

# HYDROGEN TODAY

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## BUSH ADMINISTRATION'S ENERGY PROGRAM ADVANCES IN CONGRESS

### Both Houses Review Bills Supporting New "National Energy Strategy" -- One With No Reference to Hydrogen

WASHINGTON, D.C. With the backing of President Bush and the White House staff, bills calling for expanded oil exploration in the Arctic National Wildlife Refuge in Northern Alaska and substantially-relaxed approval systems for new nuclear power plants advance through both House and Senate committees.

These bills, noted as S-570 in the Senate and HR 1301 in the House of Representatives, were introduced in early March of this year and reflect what President Bush calls "The National Energy Strategy (NES)".

Environmentalists throughout the U.S. such as the Worldwatch Institute, the Wildlife Federation, the Sierra Club, and the Rocky Mountain Institute, have expressed grave concern about these proposals, but they are vigorously supported by powerful lobbyist groups representing the oil and nuclear energy interests.

#### Alternative Fuels Supported For Cars and Trucks

The Administration-backed proposals would require centrally-fueled fleets to purchase vehicles capable of using alternative fuels, would increase Federal purchases of alternative fuel vehicles, and increase the Corporate Average Fuel Economy credit to automakers for producing alternative fuel vehicles. Further proposals call for new Federal support for the automobile industry (up to \$150 million from FY 1992 to FY 1996) to accelerate the development of electric vehicles.

Other "energy efficiency" programs proposed include promoting state and local programs that offer a "bounty" for scrapping older vehicles, increasing the limit on tax-free commuter subsidies employers can offer employees for using public transit or car-pooling. The Federal government would also accelerate R&D in certain new energy-effi-

cient technologies such as high-performance aircraft engines and MAGLEV and high-speed rail; and would widely implement Intelligent Vehicle/Highway Systems.

The NES also includes a variety of proposed programs intended to raise electricity efficiency by encouraging greater competition and stimulating energy-efficient investments by both utilities and customers. The Administration would also spend \$55 million in FY 1992 (a 22% increase over current funding) to accelerate R&D on building technologies.

#### Oil From Wildlife Refuge & Off-shore Sources Targeted

The most vigorously opposed aspects of the Administration's proposals, however, include those that call for allowing oil development in the Arctic National Wildlife Refuge and the Outer Continental Shelf areas. In addition, the Administration proposes expanding oil development and production from the Alaska North Slope and off-shore California.

#### Nuclear Plants Promoted; But No Solutions To Waste Disposal Problems Offered

Construction of additional nuclear electric-generating plants would be encouraged by "streamlining" the licensing and review process and developing "standardized designs for next-generation plants" to speed-up the licensing process and reduce financial risks to the utilities. A single review process would replace the present two-phased process.

Conspicuous by their absence were suggestions about how to dispose safely of the radioactive waste and "decommissioned" (i.e., worn-out) contaminated nuclear plants (presumably because nobody knows of any reasonable suggestions).

#### "Clean" Coal and Natural Gas Production To Be Expanded

"Clean" coal and natural gas production would also be increased.

The NES, according to the Administration, includes a major commitment to advanced energy technology. "The FY 1992 budget", says the NES Fact Sheet released by

the White House, "includes \$903 million for support of National Energy Strategy research and development initiatives." Major research initiatives include: advanced transportation fuels from biomass, vehicle propulsion technologies, high-speed rail and magnetic levitation, telecommuting, air traffic control, advanced oil recovery technology, and advanced light water nuclear reactor concepts. (It is not clear from the White House Fact Sheet on NES to what extent this funding has already been provided by other energy research bills, such as those reported in an earlier issue of *Hydrogen Today*). The amount cited, however, is noted to be 34% above FY 1991 levels, suggesting that many of these programs are already ongoing or have been approved previously by Congress.

Although the Administration claims this new National Strategy "will reduce greenhouse gas emissions and demonstrate U.S. leadership on this issue", there is little in the NES to support this goal. In fact, the Administration admits that (with this strategy), U.S. greenhouse gas emissions in 2000 are projected to be at 1990 levels.

#### Nowhere Is Hydrogen Mentioned

With a continued reliance on oil, natural gas, coal, and other fossil fuels, this result is hardly unexpected. Nowhere in the National Energy Strategy description is the word "hydrogen" even mentioned.

Apparently, hydrogen is considered to be less viable than fusion nuclear power. Bush's National Energy Strategy recommends intensifying international collaboration in fusion research, with focus on magnetic and inertial confinement reactor concepts. With these efforts, the Administration believes a demonstration nuclear fusion plant could be developed by 2025 and a commercial plant could be ready by 2040.

[Editor's Note: Although we at AHA can take pride in what we have accomplished in getting people educated about the potential of hydrogen, we obviously have a great deal of work to do. Our mission has been to make "Hydrogen" a household word: The White House is one household we've obviously missed.]

## IN MEMORIAM

*Frederick William "Rick" Handley*

1950 - 1991

Each of us owes a debt of gratitude to those silent, tireless workers who, while seeking no accolades or glory for themselves, labor quietly and, by virtue of sheer diligence, talent, and professionalism, achieve that degree of personal recognition for which they never actively strove. Rick Handley was such a person.

Rick's introduction to concepts of hydrogen and renewable resources provoked a profound recognition of the urgent requisite for a transformation from a fossil fuel economy to one based on hydrogen. He built upon that conviction with characteristic intensity and study. Rick utilized his award-winning talents to their fullest potential in the production of our most widely-shown video, "A Solar Hydrogen Economy". This tape is a succinct, challenging presentation that projects an instructive, uplifting, and inspiring message.

Rick died in New York City on April 22 while on assignment for ABC News. A tragic accident stilled his creative spirit but not the potent legacy he left. Rick's passing leaves a void in our ranks, yet his example and his work continues to inspire and set a standard of excellence for all to emulate.

Rick's devotion to attaining a wholesome biosphere with a hydrogen economy as the driving force to ensure its continued existence will not be soon forgotten. His tremendous talent, with film, the spoken word, and music, will surely be missed. But as a friend and co-worker to us at AHA, Rick is even more sorely missed.

To Rick's wife and all his family, the American Hydrogen Association extends our most heartfelt condolences. For solace in this sad time, we draw upon the wisdom of poet-philosopher Kahlil Gibran, who, in these words, we believe, captured the essence of what it is that Rick Handley believed in and worked for:

*The universe is my country and the human family is my tribe.  
You may do unto me whatever you wish, but you shall not be able to touch my truth.  
What I say now with one heart will be said tomorrow by many hearts.*

### *Program Update:*

## H<sub>2</sub> RACING PROGRAM ACCELERATES

By Demetri Wagner

The hydrogen racing development program is in first gear and accelerating fast. The program is designed to demonstrate that hydrogen is safer than gasoline or methanol and that hydrogen offers improved engine performance. Corporate sponsorship packages are anticipated, as well as strong individual participation.

Motor sports is a high visibility spectator sport. A hydrogen-powered racing car that challenges fossil fuel-powered cars head-on will certainly attract attention. It is the goal of AHA to promote H<sub>2</sub> racing in a manner that establishes hydrogen as the environmentally-clean, safe, versatile, and preferred automotive fuel for better performance and engine longevity.

The racing program goals include:

- \* Developing channels of communication with major motor sport racing associations, motor raceways, prospective sponsoring organizations, and motor sport media networks.
- \* Advancing, promoting, and demonstrating the use of hydrogen in motor sports by participating in rallies, races, and auto shows.
- \* Demonstrating hydrogen safety and equipment standards in racing applications.
- \* Encouraging technical excellence and diversity in the use of hydrogen as a fuel by hosting an annual show and competitive event.

- \* Advancing hydrogen fuel and conversion equipment availability.

These basic goals are designed to introduce hydrogen to the public in a highly visible but responsible way. Racing is also the best way to develop crash-protection and fail-safe equipment. The automotive and safety engineering work done on a H<sub>2</sub>-racing car can be easily extended as well to natural gas or other gaseous fuels.

The 1991 projected budget for the racing program is \$50,000 (excluding the cost of the vehicle itself). Included is conversion work on the 1991 Oldsmobile Calais HO Quad-Four engine to run on hydrogen, pit tools and trailer, presentation materials, and general development costs.

Progress on this racing program is governed by four factors: funding, racing association/track class sanction, car preparedness, and the racing/demonstration schedule.

My roles in this program are dual: director of racing development and team manager.

*(Please see Racing ... on next page)*

## H<sub>2</sub> RACING PROGRAM SPEEDS UP

(Con't. from previous page)



Pictured above and to the right is a photo of the new H<sub>2</sub> fuel storage tank installed in AHA's Olds Cutlass Calals being converted to Hydrogen Power.

The director's work is largely one of education and public relations. As AHA Racing Team Manager, I am responsible for securing sponsors and project funding, selecting the right equipment for the job, recruiting top drivers and mechanics, and, in general, developing a winning team.

In both these roles, there is a need for volunteer assistance. If you are interested in helping in this exciting program, please contact me at (602) 967-3278 Tues.-Fri. or (602) 282-4246 Sat. - Mon.

*Any way you look at it, hydrogen racing cars, whether powered by internal-combustion engines or fuel cells, mark an important beginning of the Hydrogen Age. Join in this dynamic step to help save our planet and bring about a clean and prosperous future.*

## H<sub>2</sub> FUEL CELL BATTERY UNVEILED

**BLOOMFIELD, NJ** The H-Power Corporation recently announced that it has developed the first commercial fuel cell-hydrogen power system. Company vice president Joe P. Maceda says the "No-Cad Vidpak" is a 12-volt, 8 amp-hr. hydrogen fuel cell power system designed for the commercial video camera market. The complete package weighs about 4.5 lbs. and has two 8-oz. AB 5 iron-nickel cartridges. The system is capable of 25 watts continuous and 100 watts peak operation.

Advantages of this new system over comparable nicad batteries include greater energy capacity and the avoidance of "memory losses" typical of nicad batteries that after a few recharges experience a reduction in usable lifetime between charges. The hydrogen system will be comparable in price to nicads.

The "No-Cad Vidpak" can be recharged from commercially-available hydrogen in 5 to 10 minutes. The first systems will be priced at about \$3,000, but the price should drop to about \$1,500 when the company reaches full production late this year.

Future plans include systems to power lap-top computers that will weigh about two pounds and have an 8-hour lifetime between charges.

- Article courtesy of THE HYDROGEN LETTER

## Ralph Nader Organization

## NATIONAL PUBLIC INTEREST GROUP BACKS HYDROGEN

**WASHINGTON, DC** A national public-interest group is urging the U.S. Congress to increase drastically Energy Department spending on hydrogen research and development. The group, "Public Citizen", is a 100,000-member consumer and environmental organization based in Washington DC. The group, founded by activist-lawyer Ralph Nader in 1971, recommends that the DOE's R&D budget for renewable energy technologies be doubled to \$27.2 million for fiscal years 1991 to 1994.

### '91 Energy R & D Budget "Pitiful"

Public Citizen's energy policy analyst, Jonathan Becker, observed that 1991 spending of only \$1.94 million was "pitiful" and that spending for FY 1992 should be nearly tripled from the budgeted \$2.6 million to \$6.6 million.

In his recent testimony before the House Environment Subcommittee, Becker stated that the use of hydrogen is projected to increase dramatically after the year 2000 because hydrogen is efficient, flexible, and -- assuming a clean energy input such as solar energy -- has little negative impact on the environment. "The economics of a hydrogen transition strategy must address hydrogen production, storage, and transport," observes Becker. "The first economical application for hydrogen will be in vehicle use. Cost-sharing with industry of hydrogen applications should be emphasized. Particular attention should be given to fuel cell technology in fleets and buses."

### Sign of "Misplaced Priorities"

Becker continues, "It is a sign of misplaced priorities that the White House wants to spend at least two times as much money on nuclear fission, nuclear fusion, and clean coal --each-- than it plans to spend on all renewable technologies combined. In fact, for every dollar the White House proposes to spend on energy R&D, less than six cents would go to renewables."

"Although we have just ended a costly war with Iraq, the Bush Administration has apparently not learned the lesson that the US must wean itself from its addiction to oil," Becker added. "In fact, the President is proposing to spend less money on renewable energy technologies during the entire FY 1992 than the US currently spends for oil imports in a single day."

- Article courtesy of THE HYDROGEN LETTER

**HYDROGEN TODAY**

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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.*

By Charles Terrey

There is much good information available to us on energy and other subjects, but unless we stop to analyze it, we can miss its impact on our lives.

I recently read a newspaper article with the following headline: "Shell claims to have found a *huge* reserve of oil in its Mars exploration in the Gulf of Mexico". The find could amount to 1 billion barrels.

Here are some calculations that lend some perspective to the word "*huge*" in the context of our petroleum usage. The information is available from the Energy Information Administration, and most is verifiable in the 1991 World Almanac.

In 1989, the United States used 6.32 billion barrels of oil. The estimated size of this latest Shell find is 1 billion barrels. This means that the Mars find adds about *two months* to our reserves of oil!

"Huge" put into the context of usage, then, is but a drop in the bucket.

The known US reserves are 25.9 billion barrels, which means that our domestic reserves would last only 4.1 years. Since we now import about 50% of our oil, we will be almost totally dependent on foreign oil by

the turn of the century. The estimated amount of oil to be found on the north slope of Alaska is 3 billion barrels -- about another 6 months worth of oil reserves.

The Middle East has about 75% of the worlds known oil reserves. The world's total known reserves of oil are 864 billion barrels of which 75% is in the Middle East. OPEC controls 81%, or 700 billion barrels. The United States oil reserves are about 3% of the worlds reserves.

The United States is the most explored country in the world for oil. It is unlikely that any significant new oil reserves will be found. (By significant, I mean an oil find that would match even our present reserves.)

Now we can begin to realize why President Bush reacted the way he did to the invasion of Kuwait. He knew that if a man with the moral integrity of Saddam Hussein were to control the oil in the Middle East, it would be an unparalleled economic disaster for this country.

If the world continues to use oil at the present rate, however, even the vast reserves in the Middle East will be used up in 40 years. With increasing demands for energy by developing nations, 40 years is optimistic.

**Is Natural Gas Our Salvation, Then?**

Total 1991 natural gas reserves in the United States are estimated at 167 trillion cubic feet. Natural gas usage in 1989 was 19.4 trillion cubic feet. If we were to continue to consume natural gas at the present rate without finding new reserves, the present reserves would last 8.6 years. The governments new energy policy wants to replace 620 million barrels of oil (10% of the annual oil usage) with natural gas. This is equal to 3.54 trillion cubic feet of natural gas. With this suggestion and our historic usage rate -- and assuming a continued new reserve development at our present rate -- we will run out of natural gas in about 18 years.

*In light of these calculations does President Bush's energy policy make any sense?*

President Bush was smart enough to realize the if Saddam were permitted to control the Middle East oil that it would be all over for us economically. Why isn't he smart enough to have an energy policy that will eliminate reliance on Middle East oil?

*Progress Report:*  
**Solar Hydrogen  
Energy Center**

By Michael Loomis

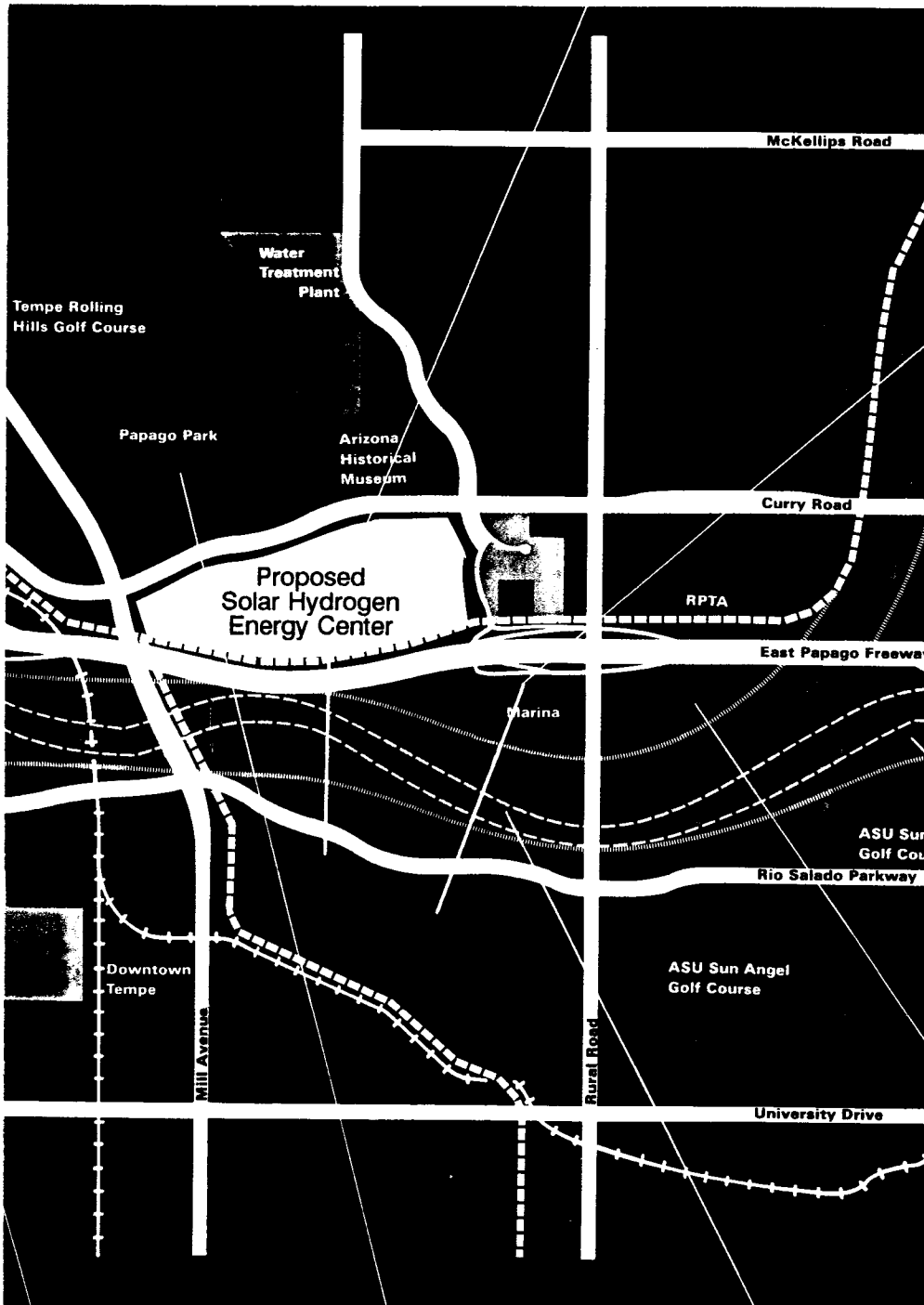
**TEMPE, AZ** The American Hydrogen Association and the Arizona Solar Energy Association have joined together to participate with the City of Tempe (AZ) in the transformation of the dry Salt River bed that runs through the city into a place of beauty and utility.

This joint effort focusses on land located south of Curry Road and just east of Mill Avenue and Moer Park. This property will be transformed into an exhibit park with a broad environmental theme. The project will include the generation and use of hydrogen fuel from water and solar energy, as well as a broad diversity of other solar energy, conservation, and waste recycling examples.

The park will also house exhibits from several small organizations that have common interests but not necessarily the same goals. These different buildings and parks would be linked by a landscaped park-like setting that would accommodate the public in a pleasing setting that features indigenous plant material such as seen in the Phoenix Desert Botanical Garden. Irrigation for this landscaping would be provided through recycled greywater from the facilities.

The two organizations submitted their concept proposal to Steven Nielsen, Rio Salado Project Manager for the City of Tempe, in mid-April. The City has responded favorably to the concept, and a joint committee for the two associations is actively engaged in developing more specific plans and details for this educational center.

Architect Charles Robert Schiffner, Michael Walters, Diane Pfaff, and Michael Loomis from the Arizona Solar Energy Association are working with Roy McAlister, Herb Hayden, and several other volunteers from AHA. To offer assistance in this program or to seek more information, call AHA headquarters in Tempe, (602) 921-0433.



Shown above is a map of a portion of the planned Tempe Rio Salado Project, including the area selected for the Solar Hydrogen Energy Center discussed on the facing page.

## Contemplations for A Squaw Peak Morning

By Sherwin Berger

(Ed. Note: For those readers not familiar with the Phoenix area, Squaw Peak is a prominent mountain surrounded by metropolitan Phoenix below.)

While witness to the birth of time upon this mountain slope,  
 It seems so strange and scary too  
 That the palette of this morning's dawn is marked  
 By moving lines of vapor trails so high.  
 One cannot hear the throb or see the plane  
 That traces poison pencil marks across the sky.  
 From this vantage place of height,  
 The city spreads to all horizons,  
 With homes and streets, trees and lawns  
 Appearing so serene that thought cannot conceive;

Fow soon to burst upon this peaceful scene  
 A cloud of brown and ugly gas and dust  
 To rise to hide across the valley floor  
 The mountains on the other side.  
 Spewed from a thousand engines  
 A roar of noise to smite the ears  
 Linked with odors so gross and foul  
 That one must surely hide the senses  
 Or bear the scars of damaged ears  
 And systems that cannot but rebel and wretch  
 With inner agony against the awful stench.

But No! Hold on a minute, you -  
 Don't you realize that progress must prevail?  
 While city streets are surely no place to be  
 If one is sensitive to our modern life,  
 Get out and find another abode --  
 Love it or leave it is my code.  
 Wild places of rare and wondrous beauty  
 Are only playgrounds to be plundered.  
 Virgin forests of giant trees  
 Are made for man to use as he will.  
 Lumber is jobs and paper and homes  
 Would you disallow our rights to live?

While a flowered mountain meadow  
 Is ours to litter and trample through for kicks  
 Don't fret - they will be there next year when we return.  
 Camping is so much fun in hidden high places.  
 Let me foul our pristine rushing streams;  
 The right is mine to dump, you know,  
 My private wastes or factories' rancid toxins.  
 After all, there is no other place.

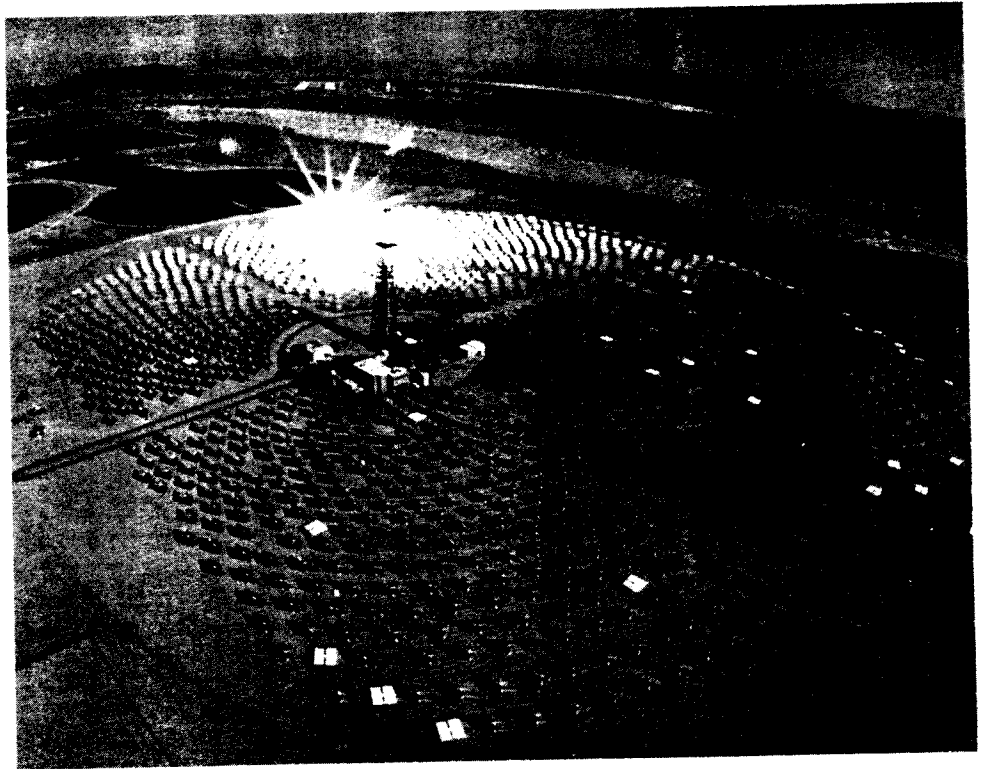
Who are you, you environmental fool,  
 To tamper with the surge of time?  
 As old-fashioned notions of preservations  
 Run afoul of my rights and freedoms to do my thing.

And so the man of vision spoke,  
 Defending with very little wit  
 A mode of life sure to guarantee  
 That when next we meet upon a mountain slope,  
 The things he values in his way  
 Will have vanished in swirling mists of noxious things,

That still his rancor as he finds  
 The surge of time of which he spoke  
 Destroyed with blind brutality and spite  
 His children who frolic on a toxic dump.

In Coming Issue:**SOLAR  
ONE  
UPDATE**

Pictured to the right is a bird's-eye view of Solar One, the 10-MW Solar Thermal Central Receiver Pilot Plant located near Barstow, California. This plant is undergoing a major refurbishing and expansion. See an upcoming issue of Hydrogen Today for an update on what's planned, as well as a report on how the plant has performed since its construction in the late 1970's.

**INTERNATIONAL NEWS:****H<sub>2</sub> IN GERMANY**

By Dan McDermitt

[Ed. Note: In January of this year, the first issue of *H<sub>2</sub>* went to press in Germany. This publication reports on a broad spectrum of worldwide technological advances in the production and uses of hydrogen. An exchange of information between *Hydrogen Today* and *H<sub>2</sub>* began even before the appearance of the first German newsletter edition, an exchange we hope will continue to the mutual benefit of the readers of both publications. Following is a brief overview of two of the articles appearing in that first issue.]

**Euro-Quebec Pilot  
Hydro-Hydrogen Project**

This ambitious multi-national endeavor will harness hydro-electric power in Canada, converting it to versatile hydrogen for use in Germany and five other European Common Market countries. Feasibility and economic studies are scheduled for completion this spring, conceptual planning has been com-

pleted, and the technical detail-oriented engineering phase is ready to begin. The overall financial plan, however, remains somewhat nebulous at this time.

If successful, this pilot project could mark a great stride towards the realization of a renewable energy economy. In sparsely populated equatorial regions and in the northern latitudes an enormous potential exists for harvesting solar-mediated (precipitation) gravitational force. In the pilot project, 100 MW of hydro-electric power will be transferred via 735 KV transmission lines to a coastal electrolysis facility. There it will be prepared for two methods of transportation to the German harbor city of Hamburg. The liquid-hydrogen method will employ the use of 3,600 cubic-meter buoyant piggy-back storage/shipping tanks, a method that minimizes vapor losses by eliminating the filling and off-loading of tanker-ships. The second method employs chemical bonding: toluene is "hydrogenated" to form relatively stable MCH (methylcyclohexane). In Hamburg, hydrogen is extracted, and the toluene is returned via tanker to Canada for another load.

If all goes as planned, the first commercially-consumable hydrogen will start arriving in Hamburg by the year 2000. This time frame gives adequate lead time to make the

necessary technological enhancements required to utilize this renewable energy source.

**Wiesbaden Hydrogen Experiment**

A cooperative effort by the Wiesbaden Technical School and the University of Frankfurt consists of a hydrogen-generating test site that uses wind as its energy source. The windmill system, which was designed, built, and maintained by the students using mostly commercially-available components, has a theoretical generating capacity of approximately 20 kW at a wind velocity of 11 meters/sec. In practice, however, the system has been averaging only about 10 kW due to turbulence on the rocky cliff location selected and bugs in the computer software controlling the windmill.

The alternating current from the windmill generator is used to heat buildings at the test site. The 380 V AC is rectified to provide 125 V DC for the pressure electrolyzer used to separate hydrogen from water.

In addition to converting natural gas-burning appliances to use hydrogen, the students have converted two 3-liter Opel production car engines to use for hydrogen-powered generators. The cost of the energy produced by this system is calculated to average about 80 cents per kWh at the present time.

## CALENDAR OF EVENTS

- May 6 - 20: Roy McAlister, AHA President, speaks at various Phoenix-area elementary schools on Hydrogen Energy.
- May 15: AHA-ASU Chapter monthly meeting featuring videos on hydrogen engines and the Alaskan Arctic National Wildlife Refuge and discussion on Stirling Engines by AHA member Clare Van Ausdale. 7 PM, Student Services Bldg. Amphitheatre, ASU Campus, Tempe.
- June 3: Apollo High School (Phoenix, AZ) All-Day Hydrogen Demonstration and Teach-In for science classes. Led by AHA member Irv Jorgenson.
- June 19: AHA-ASU Chapter monthly meeting. Guest speaker is T. Lepley, Solar Energy Research Program Manager for Arizona Public Service (APS) on his company's activities in solar energy. 7 PM, Student Services Bldg. Amphitheatre, ASU Campus, Tempe.
- June 19-23: California Clean-Car Race, starting in Sacramento and ending in Los Angeles.
- June 25: Conference on Hydrogen Opportunities for Alaska, at Sheraton Hotel, Kuskokwim Room in Anchorage, AK, 8 AM to 5 PM, luncheon included.

(Advertisement)

# The Hydrogen Letter

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Every Month. Worldwide.

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**Leaders Seek Your Opinion:****AHA BOARD WEIGHS MEMBERSHIP FEE STRUCTURE AND OTHER CHANGES**

**TEMPE, AZ.** As the American Hydrogen Association moves into its second year, its Executive Board is contemplating changes to its membership fee structure. As AHA President Roy McAlister explains, "The current annual membership fee is \$30 for regular members and \$15 for seniors and students. While we want to encourage as many people as possible to join AHA, these fees simply do not cover the costs of operation."

During its first year of existence, McAlister explains, the primary goal of the organization was to make "Hydrogen" a household word. "Virtually all our activities were built around that goal. We participated in some twenty exhibitions, fairs, and the like; we gave lectures at numerous schools, service clubs, technical forums; members appeared on roughly a dozen radio and/or television shows; we held monthly AHA chapter meetings throughout the year, and had weekly organization management

meetings. In addition, we prepared some fifty different papers and handouts, ranging from one-pagers to technical papers of ten to twenty pages each."

The net result, according to association records, has been to sign up some 650 paid members and several hundred more people who expressed an interest in learning more about hydrogen and wanting to receive regular mailings. Our current newsletter circulation totals about 3,000 copies.

"The current \$30 annual membership rate represents a real bargain," McAlister points out. With it comes six issues of *Hydrogen Today* and four issues of the new *Hydrogen Journal* (an advance run of the first edition, for Summer 1991, was printed last month; it will be mailed to members in June). In addition, there are monthly meetings at Arizona State University (with others being scheduled to be held starting later this year in other parts of the country).

The Association maintains a full-time office staff and headquarters in Tempe. On an average day, the staff handles at least a dozen telephone inquiries and requests. (Following a television or radio interview or story, ten or more calls an hour come in.)

As seen in the feature box below, over 27 people are listed in leadership positions in AHA. In addition, there are at least that many more individuals that regularly dedicate time to helping implement the various programs of the Association.

*None of these people is paid anything for their time.*

"The number of manhours donated to AHA is incredible," McAlister observes. (In fact, many contribute substantial amounts of money as well to help finance the printing costs, mailings, cost of

display materials, office supplies, etc.) Some contributions and on-going support is also provided by corporations and small business. "Unfortunately, few of the many volunteers involved can afford to continue to devote all this time and support on a gratis basis indefinitely," says McAlister.

AHA is currently attempting to secure additional backing for its programs from Federal and state sources as well as from other major corporate sponsorships. However, now that the Association is moving to implement its second and third goals -- developing demonstration programs and educational curricula for schools -- much greater financial support is needed.

Among other alternatives under consideration is the raising of membership dues for some or all categories of members. The Board would like your comments regarding such actions as well as any suggestions of other fund-raising programs that might be undertaken. Additional financial gifts (tax-deductible) are also welcome.

**The Hydrogen Association**

*dba The American Hydrogen Association in the United States*

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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.

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

# 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. Jacobson. 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.* . .

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