalition of New Hampshire environmental, consumer, and sustainable energy organizations, conducted a poll last February of the major Republican and Democratic candidates then in the race for President. Since then, of course, the majority of these candidates have dropped out of the contest, and another, J. Ross Perot, is considering officially entering the race as an independent. Summarized in the table below are excerpts from this survey for those candidates who are still campaigning. Listed in alphabetical order, they are former Governor Jerry Brown, political commentator Pat Buchanan, President George Bush, and Governor Bill Clinton. (The "Other" category reflects a "non-answer" comment.)

1. Do you favor raising the Corporate Average Fuel Economy standards for new automobiles to at least 40 MPG by the year 2001?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush		X	
Clinton	X		

2. Do you support the proposed "one-step licensing" process for nuclear power plants that would curtail public participation and accelerate nuclear power plant construction and operation?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown		X	
Buchanan	X		
Bush	X		
Clinton		X	

3. Do you support committing the Department of Energy to a goal of U.S. energy self-sufficiency through a shift in funding from nuclear fission and fossil fuels to the development and implementation of energy efficiency and renewable energy technologies?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush		X	
Clinton	X		

4. Do you support combating the environmental dangers posed by global warming by:

- A. Instituting a "carbon tax" on CO₂ emissions from oil, gas, and coal?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown			X
Buchanan		X	
Bush		X	
Clinton			X

- B. Accelerating the elimination of CFC's?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush	X		
Clinton	X		

- C. Initiating a large-scale effort for development and commercialization of solar/hydrogen fuel systems for vehicles and power generation?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush		X	
Clinton	X		

5. Do you support reducing U.S. energy use by at least 10% by the year 2010?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush	X		
Clinton	X		

6. Do you support tripling the current contribution of renewable energy technologies by the year 2010?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush			X
Clinton	X		

7. Do you support the U.S. taking a leading role in reaching international agreements and proposing alternatives to restore and protect the global environment?

Candidate:	<u>Yes</u>	<u>No</u>	<u>Other</u>
Brown	X		
Buchanan		X	
Bush	X		
Clinton			X

[Ed. Note: As of press time, Mr. Perot has not disclosed his own views on these issues – or on many others, for that matter. He seems to have discovered that to take a stand on anything is to lose votes. This, unfortunately, may be all too true. This certainly does not bode well for a democratic form of government, however; the very basis of democracy is an informed electorate. What we seem to be headed for is a government headed by officials chosen for what they don't say they believe in or support. . . or by leaders chosen by a flip of the coin or as the lesser-of-apparent-evils. Rather than government by and for the people, we may be opting for government by chance and blind faith.]

Inside The AHA . . .

The views expressed on these pages are those of the author and do not necessarily reflect the views of the Hydrogen Association or AHA. Opposing views are welcome.

D. O. E. Responds To Hydrogen Corporation Proposal

[Ed. Note: Phoenix-area businessman I. Jerome Hirsch wrote a letter to Congressman Jon Kyl proposing a quasi-governmental corporation to promote hydrogen. This letter was published in the last issue of *Hydrogen Today*. The following is a response from the U.S. Department of Energy.]

Department of Energy
Washington, DC 20585

Dear Congressman Kyl:

This is in response to your letter of January 6, 1992, on behalf of Mr. I. Jerome Hirsch, regarding increased use of hydrogen and the establishment of a quasi-governmental corporation to promote hydrogen energy systems.

We agree with Mr. Hirsch that hydrogen has potential for use as an energy medium. It is clean burning and can serve many applications now being satisfied by petroleum fuels or natural gas. However, unlike petroleum or natural gas, which can be extracted from nature's storage pools and caverns while using a tiny

fraction of the energy they deliver, production of hydrogen from water requires dedicated plants that consume several times the energy represented by the resulting hydrogen product. In this sense, hydrogen is similar to electricity; large quantities of a relatively low-value energy source (for example, coal or the sun's rays) must be consumed to produce a lesser amount of a more valuable energy product (electricity or hydrogen). In each case, the principal question is: What energy source is to be consumed to provide the valuable energy end-product?

Renewable energy sources, particularly certain conversion approaches using solar energy, are important candidates for providing the energy needed to produce hydrogen. The renewable-hydrogen combination has attractive environmental characteristics. However, available renewable energy-powered systems result in a delivered hydrogen product that is not competitive with conventional means of production. As a result, we are placing our major emphasis on improving solar and other renewable energy conversion devices. As renewable systems improve, increased attention can be placed on hydrogen production.

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AHA Adds New Staff Members for Summer

Two new staff members have joined the AHA office for the summer. Stephanie Bolton and Kim Young will be helping out with the workload as part of Arizona State University's college work-study program.

Stephanie is an undergraduate majoring in communications and justice studies; and Kim is a political science major who will graduate with her bachelor's degree in July.

One of the more important goals that they will be concentrating on will be to help boost AHA's membership (current membership is approximately 1,000).

In addition, they will be helping Kathy McAlister out with her overwhelming workload in the office and take over while Kathy tends family matters this summer.

Kim and Stephanie definitely have their work cut out for them, but both display a great interest and enthusiasm in the work that AHA is doing and say they are looking forward to a summer of learning about and promoting renewable energy.

AHA welcomes Stephanie and Kim.

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LETTERS POLICY

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Letters should include your name, address, and a telephone number where you can be contacted.

All letters are subject to editing. Address letters to:

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More Inside The AHA...

Call to Action for a Sustainable Energy Future

By Sandy Bahr

Government and international organizations could help move the world toward a more sustainable energy future, but relying on and waiting for their action will only slow down progress that should be moving forward at top speed. In general, government seems to protect the status quo and resists change. Industry appears to be even more reluctant to adopt long-term energy strategies that focus on renewable energy. They are too caught up in the business of making short-term profits at the expense of the environment, society at large, and future generations.

If change is to occur anytime soon, the impetus for it will have to come from the people. Without intense domestic pressure and demands, few governments will take actions on such issues. Industry responds to the demands of the consumers. A populist demand for a clean, safe, more prosperous future can give the movement for renewable solar-hydrogen the boost it needs to become tomorrow's energy resource today.

In order for this to happen, however, people have to be informed. While most people are aware of the negative impacts that fossil fuels and the wastes from nuclear reactors can have on the environment and their health, they are not aware that there are viable alternatives. Education is the key. Information about a clean, safe energy alternative can be empowering.

When it comes to issues of the environment, national boundaries are of little significance. Pollution, acid rain, global warming, and most of the problems associated with burning fossil fuels do not stop at a country's border. Likewise, when these fuels are gone, it will not matter what nation is called home; if it is dependent on these fuels, it will be headed for economic collapse.

Just as these problems know no borders, the information about solving them should not be constrained either. Knowledge about technology, economics, and social aspects of developing solar-hydrogen should be shared and distributed. Every person is a world citizen. As such, it is up to each individual to help educate people whenever possible as to the benefits and viability of solar-hydrogen. People need to know that ending dependence on fossil-fuels and making a transition to solar-hydrogen does not mean enduring hardship and sacrificing economic growth. Instead, it means ensuring a more prosperous future. This can only happen if action is taken before it is too late, before the fossil fuels are gone and the planet is uninhabitable.

Industrialized countries of this world have built their economies by relying on fossil-fuels, at the expense of the environment. When developing countries look for ways of strengthening their economies, it is important they understand the true costs of fossil-fuels — the pollution-related health problems, the environmental devastation, and the sacrifice of national security due to reliance on outside energy sources. Developing countries can learn from the mistakes of their industrial neighbors and hopefully avoid the same pitfalls.

The technical obstacles to a transition to solar-hydrogen are relatively small and can be overcome, but the political and economic forces that protect the status quo are quite formidable. It will take a massive movement from the people of this planet. They must demand a better, safer, cleaner environment and a more prosperous future for their children. The key to such a future is wide distribution of information and technology regarding solar-hydrogen.

Dear Roy and Kathy McAlister,

This letter is to express my gratitude and appreciation of what both of you have contributed in the formation and sustaining efforts of the American Hydrogen Association.

I am very proud to be a member and secretary of the chapter here in Southern California.

I will always do my best to keep and preserve the movement of "progress without pollution" wherever I travel. The small investment I have made over the last year into the Southern California Chapter of the AHA has returned immeasurable benefits.

These benefits are meeting people who have sacrificed greatly to preserve our planet. They have stood up against the old way and offered a transition to solar hydrogen technologies.

I believe this transition is on its way in and I am honored to be invited as a member of the AHA.

Thank you for all your help.

Sincerely,

Leroy D. Essel
So. California Chapter, AHA

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Letters to the Editor

[Ed. Note: The following letters were written by students at Vista Verde Middle School after a presentation on Hydrogen made by Charles Terrey to their Science Class.]

Dear AHA,

I thought the idea of using hydrogen for fuel and many other things is fascinating. It's a great idea since hydrogen is non-polluting and one of the most abundant chemicals in the universe. It's clean and efficient. I can't wait until we put it into effect. The display set up had a great visual example of how it works. Good luck with any new programs with the use of hydrogen. Thank-you for your help to make the earth clean again.

Sincerely,
Shawn Petree

Dear Charles Terrey,

I appreciate the help that you and the Arizona Hydrogen Association gave us. The demonstrations were great, and the gas separation device was fully explained.

Sincerely,
Daniel R. Byrd Jr.

Dear Mr. Terrey,

I sincerely want to thank you for all the help that you have so willingly given to me in information on my science project. My project was selected to go to the ISEF in Nashville, Tennessee, on May 9 and it was also accepted in the Naval National Science Fair. I will have my project at the Canyonball Run and I hope that you will have a moment to look at it when you are there.

Without the help of wonderful people like you, there would be no way for a student in a remote area such as Show Low to get help on information like this. Our library is very small and even though I made many trips to Phoenix to the library, there is just so much one can do in one day at a time.

Thank you again for your help.

Sincerely,
Katrinna Pint

[Ed. Note: Katrina won the First Place Award and a \$500 savings bond for her hydrogen-powered lawn mower in the student display at the Canyonball Run. Congratulations, Katrinna. Uh... I don't suppose you would like to demonstrate your prize-winner on my back lawn?]

EARTHCRY

By Jennifer Sauwe

In Honor of Earth Day 1992

Have you heard the Earth cry?

For she does, you know.

*We've seen her tears in the brown haze
that covers the sky.*

*Mother Earth's cry sounds like a
choking, sobbing, gasping for breath:*

"Please help me before I die!"

It's all up to us to stop those tears,

Each one of us... so just make a start.

*Day by day recycle, reuse, and
educate those around us until the sky
clears.*

*As for me, I will do my part for clean
water and clean air by using my pen.*

*Don't you sit around... make a new
start!*

What Have You Done for Mother Earth Today?



Editorial Cartoon Drawn by John Zeggert, age 13.

Upcoming Events...

**Have an event for our calendar?
Write us and let us know!**

May 14-15 - Energy and the Environment Conference, Manhattan, KS.

May 20-21 - Tenth Anniversary Conference of the Hydrogen Industry Council, Kananaskis, Alberta, Canada.

May 28-June 6 - Ecotech Rio '92-Exhibition CERTAME, CERTAME, Rio de Janeiro, Brazil.

May 30-31 - Kern Wind Energy Association and the Kern-Kaweah chapter of Sierra Club, Tehachapi Wind Fair and Windmill Hike on Pacific Crest Trail, Tehachapi, California.

June 1-12 - Earth Summit, Rio de Janeiro, Brazil.

June 1-3 - Energy in Rural America: Profits and Opportunities in Agriculture, Fuels and Utilities, 309 Davis Street, Evanston, IL 60219.

June 1-5 - Conference and Exhibition on Zero Emission Vehicles, Florence, Italy.

June 3-5 - Responsive Energy Technology Symposium and International Exchange, San Diego, CA.

June 7-12 - Florence World Energy Research Symposium, Florence Italy.

June 9 - Southern CA AHA Chapter Meeting, Contact Dick Williams at (213) 949-9482.

June 8-10 - International Alternative Fueled Vehicle Roundup, Topeka, KS, Contact Jack Johnson at the Kansas Energy Office, (316) 429-3882.

June 13-18 - Solar '92: The National Solar Energy Conference, Cocoa Beach, FL, Contact American Solar Energy Society (303) 443-3130.

June 14-17 - Eco World '92 Conference and Exhibition, Washington D.C., Contact Martin Rogers of ASME, 22 Law Drive, Box 2350, Fairfield, NJ 07007-2350.

June 23-24 - Meeting of the International Energy Workshop, Cambridge, MA.

June 22-25 - Ninth World Hydrogen Energy Conference, Paris, France, Contact T. Nejat Veziroglu, Oxford OX3 OBW, U.K.

June 27 - Tucson AHA Chapter & the American Lung Association, all-day event with Dr. Zweig's hydrogen pickup, Contact Michael Bakker (602) 529-0330.

June 29-July 3 - The Sixth World Conference on Transport Research, Lyon, France.

June 20-July 1 - National Alternative Fuels Conference: Clean Air Solutions for Transportation and Engines, Milwaukee, WI. Contact The Wisconsin Center, 702 Langdon Street, Madison WI, 53706,(800) 462-0876.

July 4-6 - Renewable Energy: Technology for Today-Eighteenth Annual Conference of the Solar Energy Society of Canada, Edmonton, Alberta, Canada, Contact Solar Energy Society of Canada, 15 New York Street, Suite 3, Ottawa, ON K1N 5S7, Can. Phone: (613) 236-4594.

July 5-10 - Twenty-Fourth International Symposium on Combustion, Sydney, Australia.

July 14 - Southern CA AHA Chapter Meeting, Contact Dick Williams at (213) 949-9482.

Aug. 1-5 - Earth Connection; Learning from the Earth: Past, Present, Future, Cincinnati, OH. Co-Sponsored by College of Mount St. Joseph, 370 Neeb Road, Cincinnati OH, 45233. Contact Sister Paula Gonzales or Bruce Anderson (513) 451-3932.

Aug. 3-7 - Intersociety Energy Conversion Engineering Conference, San Diego, CA.

Aug. 10-13 - Society of Automotive Engineers Conference and Exhibition on Future Transportation Technology, Costa Mesa, CA.

Aug. 11-13 - Northeastern NGV Conference, Binghamton NY.

Aug. 30 - Sept. 4 - Ninth World Clean Air Congress and Exhibition: *Toward the Year 2000 - Critical Issues in the Global Environment*, Montreal Quebec, Canada.

Membership Application

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

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Enclose check or money order and mail to:

American Hydrogen Association, 219 S. Siesta Ln., Ste. 101, Tempe, AZ 85281

D.O.E. Response to Letter

Continued from page 7

As the foregoing suggests, there is no guarantee that conversion of primary energy sources to hydrogen will be more cost effective than alternative approaches. For example, conversion to liquid fuels such as methanol or ethanol or certain alcohol mixtures could ultimately prove more desirable. Continuation of ongoing research efforts in several reasonably attractive areas can help provide information needed to select from among various options. In our view, this represents better use of currently available resources than investing an overwhelming proportion of funds and scientific effort on any single option. Consequently, we are not ready to endorse the quasi-government/private sector organization that Mr. Hirsch proposes.

We appreciate Mr. Hirsch's concern for improving the Nation's energy future. In view of his interest in hydrogen, we have enclosed a booklet that provides a summary of the Department's efforts involving hydrogen and related technologies.

Sincerely,

J. Michael Davis, P.E.
Assistant Secretary
Conservation and Renewable Energy

Editor's Comments: Mr. Davis' letter raises some good and valid points: hydrogen is clean-burning and certainly has potential for use as an energy medium. The production of hydrogen from water does require a great deal of energy, which underscores the need for efficient solar or other renewable energy conversion devices.

What Mr. Davis (and, it seems, D.O.E. and many other energy policy-makers) fails to account for is the actual, fully-loaded cost of all the other energy alternatives under consideration. Their focus is on the direct production costs only - the environmental clean-up costs, the health-care costs, the ultimate costs of sustaining life on a poisoned planet are all ignored or greatly discounted.

As a result, D.O.E. only devotes a small fraction of one percent of its total budget to this technology. It spends far more supporting its own complex overhead structure. Perhaps a quasi-government/private sector organization that addresses the Nation's energy future would negate the need for a Department of Energy altogether.

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Hydrogen Energy Course Offered by the Solar Technology Institute

By Dave Monfore

The Solar Technology Institute (STI) presented a one-week course entitled "Hydrogen Energy" at its Carbondale, Colorado location June 1st through 4th.

This comprehensive course was presented in a non-technical format that included slides, videos, conversations with industry experts, demonstrations, and a hydrogen-fueled cook-out and party at the conclusion of the course.

Subjects covered in the course included: Solar hydrogen energy economy; properties of hydrogen; historical overview; current uses of hydrogen and comparison to other fuels; methods of production; potential energy sources for hydrogen production; electrolyzer theory, operation, and demonstration; potential uses of hydrogen; internal-combustion engine modification; transportation and distribution; storage options; appliance conversion and demonstration; safety; fuel cell theory, operation, and demonstration; electric and hybrid vehicles; available products; academic institutions and promotional organizations; possible system integration for home power installations; political and institutional obstacles to change; exponential icebergs; and "how do we get there from here?"

STI is a non-profit organization committed to the education and promotion of renewable energy. Other courses offered at the institute include wind power, micro-hydro electric systems, basic and advanced photovoltaic design and installation, and basic and advanced passive solar home design.

For more information, write to: Solar Technology Institute, P.O. Box 1115, Carbondale, CO 81623-1115; or call Ken or Johnny at (303) 963-0715.

Hydrogen Today Writer's Guidelines:

Articles published in *Hydrogen Today* should be informative and written in a style that members of the general public can enjoy. Acceptable topics include all forms of renewable energy developments and technology, such as solar, wind, biomass, and ocean thermal energy systems, energy efficiency, and new and innovative applications of renewable energy.

Related social and business issues are also of great interest, since the advancement of renewable energy is keyed to the marketplace and to public acceptance. Pure editorials and opinion, however, are less often used.

Photos and other graphics are highly desirable. Try whenever possible to include some form of illustration or photo, preferably black & white, to help readers visualize and understand the article. Photos of the author are also welcome.

Hydrogen Today also features a Calendar of Events and selected Letters to AHA. Please let us know about upcoming events of interest to our members, and write us about news that you may discover yourself.

The tentative deadline for the next edition of *Hydrogen Today* is June 28, 1992. We reserve the right to be selective of material received and to edit for length or readability if necessary. Each column of text in the publication is about 300 words, and articles are commonly about 300 to 1,000 words in length. Longer articles may be, at least in some cases, excerpted or published in parts over more than one issue.

Please join us in helping educate the world about clean, renewable energy resources!

The Hydrogen Association

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