

It is clear that politicians on both sides of the aisle need to understand that the science and technology behind hydrogen is real, and isn't tied to Bush by any deeper motive.

A consistent theme of the conference was the need to educate key groups on the benefits of hydrogen as a safe, clean, and effective fuel. Although the *Clean Air Now* community understands hydrogen's advantages, a vast majority of the country does not. A good example of this disconnect can be seen with the difficulty hydrogen and fuel cell companies have simply getting their products to market.

Jadoo power systems is a highly touted, portable fuel cell start up from Massachusetts. Their technology uses metal hydride canisters to store and supply hydrogen to micro-fuel cells that power portable electronics and power systems. Due to the power and use requirements of television cameras, replacing current battery technology with a Jadoo portable power system can provide cost savings of up more than 60%. Though Jadoo products have been tested, are ready for sale, and have significant demand based on the technological and economic advantages, they have been unable to effectively ship their products due to outdated and inconsistently applied federal regulations. Several federal agencies went so far as to approve their products for shipping, and then fine them and their customers when they did. These barriers are not only unacceptable, but can be devastating to a virgining industry, especially when the products have real value in the marketplace.

The *National Hydrogen Association* is currently putting together the "*H2 & You*" campaign. Its primary goal is to make the case for hydrogen at the federal and state levels. I am pleased to see the NHA taking on this important task, however, we all share the responsibility. It is also worth point out that *Clean Air Now* has been making the hydrogen case for over thirty years now. It is little wonder that the *National Hydrogen Association* continues to

present the Dr.Zweig Award at the annual conference.

So, let us all raise our glasses of water from the tailpipes of hydrogen cars, and give a toast to Dr. Zweig and *Clean Air Now*. May we all share in his vision and wisdom, by continuing to push the evolution of the energy revolution. Thank you for allowing us to be a part of changing the world.

Yes! I want to become a Clean Air Now member and help to improve air quality. Enclosed is my tax-deductible membership contribution:

Please make checks payable to:
Clean Air Now (Tax ID #33-0087555)

Name _____

Address _____


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Membership category _____

Student: \$10	Sustaining: \$100
Individual: \$25	Sponsor: \$250
Premium Individual: \$50	Corporate: \$500

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Hi, I just got back from the program and I'm very impressed the presenters, information, printed materials, the experiment supplies, and especially the hydrogen car! Although I wasn't feeling well and my family wasn't happy about me being away on the weekend I'm glad I went. I'm sure I'll be teaching most of the program as a complete unit to my 8th graders. Thanks, Cliff Rosenthal
-07 Clean Air Challenge Teacher

Clean Air Now News

Volume 9, Issue 1
Editor, Virginia Field
Asst. Editor, Matthew Burks



September, 2007
President, James Provenzano

California High Speed Rail in Funding Limbo?

By Woody Hastings

Intercity High Speed Rail (HSR) for the state of California (bullet trains) remains an elusive dream under the Schwarzenegger administration. Cool to the 11-year old project for most of his administration, Schwarzenegger recently wrote an OpEd in the Fresno Bee extolling its virtues, but calling on the California High Speed Rail Authority that administers the project, to come up with a workable, sustainable financing plan.

HSR is a win/win/win. It's good for the environment – it's supported by the Sierra Club, good for air quality (see below), good for the economy – estimated to create about 450,000 permanent jobs, good for reducing global warming gas emissions (see below), and good for intercity travelers, especially folks who make frequent flights or driving trips between, Los Angeles, San Francisco, Sacramento and San Diego.

HSR is a system that, for example, will allow travelers to get from LA to San Francisco in about 2.5 hours in trains that cruise at speeds just over 200mph.

Some of the environmental benefits* of HSR include:

- Decreases air pollutants statewide and in all air basins as a result of reduced pollution from automobiles;
- Electrically-powered HSR reduces pollutant and greenhouse emissions and reliance on fossil fuels. The total predicted emissions savings of the California HSR system is up to 10.4 billion pounds of CO₂ per year by 2020 and will grow with higher ridership.
- Imposes less impact on the environment than expanding airports and highways: less impact on wetlands, water resources, biology and farmlands; less noise impact, and even reductions in areas where the HSR project grade-separates existing roads over intersecting rail lines.
- Is projected to save five million barrels of oil per year, even with future improvements in auto fuel efficiency. Comparing the energy required to carry a passenger one kilometer, the HSR needs only one-third that of an airplane and one-fifth of an automobile trip.
- Avoids and/or minimizes the potential impacts to cultural, park, recreational and wildlife refuges to the greatest extent possible.
- Maximizes use of existing transportation corridors and railroad rights-of-way in order to minimize the impacts on California's landscape.

These are just some of the many benefits of HSR. There are also many more transportation, economic, land use, and social benefits. Let your state assembly and senate representatives know that you support High Speed Rail. Thank the governor for his recent support and urge him to work with his colleagues to develop a financing plan.

To learn more about the California High Sped Rail Project, visit: <http://www.cahighspeedrail.ca.gov/>
*Source: CA High Speed Rail Authority



Robert M. Zweig, M.D. Memorial Endowed Scholarship

By Virginia Field

When Bob Zweig passed away in 2002, Clean Air Now, his friends, and his family wanted to remember him and his contributions to health by establishing the Robert M. Zweig, M.D. Memorial Scholarship Fund at the University of California, Riverside. The purpose of the fund is to support medical students in the UCR/ UCLA Thomas Haider program in Biomedical Sciences. The selection of students states that candidates for the scholarship with interest in medical problems accruing from air pollution receive special consideration.

Initially, Clean Air Now donated \$12,000 to establish the fund. Through the generosity of donors, this fund grew to over \$50,000 at the end of 2006. This reflects the desire to continue to honor Dr. Zweig, and to support his ideal of heightening the awareness of respiratory problems resulting from air pollution. Annually, since 2005, a particularly promising biomedical sciences student has been the fortunate recipient of this scholarship award. To date we have awarded two scholarships of \$1,000 each. *Shirley Tung* was admitted to the Medical Program in Fall of 2004. In June 2005, she became the first recipient of the Zweig Memorial Scholarship. *Engy Tadros* was admitted to the Medical Program in Fall of 2005. In June 2006, she became the second recipient of the Zweig Memorial Scholarship. As the fund grows it is our hope to increase the amount of the scholarships and/or the number of recipients.

UCR is currently working to establish a full four-year medical school (opening in 2012). This medical school will have as one of its focus areas chronic pulmonary conditions with the hope of eliminating them altogether. UCR states that their goal is to educate the next generation of caring physicians who will follow in the footsteps of Dr. Zweig.

Visit our web page at www.cleanairnow.us to watch a memorial video and learn more about Dr. Zweig.

"He strove to build a hydrogen economy to reduce human suffering from pollution."

If you would like to contribute to the scholarship fund please make your check payable to the "UC Riverside Foundation for the RMZMEF" and indicate in the memo section the Robert M. Zweig, M.D. Scholarship Fund. Checks should be mailed to the Clean Air Now office at 6960 Magnolia Ave., #200, Riverside, CA 92506.

Alternative Energy Where We Are Heading

By Phil Hodgetts

The high price of fossil fuels has put us in an unnecessary bind. There is a way out if we are willing to fight the existing system. **We do not have an energy crisis. We have a policy crisis.** We have enough sources of clean alternative energy in this country to satisfy all our needs. We merely need to get our priorities and subsidies aimed in the proper direction. Presently the most highly subsidized entity is the petroleum industry. The intention of a subsidy is to give aid to an emerging industry so it can get on its feet. Instead, our money is going to one of the most profitable of industries, helping them to maintain a monopoly and keep out competitive industries. This is just the reverse of how a subsidy should be used.

Probably the best way to see how we got where we are today is to go back about one hundred years. Several factors gave the nod to internal combustion engines over electric cars. Improved roads led to the demand for more range than could be obtained by the batteries in the electric cars at that time. An electric starter made it possible for ladies to drive the IC cars. The abundance of petroleum provided a cheap source of fuel.

The petroleum industry and the auto industry helped make our country the great world leader it is today. But things have changed. The petroleum is neither inexpensive nor available locally. The IC engine uses only 15% of the energy available in the fuel to turn the wheels. The rest goes off as heat. While each vehicle produces only a small amount of pollution, the sheer numbers of them has created an unacceptable pollution problem. The General Accounting Office has stated that for every dollar we spend on gasoline it is costing us four dollars in environmental damage. That amounts to 9.5 billion dollars every year in the Southern California area alone. Unfortunately the previous success of the present system has boxed us in to the idea that we can continue successfully along this route. We are in the position of a man on a raft happily floating down the Niagara River and ignoring a loud roar that is coming from downstream. There is an old Chinese saying, "If you do not change your course, you will end up where you are heading."

I hope this presentation will give you a look at some of the rewards in store for us if we change course and head for a clean, profitable future with alternative energy.

DAY LIGHTING

Forty-eight percent of our energy consumption is used up by the

way we build our structures (1). We sit in buildings with roofs that keep out all the sunlight, and turn on electric lights. We need more buildings with skylights, solar tubes, and translucent roofs. Teachers in a school that had day lighting reported a reduction in discipline problems and an improvement in learning. A study was made that confirmed their claims. The study reported an improvement of over twenty percent in the results on standard tests.

SOLAR

The fastest return on an investment in solar energy is in solar water heating, and tax credits are available (2). In the 1920's fifty percent of the homes in Florida heated their water with solar energy. Then they started running in natural gas lines and the price was so reasonable that the solar units disappeared. Today, with the high price of natural gas, you can save money with the solar heaters.

Photovoltaic (PV) panels have a bright future. One of the great contributions of this type of energy is that it can be installed locally, where it is needed. It is distributed energy. It requires no additional electric lines and there is no line loss involved. Most other forms of energy including wind systems are located remotely from where the energy is needed. The lines and the systems are vulnerable to natural disasters and to terrorists. The PV panels are a CGS system - **C**lean, no particle pollution, **G**reen, no air pollution and **S**erene, no noise pollution. There is one more important characteristic of these panels. They produce the most electricity right when there is a peak demand. Enough of these units on line would be a great buffer to blackouts. But here is where our policies interfere with progress. There is a cap on the number of PV units that will be subsidized, at 0.5% in California. It is interesting to note that the energy source with the greatest potential (PV) is the one we are using the least. deWinter and Swenson (3) place the technically feasible energy from 1W at 60 terawatts. A terawatt is one million megawatts - the amount of energy from 1000 power plants with a capacity of 1000 megawatts each. The world energy consumption in 2005 was 17 terawatts.

HYDROGEN

Hydrogen, like electricity is not a source of energy. It is the most abundant element in the universe. When used as a fuel it is very clean. The exhaust is only water vapor. But the Hydrogen system is only as clean as the energy source used to produce the Hydrogen. It can be made from coal, gasoline, and natural gas or from electrolysis of water. The oil refineries produce tons of it every month and use it internally to refine gasoline and diesel.

The late DR. Robert Zweig drove a pickup over 100,000 miles that was converted to run on hydrogen. Hydrogen fed into a fuel cell produces electricity with no pollution. To determine where we are in this field we should divide the usage into two categories: stationary systems and mobile or vehicular usage. Stationary systems have successfully used fuel cells for years. But the types they use are not suited for electric vehicles. At UC Irvine a solid oxide fuel cell operating at 1000 degrees Celsius is married to turbine generating additional electricity from the high temperature. A large fuel cell building at AQMD in Diamond Bar uses hydrogen from natural gas (reforming). These and many others in Southern California are in operation.

Unfortunately the only fuel cells small enough and with a low enough operating temperature for use in a vehicle is a Proton Exchange Membrane fuel cell (PEM). This cell is very expensive and has a short life. There are some demonstration fuel cell vehicles around, one on the UCLA campus. The price tag is, \$1,000,000.

The battery driven electric car using the new Lithium Ion batteries is technically way ahead of the hydrogen fuel cell vehicle as Paul MacCraedy pointed out in The Case For Battery Electric Vehicles (4).

TEMPERATURE CONVERSION PROCESS (TCP)

One of the emerging technologies that Barry Hanson has disclosed in his book "Energy Power Shift" is the possibility of turning garbage into oil (5). The process heats the waste material to a high temperature in the absence of oxygen - pyrolysis. It does in hours what it took Mother Nature a millennium to do. Los Angeles has made plans to install six of these units. The first will go on line in 2010. Rainbow Disposal is consulting with a company to install a similar unit that produces electricity from waste material. Mr. Hanson has pointed out that if we open up the Arctic National Wildlife Reserve, after ten years the total amount of energy available will be 14 Quads (we currently use 27 Quads in one year in the USA) The temperature conversion process can provide us with 120 Quads before one drop of oil can be pumped from the ANWR.

WHAT YOU CAN DO ABOUT IT

- Educate yourself by using web sites such as H2FC.com.
- Read what others are doing in Home Power Magazine, available in our local library.
- Contact political candidates. Remind them that funding renewable energy means local jobs, prosperity, and votes.
- Purchase renewable energy products.
- Visit my home at 16041 Burgess Circle to see what can be done to your home.

IN CONCLUSION

- We have a choice.
- We can reap the rewards that Barry Hanson has summarized as:
 - 6.5 million new jobs
 - Clean environment
 - Energy independence
 - True national security
- Or we can continue on our present course and pay the penalty.

Sources:

1. "It's the Architecture, Stupid!" By Edward Mazria Solar Today, May/June 2003 issue.
2. "Federal Tax Credits" Home Power Magazine, April/May 2006 www.energyvstar.gov.
3. "A Wake-up Call" By Francis de Winter and Ronald B. Swenson, Solar Today, March/April 2006
4. "The Case For Battery Driven Electrics" by Paul MacCraedy, in a chapter of the book The Hydrogen Energy Transition by Daniel Sperling and James Cannon.
5. Energy Power Shift, Benefiting From Today's Technologies By Barry J. Hanson. Lakota Scientific Press. Internet access www.energypowershift.com.

National Hydrogen Association 2007 Conference Summary

By Matthew Burks

Through the joint support of Clean Air Now and the Hydrogen Energy Center in Maine, I was able to attend the National Hydrogen Association's (NHA) 2007 annual conference in San Antonio, TX. Boasting over 100 exhibitors and almost 1,000 attendees, the conference was the largest NHA event to date. The theme of the conference was "Hydrogen: Here and Now," to emphasize that hydrogen is a reality today, not just a technology of the future.

The bulk of the conference was centered around transportation and gaseous refueling. Toyota and Shell Hydrogen were the top two sponsors, with Honda, BMW, The Linde Group, Chevron Hydrogen, and Air Products in key financial support roles as well. Almost all of the major auto manufacturers provided an opportunity for attendees, and the general public, to drive their latest fuel cell

vehicle models. The "Ride and Drive" was organized by our friends at *The California Fuel Cell Partnership*, presenting an impressive list of cars from Honda, Toyota, BMW, GM, DaimlerChrysler, and Volkswagen. The Linde Group provided equally impressive mobile refueling for both liquid and compressed gas hydrogen vehicles (although old hat for Clean Air Now members, who helped to build one of the first hydrogen vehicle fueling stations more than ten years ago in El Segundo, CA).

I was able to ride in the BMW dual-fuel, Series 7. It is a truly noteworthy car. The V12 internal combustion engine (ICE) seamlessly switches between liquid hydrogen and standard gasoline with the push of a button. Although there are certainly strong opinions regarding the efficiency and viability of using liquid hydrogen and hydrogen ICE technology over the long term, I chose to suspend my judgments for the day and appreciate the engineering achievement.

There is little doubt that BMW's solution provides an elegant and pragmatic bridge between the petrol past and the hydrogen future. The ability to run on clean burning hydrogen for 125 miles, and then seamlessly switch to traditional gasoline for an additional 300+ miles of range, provides unmatched flexibility for long distance driving and intermittent hydrogen fueling infrastructure.

On the safety side, BMW removed human error from the fueling process. Once the user attaches the hose, the car takes over and communicates directly with the pump, monitoring safety, pressure, and flow rate to properly and safely fill itself. Their tank design uses several patented techniques to reduce boil off from the 30 gallon liquid hydrogen fuel tank. The H-7 boasts a unique hydrogen vapor recapture system, as well as a fuel tank so well insulated it could keep a block of ice frozen inside for thirteen years. Although this may seem extreme, keep in mind that liquid hydrogen has to be kept at a frigid -253 C.

My understanding, from conversations with BMW, is that the initial group of pilot vehicles are being leased to carefully selected individuals, based on their visibility and proximity to liquid hydrogen fueling. BMW plans to lease one hundred additional H-7s in both Europe and the US starting later this year.

With all of the major auto manufacturers implementing similar hydrogen ICE and fuel cell roll out schedules, it is easy to conclude that the hydrogen transportation debate is over. The reality is that there is still significant work to do. The less glamorous issues related to support infrastructure are easy to overlook in the presence of sleek hydrogen vehicles, but their importance can not be ignored. Every single auto-related presenter spoke about the chicken-egg conundrum and how it effects their development, testing, and role out schedules. Both auto manufacturers and fuel suppliers realize how profoundly linked they actually are.

It doesn't take complex math to understand the potentially catastrophic consequences of releasing hydrogen vehicles without the infrastructure to support them. Beyond cars and the fuel to run them, other issues like hydrogen fuel transport, maintenance for cars and fill stations, production, warehousing and distribution of replacement parts, mechanical and technical instruction, and emergency response training are all important pieces to the new vehicle puzzle. Most of these need to be in place before moving into new markets. If hydrogen is branded problematic, inconvenient, or even worse, dangerous, public opinion could quickly negate much of the progress we have made over the past fifteen years.

It was interesting to watch the somewhat volatile mixture of idealism and pragmatism with the larger vehicle manufacturers. The hydrogen industry does not want to over promise right now, however, 2009 is rapidly approaching, and continued funding at the federal level is a genuine concern. Insiders see the potential for backlash towards projects associated with the Bush administration.