

HYDROGEN TODAY

Official Publication of the American Hydrogen Association (AHA)

September-October 1990

Volume 1 Number 2

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WHERE IS HYDROGEN WHEN WE NEED IT?

TENSIONS MOUNT IN MIDDLE EAST -- WAR THREAT HEIGHTENS

Over 150,000 U.S. troops have been shipped to the Persian Gulf in the past month, with more to come soon. They are joined by fighting forces from England, Egypt, Turkey, Saudi Arabia, and several other countries in an effort to force Saddam Hussein of Iraq to back out of Kuwait and release the thousands of foreigners Iraq is holding hostage. As each day passes, tensions continue to build and it appears more likely that war will soon break out.

Though the U.S. considers Saudi Arabia a close ally, it finds itself in a difficult position, even from a philosophical point of view: since the formation of Israel, the U.S. has been an unabashed supporter and bankroller for a bitter foe of the Arab nations, providing Israel with more financial support per capita than it has given over the same forty-plus years to all Arab nations combined. Now, however, the U.S. is committing \$15 billion/year (at present count) to provide military support to Israel's long-standing enemies.

The Arab nations, for their part, have very mixed feelings about the U.S. involvement as well. Although they need the military might to balance the scale with Iraq (which has amassed more weapons and a larger armed forces by orders of magnitude than any of its neighbors), most Arabs are very uncomfortable with Americans roaming about their holiest of nations and hovering offshore with enough heavily-armed

warships and aircraft to obliterate the entire region.

Why, then, is the U.S. there? The indisputable reason is, of course, oil. Despite a clear and unequivocal signal in 1973 that our country should become energy independent, when OPEC was formed and oil prices were driven up spectacularly overnight; despite a Presidential edict that we would do so (remember "Project Independence"?); despite repeated occasions of OPEC price and oil output manipulations that have left the U.S. nervous about its energy security -- the U.S. has continued to import a major percentage of its total oil.

What if we had continued the government-support programs to develop solar energy started by the Carter Administration? And what if we had not spent all that money on another government bureaucracy (the Department of Energy and SERI -- the multi-billion dollar Solar Energy Research Institute that has yet to produce a significant improvement in solar energy technology; and has, by itself, done little to bring down the costs of any form of solar energy)?

What if, instead, a focus had been placed on Hydrogen Energy?

It is difficult if not impossible to reconstruct history -- but in the 17 years since the formation of OPEC and the First Energy Crisis, a focussed effort on solar hydrogen production and use -- with private and government financial support equal to a fraction of what has been wasted

on programs like oil-shale development or recovery-enhancement of marginal and low-producing oil wells -- would almost surely have moved the U.S. into Hydrogen Economy by now. We could have had a large hydrogen production capacity on line, with more coming on stream steadily. At the very least, the hydrogen would be blended into our natural gas supply and used to upgrade the BTU-content of the methane and extend our domestic natural gas supply.

(Please turn to "WAR LOOMS" - Pg. 5)

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WHEC # 8 In Hawaii Hydrogen Is Subject Of World Confab

The Eighth World Hydrogen Energy Conference, co-sponsored by the International Association of Hydrogen Energy and the State of Hawaii, was held this past July 23 - 27 in Hawaii. Twelve members of AHA attended the conference, including Roy McAlister, AHA President, who presented two technical papers during the meeting sessions.

The Association also had a display booth at the exhibition and distributed literally thousands of position papers, newsletters, fact sheets, membership applications, etc. An 8-minute videotape on Solar Hydrogen was a popular drawing card, bringing IAHE members and guest scientists from all over the world to the AHA display.

A recently-published book, *The Phoenix Project, An Energy Transition to Renewable Resources*, by AHA Board member Harry Braun, was marketed at the conference, as were AHA T-shirts and various publications.

Several attendees joined AHA, including scientists from Japan, India, Russia, and Germany.

The convention itself provided a broad perspective about what is going on in the field of hydrogen energy research, production, storage, and utilization. (See the accompanying box for samples of subjects presented at the conference.) Papers from all over the world address virtually every aspect of the field of hydrogen energy. Attendees from AHA left Hawaii with little doubt that solar hydrogen would be the energy carrier of the future -- and the future is not far off.

What was disturbing to members of AHA, however, was the fact that several countries are apparently many years -- perhaps a decade or more -- ahead of the United States in the development of hydrogen technology. Germany, Japan, Russia, Saudi Arabia -- all have major, tangible programs in hydrogen energy production and/or utilization currently underway.

The two major luxury automobile companies of Germany, Daimler-Benz (Mercedes) and BMW, both have major hydrogen vehicle testing programs well underway, with cars on German highways and roads at the present time. A Russian Tupolev 155 powered by liquid hydrogen was successfully used in commercial flight -- from take-off to landing -- in the USSR for the first time in early 1988. A project to produce large-scale solar hydrogen from photovoltaic cells is underway in Saudi Arabia, the product of a joint-venture project of Germany and Saudi Arabia. (See "While U.S. Prepares To Fight For Oil ..." on page 6.)

The clear and stated intention of Germany is to be technological leaders of hydrogen energy, allowing them to export the technology to solar-rich regions of the world (like Saudi Arabia, the Sahara desert, Australia, and the United States) in order to guarantee future supplies of hydrogen for import into their own country -- and continued economic prosperity as well. Their thinking has taken them far beyond the embrace of fossil fuels to securing future sources of clean, renewable energy. They have come to recognize that hydrogen is the only way, not only to insure their energy future, but to guarantee any future at all.

**Sample of Subjects
Presented At Conference**

Hydrogen Energy -- An Overview
Greenhouse Warming Mitigation

Electrolysis
Thermochemical H₂ Generation
Photoproduction: Biological

Hydrogen Storage
Metal Hydrides
Transmission, Dist'n., & Storage
Hydrogen Engines/Fuel Cells

*Technical Alternatives Allowing
Continued Use of Fossil Fuels **

**Hypersonic Flight To Space --
National AeroSpace Plane**

*Renewable Hydrogen In
Transportation Applications **

* (Presented by R E McAlister,
AHA President)

Recent Energy Events (Should) Offer Opportunities For Advance Of H₂

* Recently, a special Advisory Board a 28-member blue-chip panel including three Nobel laureates, was appointed to the U. S. Secretary of Energy. This committee, which includes one representative each of the automobile, oil, and chemical industries, as well as leaders from public utilities, consultants, scientists, and business school administrators. This group will meet regularly with the Secretary of Energy to provide input on long-range planning and analysis of national energy conservation and environmental issues. AHA is preparing material on solar hydrogen to send to the newly-created Board.

* Ford, General Motors, Chrysler, and 14 petroleum companies have launched a cooperative research program "to find cleaner-burning fuels and engine technology according to a Ford news release to stockholders. The reported aim is to improve air quality and reduce vehicle emissions. More than 2,000 emission tests will be conducted by GM and Ford to evaluate a wide range of alternative fuels for use in both current and future vehicles. When AHA called Ford to find out more about this program, it was told that the focus of the entire testing program was alternative blends of gasoline. Hydrogen "is too far into the future to be of immediate interest in this program according to Don Buist, Ford's Director of the Office of Automotive Emissions.

* Nissan, in cooperation with an individual Japanese inventor, has developed a liquid hydrogen-powered engine. Although Nissan reported that some bugs were still being worked out, the biggest problem with hydrogen was the relatively-large amount of space required for liquid hydrogen storage.

In Cooperation With German DLR, NASA, and World Survival Foundation

AHA Hosts \$100,000 Display In Arizona & California

The American Hydrogen Association, in conjunction with the World Survival Foundation, has contracted with the German Aerospace Research Establishment (DLR) to bring an impressive hydrogen energy informational display to the mainland U.S. This display, entitled "Solar Hydrogen: Energy Carrier of the Future", consists of some 34 color display panels that provide a comprehensive overview of hydrogen energy. This display, which was shown at the World Hydrogen Energy Conference in Hawaii in July, was delivered to Phoenix in mid-August and will be on public display under AHA's auspices through October 10, 1990.

AHA also arranged for a model of the NASA-proposed National AeroSpace Plane, the X-30, to be presented along with the DLR exhibit. This plane, which is designed to run on a hydrogen slurry fuel, would replace the present space shuttle with a space vehicle that could take-off from a horizontal runway.

In addition, AHA provided a variety of its photograph display panels, a model of an advanced-design internal-combustion engine, a video film on solar hydrogen, and an assortment of written hand-outs.

The combined exhibit is valued at over \$100,000.

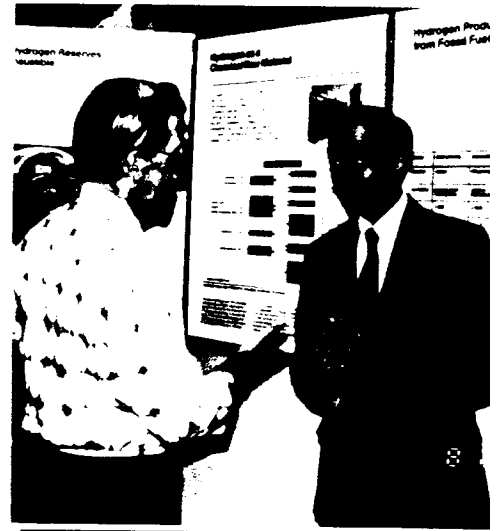
The DLR exhibit features descriptions of how hydrogen is extracted from water,

how it may be pipelined or transported, how it can be stored, and how it can be used. Photographs of actual Mercedes and BMW vehicles that have been converted to run on hydrogen; of a Russian jetliner that currently is in operation with one engine running on liquid hydrogen; and of storage systems, fuel cells, and various solar hydrogen production installations are highlighted in this extensive exhibit.

AHA introduced the exhibit in a week-long showing at the Arizona State Capitol building the week of August 20-24. Subsequent scheduling includes an extended showing Aug. 27-Sept. 15 on the campus of Arizona State University and a scheduled presentation in conjunction with the city of Phoenix at the Valley Bank Center Plaza in downtown Phoenix from Sept. 17-22. The exhibit is then scheduled to appear at the University of Arizona in Tucson the last week in September.

A smaller display featuring AHA-prepared materials and videos is simultaneously on display in various Northern Arizona locations.

The DLR display will be shipped to Los Angeles for presentation at a national Clean Air Conference the week of October 15-19. Arrangements are pending for the exhibit to be shown at the University of California at Berkeley and/or Stanford University late in October.

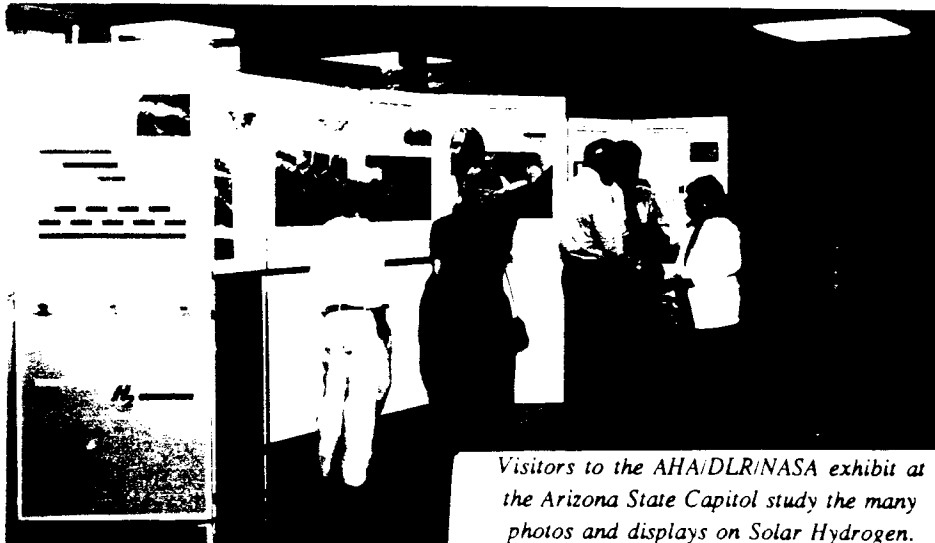


Roy E. McAlister, President of AHA, discusses Solar Hydrogen with one of the hundreds of visitors to the AHA/DLR/NASA exhibit at the Arizona State Capitol.

AHA USES EXHIBIT TO STIMULATE SUPPORT

The Solar Hydrogen exhibit was scheduled at the Arizona Capitol to familiarize state legislators about the Hydrogen Economy prior to their reviewing Arizona's Energy Policy, a process that started the week after the AHA exhibit. (See "AZ Energy Policy In Development" on pg. 7.) During the week at the state Capitol, an estimated 1,000 people toured the exhibit, including a number of legislators and members of the press. Two press conferences and a VIP reception attracted people from all over the state, and AHA members were interviewed on several radio talk shows and local TV news broadcasts.

Other members of the state legislature, candidates running for office, and local politicians saw the exhibit or were briefed in presentations by AHA members over the next several weeks. These included the Tempe City Council, the Mayor of Phoenix, and a number of officials from that city's public transportation and water and waste management departments. In total, an estimated 4,000 people saw the exhibit over the first three and a half weeks of its showing.



Visitors to the AHA/DLR/NASA exhibit at the Arizona State Capitol study the many photos and displays on Solar Hydrogen.

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American Hydrogen Association
(AHA)

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 Tempe, Arizona 85282
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Published Bi-Monthly

Editorial

**Is "Is The World's
 Supply of Oil
 Running Out" The
 Right Question?**

By Robert B. Liden

We've all heard the wide range of estimates about how much fossil-fuel reserves we have left. Some say we have but 10 to 20 years of oil left, particularly if the rate of consumption increases at a pace similar to that of the past fifty years. Other experts claim we have a maximum of perhaps 50 years. A couple of weeks ago, a *Nova* program on PBS, entitled "A World Full of Oil", cited geologists that claim that we may have several hundred years supply of oil left at today's usage rate.

If this is so, then why do we struggle with the problem of converting the world to a hydrogen-based economy?

The answer is simple -- our atmosphere cannot tolerate the continued build-up of carbon (primarily in the form of carbon dioxide). We know that when we burn oil -- or any "fossil fuel" -- we create as many molecules of carbon dioxide, carbon monoxide, or pure carbon as we had atoms of carbon in the fuel to begin with. We also have come to learn that the so-called "Greenhouse Effect" is a natural phenomenon. As Ed Phillips, a well-known Scottsdale, AZ, meteorologist, writes in his recently-published book *Crisis in the Atmosphere:*

The Greenhouse Factor, however, the Earth maintains its own greenhouse effect. Without this effect, our planet would be about 72° F cooler -- to a chilly average global temperature of about -13° F!

Certain gases, particularly carbon dioxide and methane, naturally exist in our atmosphere. These gases partially trap and block the re-radiation of heat back into space. Left on its own, the Earth maintains an equilibrium in the atmosphere -- a sort of invisible blanket that holds enough heat on the Earth's surface to make life comfortable and habitable for mankind (and all other living things).

If we dump more of these heat-trapping gases into the atmosphere, we basically build ourselves a thicker blanket. The result is higher temperatures here on Earth. Carried to the extreme, our whole atmosphere might become CO₂, like that of Venus. And, like Venus, we could expect temperatures of up to 900° F.

We fortunately are not near that extreme at the present time. But the actual fact of the matter is that the level of carbon in the Earth's atmosphere is over 25% greater now than at any time in the past 160,000 years. Worse yet, based on the present trend, many scientists predict we will have roughly three times as much CO₂ in our atmosphere by the year 2050.

In the past 100 years, the average temperature on Earth has risen one degree; that's not much, until you know that it took 2,000 years before this to get one degree warmer. The six hottest years of the 20th Century all have occurred in the 1980's. Weather patterns are clearly beginning to show significant changes.

What all this really says to me is this: releasing unnecessary amounts of greenhouse gases into our atmosphere is obviously rocking a small, delicately-balanced boat in a big ocean. We may be able to get away with it for awhile, but it is folly to think we can keep going like that without severe consequences.

We simply cannot let three times as much CO₂ get into our atmosphere as we have now.

It's not a question of whether or when we will run out of oil. *The only real question is How Soon Can We Stop Burning Oil?*

* * *

DID YOU KNOW --

By Charles Terrey

- That Hydrogen can be manufactured using solar energy and water? It is called "Solar Hydrogen".
- That Solar Hydrogen is a non-polluting, renewable fuel?
- That Hydrogen burned as a fuel produces only water and traces of oxides of nitrogen? Both are natural in our atmosphere.
- That Hydrogen could be cost-competitive at \$0.75 per gallon equivalent of gasoline? (This estimate is based in the thermal conversion of solar energy to hydrogen and mass production of solar gensets.)
- That existing automobiles could be economically converted to burn Hydrogen fuel?
- That burning Hydrogen does not contribute to the Greenhouse Effect?
- That converting to a Hydrogen-based fuel economy will largely eliminate acid rain?
- That Hydrogen is naturally produced by plants and animals? Hydrogen is not toxic.
- That Hydrogen is safer than gasoline?
- That Hydrogen is safer than natural gas?
- That an efficient atomic- or fossil-fueled central power plant can deliver only about one-third of the energy in the fuel as electricity?
- That small personal or local power and management plants could be designed to utilize the energy we now throw away? We could at least double energy utilization compared to present practices.
- That these power plants could be mass-produced so that the cost per watt is much less than that of larger hand-built power plants?
- That it is less expensive to move Hydrogen across the continent than an equal amount of electrical energy?
- That Hydrogen could be supplied through the same system that now supplies natural gas?

(Please Turn to "DID YOU KNOW?" - pg. 5)

HOW TO MAKE SOLAR H₂ COMPETITIVE WITH GASOLINE

Roy McAlister, P.E.
President, AHA

An oft-asked question is "How can hydrogen compete with gasoline?" The answer: "Use free solar energy and do what Henry Ford taught the Industrial Revolution concerning horseless carriages." Ford provided motorized carriages from an assembly line using components manufactured from precision production tooling. Ford's cars were affordable because common materials were used to build car components in quantities that wore out high-speed production tooling. This allowed millions of dollars in tooling to be amortized over tens of millions of parts. The resulting tooling cost per part was only pennies.

Today's automobile includes a complex engine, transmission, differential, alternator, battery, computer, seats and upholstery, sheet metal and plastic body parts, and more wrap-around glass than the windows in many homes of Henry Ford's day. Cars that cost \$20,000 or less generally offer engine selections ranging from 100 to 200 horsepower.

A 135-horsepower engine will drive a 100-KW electricity generator. This arrangement is called a "genset". If the

engine uses new solar energy as the fuel instead of ancient solar energy captured in gasoline, it is labeled a "solar genset". A parabolic point-focus, aluminized-polymer reflector is one of the most cost-effective

WAR LOOMS

(Con't. from page 1)

By this time, our automotive industry, had it been confident of a large and steady source of supply of reasonably-priced hydrogen, could be supplying hydrogen-powered new vehicles and retrofit kits to adapt older cars to run on hydrogen.

We also could have our factories, hospitals, schools, office buildings, etc. all running on hydrogen-powered gensets.

Most importantly, we could be in a position now where we didn't need Middle East oil. Our nation's balance of payments situation would be immensely improved. Our National Deficit could be a fraction of what it has grown to become. Unemployment could be lower. Our air would be a lot cleaner. The Greenhouse Effect would be small or non-existent. We might even be able to breathe a little easier as we studied the hole in the upper-atmosphere ozone layer.

We wouldn't be waving goodbye to many of our nation's finest young men and women -- fearing, almost fatalistically accepting, the fact that many would not come back.

And we wouldn't be spending \$15 Billion to try to offset the actions of a maniacal despot who has decided to try to gain control of his neighbors -- as an extension of a centuries-long struggle for dominance in that part of the world. (Who knows -- if the world didn't have such a thirst for Kuwait's oil, maybe Hussein wouldn't have been so hungry to take over Kuwait in the first place.)

Instead, we stand on the brink of war. And we will continue to put ourselves in this uncomfortable, costly, and vulnerable predicament as long as we continue to spend our money supporting foreign-produced oil rather than renewable, inexhaustible, clean, domestically-produced Hydrogen.

shapes and material selections for concentrating solar energy for use in a heliostatic engine.

Modern water electrolyzers (powered by the electricity generated by a solar genset) can provide hydrogen at an energy efficiency of about 80%. The cost of hydrogen from electrolysis using a solar genset, then, is about 1.25 times the amortized capital cost of the equipment and land involved, plus maintenance, plant overhead costs, and the delivered cost of water to the plant.

(Please see "H₂ vs. GASOLINE" on pg. 4)

WHILE U.S. PREPARES TO FIGHT FOR OIL, SAUDIS WORK TO DEVELOP HYDROGEN

As the United States proceeds with major military build-up in and around Saudi Arabia in an all-out effort to defer the rich oil fields of the Middle East, the Saudis, ironically, are involved in a major program to develop Solar Hydrogen Energy. Their efforts are part of a joint venture arrangement with the German government in which the solar generation and utilization of hydrogen is to be investigated and demonstrated.

The project includes the construction of a prototype photovoltaic 350 KW hydrogen generation plant in Riyadh, Saudi Arabia. As reported in the companion brochure prepared to accompany the DLR exhibit currently being shown in the U.S. by AHA, "The installation in Riyadh consists of an array of generators with solar cells that track the sun and operate with concentrated irradiance [sunlight] and a sophisticated electrolysis plant complete with elaborate measuring equipment." The installation is scheduled to begin operations later this year and will generate about 6 million cubic feet of hydrogen per year.

DID YOU KNOW?

(Con't. from previous page)

That Hydrogen is the only fuel that can make the United States fuel independent and pollution-free for as far into the future as the sun will shine?

That Hydrogen could create millions of high-quality jobs in the United States?

That the United States could make the transition to Hydrogen fuel by the year 2010?

That Arizona could manufacture enough Hydrogen fuel from our solar energy resources to supply the entire transportation system of the United States, using about 5% of its land area? Similar statements could be made of California, Nevada, New Mexico, and Texas.

FOREFATHERS

(Con't. from previous page)

Our forefathers spoke and wrote of this theme often. *We can do no less but to heed their words. It is the most meaningful legacy we can leave.*

As an affirmation of your support for the mission of AHA, please become a member today. Encourage others to do the same. Purchase our publications and tapes. Become informed. Become active. Help save our economy. Help save our planet.

New Arizona Energy Policy In Development

By Rick "Demetri" Wagner

[Ed. Note: Several states around the U.S. have in recent years developed formal energy policies. California has important environmental legislation under development and a major environmental initiative, nicknamed "Big Green", on the November ballot. Several members of AHA have been involved in hearings and debates regarding a formal energy policy currently under development for the state of Arizona. Following is an excerpt from a recent report prepared by Mr. Wagner, who is Director of World Survival Foundation and an active leader of AHA.]

For the past eighteen months, the Advisory Committee on Energy Planning and Policy, composed of citizens appointed by the Arizona Legislature, has been working with staff from the Arizona Energy Office to develop recommendations on the formation of a state energy policy and implementation plan. The panel, selected from a cross-section of distinguished citizens, elected officials, and business executives, has been attempting to forge a consensus policy out of a myriad of facts, figures, and criteria concerning all facets of energy production, distribution, and utilization.

The energy policy of the state has a direct and meaningful impact on economic development, environmental quality, quality of life, and citizens' health. Developing a comprehensive energy policy is no easy task. It has been even more difficult due to the varied locations and backgrounds of the members and the

frequency and length of the meetings. Several appointed members have resigned (including the first chairperson), a couple of members have not attended a single meeting, and no member has been able to step forward in a leadership capacity and lend continuity to the development of a meaningful vision of Arizona's energy future.

The committee members and staff that have attended meetings are to be commended for their hard work and sincere effort to participate in this monumental task. But everyone in Arizona should recognize that the primary participants have been largely defenders of the "status quo" or business executives bent on improving their position in the marketplace.

The noble ideal of comprehensive citizen participation in the process has been mostly lost thus far. However, the people's opportunity to participate in the process will come again in a series of public hearings to be held around the state late this month and next. This will be the citizen's final opportunity to review the policy and add their words to its substance. The changes, additions, and deletions suggested by the public will be incorporated into the document prior to its delivery to the Legislature in December of this year.

Having observed the "generation" of the draft Energy Policy over the past year, I can say that the policy to be presented goes a long way towards maintaining the stranglehold position the utilities and petroleum industries have around the necks of the citizens of Arizona. The definition of the word "policy" is to define a "definite course of action" to be administered in dealing with the subject for which the policy has been written. The Arizona Energy Policy being developed is extremely short-sighted and fails to set forth specific *policy* for the development and utilization of the immense solar energy resources in Arizona. Nor does it set "policy" for altering our transportation system to any alternative fuels such as non-polluting hydrogen. Given Arizona's vast solar resources, the policy could set the goal to achieve state energy independence by 2010 and achieve energy exportation by 2020 -- using solar hydrogen energy.

Alas, no such meaningful vision or definite course of action is set forth in the policy as presently drafted.

In several other states, no opportunity has been given to citizens to participate in the development of specific energy policies. We in Arizona have a tremendous chance here to take a leading role in demanding the conversion from polluting energy resources to non-polluting renewable resources.

All AHA members and friends: Help give Arizona's Energy Policy a specific course of action. When the public hearing comes to your region -- stand up and shout "ARIZONA 100% SOLAR BY 2010!"

COMING EVENTS

- Sept. 17 - 21: AHA/DLR Display at Valley Bank Ctr. - Phoenix
- Sept. 19: ASU Chapter Meeting - Student Svc. Bldg. - ASU Campus (7PM): Ed Phillips - "Crisis In Our Atmosphere" & Roy McAlister - "Hydrogen In Transportation"
- Sept. 22: AHA Workshop - Pima Rm., Memorial Union, ASU Campus (10 AM): Irv Jorgenson - Hydrogen Chemistry Demonstration; Roy McAlister - H2 Prod'n. From Wastes; Dan Brewer & Michael Lowe - Hydrogen Fuel in Aircraft
- Sept. 28: Energy Industries Forum Luncheon (12 Noon): Herb Hayden
- Sept. 22 - 29: AHA/DLR Display at Univ. of AZ Campus - Tucson
- Oct. 4: Energy Engineering Luncheon, Az. Club, First Interstate Bank Tower, (11 AM): Roy McAlister
- Oct. 15-19: DLR Display at Clean Air Conference in Los Angeles
- Oct. 18: AZ Solar Energy Ass'n. Meeting: Roy McAlister
- Oct. 22 - 31 (Tent.): AHA/DLR Display at Stanford and/or U. of Calif. (Berkeley)
- Oct. 24: "The Billion-Pound Diet", Presented By Debbie Gordon (Energy Policy Analyst with Union of Concerned Scientists): 1 PM, Glendale (AZ) Comm. College (Rm SC142); and 7PM, ASU Student Svc. Bldg., ASU Campus

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.

Such an energy and industrial transition is technologically feasible today. We are proposing, however, a massive change in our economic and energy structure that will require widespread support of industry, government, and the public. The real problem we face in this regard is the enormous information-gap that exists within the scientific and educational community, industry, the political establishment, the media, and most importantly, the general public. In that regard, we have our work cut out for us. But our objectives are clearly defined – and they are achievable.

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.* . . .

(Tear Or Cut At Dotted Line)

* * * 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: _____

Student Membership (\$15/year)

Seniors (60 +) Membership (\$15/year)

Family Membership (\$40)

Regular Membership (\$30/year)

Sustaining Membership (\$100/year)

Life Membership (\$1,000)

Corporate Sponsor (\$1,000/year)

Foreign Government (\$1,000/year)

Other Gift (specify amount)

Signature: _____ Date: _____

Enclose check or money order and mail to: American Hydrogen Association, 2026 West Campus Drive, Tempe, AZ 85282
