

Hydrogen Today



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'We Deliver Clean Air'

Show Me the Hydrogen



The itinerary of the recent 2nd Great Western Hydrogen Tour included pulling off the freeway to check out a few of California's many hydrogen refueling stations. The sites were purposely designed to look ordinary- drive in, swipe your credit card, connect the nozzle and drive off four minutes later. The station in West Sacramento is operated by Linde. We chatted with a couple technicians doing maintenance diagnostics, but we didn't meet any customers to interview. Continued next page.....

"Quotations"

"Live simply so others may simply live." Mahatma Gandhi

"Age wrinkles the body. Quitting wrinkles the soul." Gen. Douglas MacArthur

"It is not necessary to change. Survival is not mandatory." W. Edward Deming

"Where there is freedom, even fools will speak; where there is none, even wise men hold their tongues." Su Tangpo (d. 1101)

American Hydrogen Association Mission

Develop and prove solar hydrogen technologies that will eliminate economic, environmental and energy hardships caused by burning one million years accumulation of fossil fuels every year *and*

Educate scientists, entrepreneurs and experimenters, parents and educators, CEO's, legislators, utilities, the media and farmers how to use solar hydrogen to create sustainable prosperity without pollution.

Show Me the Hydrogen, cont...



West Sacramento liquid hydrogen (LH2) storage



Price of hydrogen per kilogram

. Hydrogen is supplied from a liquid hydrogen tank at the back of the lot. The price per kilogram was \$16.54, equivalent to a gallon of gasoline. That sounds unreasonably expensive, but consider that a fuel cell car gets twice the MPG of a gasoline engine and think about what it's costing us to breathe car exhaust every day.

The True Zero hydrogen station, located at a Valero gas station in Campbell, CA. is operated by First Element Fuel. It opened last October. First Element received a \$26 million grant from the California Energy Commission to install (19) H2 stations.

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**** SAFETY FIRST ****



First Element hydrogen station in Campbell, CA



350 bar (3000 PSI) Hydrogen or 700 bar (7000PSI) Hydrogen



Fully Enclosed Hydrogen Storage in Campbell

Whenever Phoenix gets a hydrogen station, we should be able to drive all the way to San Francisco in any 300-mile-range hydrogen car. Europeans can already drive hydrogen vehicles along many major highways from one end of Europe to the other.

The 2nd Great Western Hydrogen Tour

A couple weeks ago, two of us from AHA Phoenix embarked on the 5-day long 2nd Great Western Hydrogen Tour. We had coffee with Dr. Joan Ogden, writer and hydrogen transportation professor at U.C. Davis. To her, the Hydrogen Age is well underway, at least in California. Her challenge is to entice students into careers in clean energy. At All Power Labs in Berkeley, we talked about how to separate hydrogen from syngas produced by their biomass gasifiers. We visited the fabulous hydrogen lab of Walt Pyle, author of the *Solar Hydrogen Chronicles*. <http://www.hionsolar.com/hychron.htm> He was introduced to hydrogen at age 5 by his father who made hydrogen for hydrogenating oil for potato chips. We spent a couple days at John Gotthold's Hysolgenics workshop in the cool redwoods. He explained several versions of his electrolyzers. There was an extended discussion about KOH foaming. We assisted him setting up and testing a small water-cooled 4500 PSI Chinese compressor. His hot project is a portable PV/electrolyzer/compressor unit for recharging drone fuel cell cylinders. Drones could be kept in the air four hours at a time simply by swapping cylinders. We're already planning Tour #3. Come along and learn with us. All AHA members are invited.

dhh 7/25/2017

Editorial

AHA HQ doesn't quite operate 24/7; it's more like 20/7. Once in a while, we'll lock the gate and everybody heads to the Golden Valley for the best Chinese in town. It takes some effort to balance work, family, hydrogen and goofing off. After everyone has gone to bed at home, I'll fire up one of the half-hour lectures on Great Courses Plus. Individual Great Course videos can run from \$29 to hundreds of dollars each, but Great Courses Plus lets you watch most of their videos for about \$15 a month. Courses average 24 lessons. The instructors are entertaining speakers for the most part. Try it for free. So far I've gone to medical school, studied the Hubble telescope and thermodynamics. Now I'm doing quantum mechanics. You might prefer hieroglyphics, military blunders, behavioral economics, why evil exists or another of their 650 courses. These courses will probably wreck everything you learned in high school.

www.thegreatcoursesplus.com

Here in the Arizona desert, honeysuckle bushes give critical summer shade to the south and west walls of my house. I used to water them every six days. Last year I started watering every five days. With some daily local highs in the range of 116 to 119°F this summer, I've had to water every other day to keep them from wilting. That increases my water bill a few dollars. Some of the bushes have died, increasing the heat load on the air conditioning. That's one way we pay for global warming. Please help us get the Hydrogen Age going.

Hydrogen Events

The Phoenix American Hydrogen Association and Phoenix Alternative Energy Meetup meet the second Thursday of every month from 6 to 8 PM at Denny's Restaurant, 650 N. Scottsdale Rd. in Tempe, AZ (SW Scottsdale Rd/202, one mile north of ASU light rail station). Call 480-234-5070.

International Conference on Hydrogen Safety, 11-13 Sept., 2017, Hamburg, Germany. Twelve separate hydrogen safety themes, <https://www.hysafe.info/ichs2017/>

Hydrogen + Fuel Cells North America, 10-13 Sept., 2017, Las Vegas, NV. Tobias Renz brings the famous German Hanover Messe hydrogen trade show to the U.S. Everybody will be there. About \$800. <http://www.h2fc-fair.com/usa/media/2017-may-29-e.html>

California Hydrogen and Fuel Cell Summit, 25-27 Sept., 2017, Sacramento, CA. Geared more for business and government than technology. These are the people making hydrogen happen. \$300 <http://www.californiahydrogensummit.com/index.asp>

8th DOE Solar Decathlon, 5-15 Oct., 2017, Denver, CO. 14 college teams from around the world compete to build the most innovative clean energy home (600 to 1000 square feet). Creativity at its best. <https://www.solardecathlon.gov/>

2017 Fuel Cell Seminar & Energy Exposition, 7-9 Oct., 2017, Long Beach, CA. The place to go if you need a fuel cell, components, a fuel cell car or a fuel cell semi-truck. \$995
<https://www.fuelcellseminar.com/>

Hydrogen on the Internet

Hydrogen Fuel News out of Newhall, CA. General hydrogen news, press releases, alternative energy jobs. Did you know a Chinese company is training U.S. coal miners to maintain wind turbines? <http://www.hydrogenfuelnews.com/>

Stan: The Energy Man, weekly program on ThinkTech Hawaii. Stan Osserman interviews the leaders of Hawaii's transition to hydrogen. Over 100 shows.
<https://www.youtube.com/playlist?list=PLQpkwcNJny6kMFYsNoD2bwb95UQKHHKI->

How I Discovered Hydrogen

I was attending a large conference in Reno, Nevada in 1990 and one of the vendors had a fuel cell generator running his computer and some lights, and I thought it was just some kind of battery, but the fellow there said that it was a hydrogen fuel cell and could run much longer than a battery. It got my attention, but I wasn't really impressed with the concept, and then in 2006, I got to drive a hydrogen internal combustion hybrid Ford Escape, that was part of an HCATT project being demonstrated in Hawaii. It peaked my interest again, but after driving it, I wasn't impressed at all. Then I actually came to work at HCATT in June 2013 and I had to learn all about hydrogen, because I was running the program, and the more I learned, and the more I connected the dots with how hydrogen technology could be a large scale "game changer" for the transportation sector, the grid, the environment, the economy, the military.....and on and on, I've become a hydrogen fanatic! I guess some of us just take a long time to catch on to the beauty of hydrogen and how it makes so much sense!

Stan Osserman, Director of the Hawaii Center for Advanced Transportation Technologies

Books & Publications

Most of the books reviewed in Hydrogen Today are available in the AHA library. Anyone can read them in house and renewed members can borrow them. We just had to add two more bookshelves.

Sons Of Wichita: How the Koch Brothers Became America's Most Powerful and Private Dynasty; Daniel Schulman, 2014. Grand Central Publishing, Amazon, 424 pgs.

Who are the Koch brothers that environmentalists love to hate? Fred Senior, the Koch patriarch (pronounced Coke), was a Texas chemical engineer who invented a superior

technology for cracking petroleum. Immediately he faced lawsuits from the major oil companies and their crooked judges. He started making money building oil refineries in the Soviet Union. He also developed a strong dislike of Stalin's communism and became one of the founders of the John Birch Society. In mid-20th century Kansas, there were unlimited opportunities for him to invest in cattle ranches and oil wells, refineries and pipelines.

The first of the four brothers was Fred Junior (83 yrs.), a Harvard liberal arts graduate who wanted to be an art collector. Charles (81), an MIT chemical engineer, was groomed to be the Koch CEO. He took over the company in 1966.

David (76) and William "Bill" were twins. David is another MIT grad and Koch V.P. He was a 1980 U.S. Vice President candidate. Bill, also an MIT grad, was fired from the company and became something of a playboy. In 1983, Bill and Fred sold their interest in Koch Industries for \$1 billion dollars.

Koch Industries makes ethanol, Northern toilet paper, Lycra, fracking chemicals and Dixie cups. Charles and David don't come across as evil. Their privileged, self-interested philosophy is: less government, less regulation and lower taxes. Underreporting a few oil spills allows them to donate \$150 million to a cancer hospital.

Blessed Unrest: How the Largest Movement in the World Came Into Being and Why No One Saw It Coming; Paul Hawken, 2007. Viking, \$24.95, 342 pgs.

Imagine if 62 million Americans joined forces to save the world. That would be an unstoppable army. Actually 62 million Americans, from students to billionaires, are volunteering every day to fix problems ranging from affordable housing to watershed monitoring. Hawken calls it a social immune system that attacks and heals local disorders.

Hawken spends too much time ranting about big business enslaving and poisoning the world. It sounds like a sermon. It can be a waste of energy confronting big government or big business. There is a dash of inspiration. An appendix list 100's of categories of organizations. However, the wiserearth.org website given for the actual organizations has gone dark. No one will have to look far for a project in their own home or village. I worked on an after-school bicycle mechanics project where we ended up feeding the kids. Bullies taunt with, "Who's going to stop me?" Your answer is, "I am."

The Appropriate Technology Library, Volunteers in Asia, 1993. Village Earth. 150,000 pages.

As a kid, my buddies and I would live off the land during summer vacation for a few days at a time, subsiding on blueberries, green apples and brook trout. I was inspired that half century ago by the *Appropriate Technology Sourcebook*. It was a review of 1050 books on small-scale technology from bees and bicycles to wind turbines and weaving. At the time, all the books were available on microfiche for \$695. Later I found copies of some of the books, but most are now long-gone. Recently I discovered the whole A.T. Library is currently available on a flash

drive (\$69) or DVD's (\$199). It's now in the AHA library. You probably don't need to make your own mimeograph machine, but you might need to build a road that doesn't wash out six times a year or lift water without an electric pump. I don't like to think about it too much, but a bicycle-powered dental drill could be a life-changer for some village.

Hydrogen/Oxygen Separator [Split] Cell Plans (electronic), Justin Church.
Jdcproducts.com, \$20, 26 pgs.

Church is mainly into HHO, but the design and materials are similar to separating electrolyzers. He offers plans for a 2 plate unit which can be up-scaled to a 7 plate, 12 volt electrolyzer and he also sells an assembled unit for \$249. Electrodes are 5 x 6 inch 316 stainless. The separators are a stiff porous polyethylene fabric called Porex. He includes a tool list, fastener list, material list and a couple templates that will save a lot of layout time. Even with lots of photos, it wasn't easy to figure out how to put it together and there is no operating information, but his YouTube channel has a couple dozen hydrogen experiment videos showing how it all works.

<https://www.youtube.com/user/jdcproducts/videos>

Happy 100th Birthday



AHA steel gaseous hydrogen cylinder has been in use since 1917. Made by Union Carbide

H2 University

Driving A Fuel Cell

A hundred and twenty years ago, some citizens believed the 'horse-less carriage' would ruin American society. They may be right after all if we continue burning fossil fuels. A majority of people do not think of hydrogen fuel cell vehicles as a friendly alternative. Twenty five years ago, one fuel cell car cost about \$1,000,000. In 2008 here in Phoenix, you could test drive a Toyota Highlander, a GM Equinox or Honda, Mercedes, Nissan, BMW, Kia and Volkswagen fuel cell cars as part of the cross-country Hydrogen Road Tour from Portland, Maine to Los Angeles. This year, one AHA member has paid a deposit on a Honda fuel cell Clarity that he expects will take a year to deliver. Hydrogen dispensers are springing up at regular filling stations next to the E85 ethanol and biodiesel pumps. Some early adopters are installing their own hydrogen generating and compression refueling systems at home. Let's take a look at the present availability of fuel cell cars.

Make	Honda	Toyota	Hyundai
Model	Clarity	Mirai	Tucson Fuel Cell
Year Introduced	2016	2014	2014
MPGe	67	66	49
Price	\$369/month lease	\$57,000 or \$499/mo. lease	\$499/month lease with free hydrogen
Range (miles)	366	312	365
Market	California, Japan, Europe	California, Japan, Europe	Korea, California, Vancouver, Europe

Car-makers have been developing fuel cell cars since the mid-60's. Three more may be on the market soon.

Audi A7 H-Tron Quattro http://www.audi.com/en/innovation/futuredrive/h-tron_quattro.html

BMW i8 Hydrogen <http://www.hydrogencarsnow.com/index.php/bmw-i8-hydrogen/>

Mercedes GLC F-Cell <http://insideevs.com/mercedes-benz-glc-f-cell-first-plug-in-fcv-production-starts-in-2017/>

Hydrogen Stock Market

We'll inform you, but we can't advise you on any hydrogen stock investments. Here's another company investing their money in the Hydrogen Age.

H/Cell Energy Corp (OTC) HCCC. Mike Strizki's residential-scale solar hydrogen energy systems. <http://www.hcellenergy.com/>

Thanks

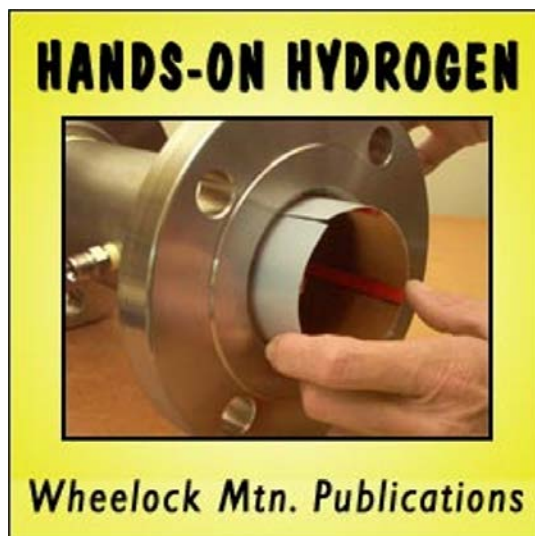
- ☺Michael D., Michael H., Claude, Frankie, Leyda and Jonathan- Supporting AHA booth at Earth Day Texas 2017.
- ☺Claude- Folding brochures for EDT, driving, gasoline, Denny's and storytelling.
- ☺Stan- Discovered Hydrogen story.
- ☺Walt- Tour of his solar lab and posting his out-of-print *Solar Hydrogen Chronicles* on his Hion website.
- ☺Joan- time for interview.
- ☺Warren- Electrolyzer articles.
- ☺John, Dotty and Nick- Hospitality in California.
- ☺Dave H.- Handling all the missed turns and bumper-to-bumper traffic in California.
- ☺Dave S.- Donating Honda Civic GX natural gas/hydrogen vehicle.



Bird Kills

I don't know who's counting bird kills in the U.S., but the following list shows the best estimates I could find. Before protesting wind farms, perhaps we should muzzle Fluffy.

Habitat Loss	?
Cats	1.4 – 3.7 billion per year
Building Windows	365-988 million per year (~ 10% of the bird population)
Electric Power Lines	174 million
Pesticides	72 million
Cars	60 million
Cell Phone Towers	6.8 million
Wind Turbines	140,000-573,000
Ivanpah 390 MW Concentrated Solar Tower	133 “scorched”



Ebooks for Do-It-Yourself Experimenters

By Phillip Hurley

- Build Your Own Fuel Cells....\$14.95
- Build A Solar Hydrogen Fuel Cell System....\$16.95
- Practical Hydrogen Systems: An Experimenter's Guide....\$16.95
- Build Your Own Solar Panel....\$12.95
- Solar II....\$12.95
- Solar Supercapacitor Applications....\$16.95
- The Battery Builder's Guide....\$16.95

<http://www.goodideacreative.com/wheelockmtn.html>

Accepts PayPal

Good Idea Creative Services
324 Minister Hill Rd.
Wheelock, VT 05851

Books are now available in paperback at:

http://www.amazon.com/Phillip-Hurley/e/B001K8XF3K/ref=sr_tc_2_0?qid=1449887967&sr=8-2-ent

Hydrogen Safety Position at Colorado NREL

The National Renewable Energy Laboratory (NREL), located in beautiful Golden, Colorado, is a leader in the U.S. Department of Energy's effort to secure an energy future for the nation that is environmentally and economically sustainable.

Hydrogen Environmental, Safety & Health (ESH) Professional Job Req #R2057

Job Summary

Advanced level Hydrogen Safety Expert and ESH Point of Contact position for research and development centers and support organizations. Provide expert direction to staff regarding hazards for hydrogen systems and other operation within research labs. Provide direction as Hydrogen Safety Expert and provide support as an ESH Point of Contact for assigned R&D and support organizations and areas.

Areas of expert consultation and support will include:

- Conducting advanced hazard assessments for hydrogen systems during design and implementation of hydrogen systems
- Providing recommendations pertaining to the safe handling and use of hydrogen per code requirements/industry standards
- Responding to staff inquiries and requests for assistance on ESH matters
- Completing code compliance reviews during design and implementation
- Reviewing plans for future research projects
- Presenting ESH and hydrogen safety information at meetings
- Leading teams in resolution of ESH concerns and problems related to hydrogen systems
- Reviewing safe operating procedures for hydrogen systems
- Lead accident/incident investigation and causal analysis as needed. Follow-up on corrective action implementation.
- Act as a member of the NREL Emergency Response Team for spill response. Responsibilities include: participation in drills, classroom training, wearing SCBA and maintenance of required certifications.

Required Education, Experience, and Skills

Relevant Bachelor's Degree and 9 or more years of experience or equivalent relevant education/experience.

Or, relevant Master's Degree and 7 or more years of experience or equivalent relevant education/experience.

Or, relevant PhD and 4 or more years of experience or equivalent relevant education/experience.

Or, relevant JD and 4 or more years of experience or equivalent relevant education/experience.

https://nrel.wd5.myworkdayjobs.com/en-US/NREL/job/Golden-CO/Environmental--Safety---Health-Professional_R2057-1

Submit Your Resume: www.nrel.gov/employment and search for **Req #R2057**

AHA Membership Form

Name _____

Address _____

City _____ State ____ Zip _____ Country _____

Telephone _____ email _____

- Regular Membership- \$39.00/year (New members receive a free copy of Roy McAlister's "Solar Hydrogen Civilization").
- Student, Military & Senior (55 and over) Membership- \$25.00/year
- Sustaining Membership- \$100.00/year (autographed book and H2 bookmark)
- Life Membership- \$1000
- Corporation/Institutional Membership- \$1000/year
- "Solar Hydrogen Civilization" book only - \$24.95 postpaid.
- Email *Hydrogen Today* only
- Send AHA New Chapter Packet
- "Hilda Hydro - Girls Go Green" - \$8.95 postpaid

Mail to: American Hydrogen Association
P.O. Box 4205
Mesa, AZ 85211
USA

Or go to: <http://clean-air.org/store.html>

Join the AHA and use our services to learn how every community can achieve sustainable
Prosperity Without Pollution.

AHA publishes *Hydrogen Today* to help educate the public about new developments in renewable energy and the science and people behind them. Join us in making a better world. You can help too by writing for *Hydrogen Today*. Tell others about your grassroots alternative energy projects, either scientific or social. Review a book, product, service or event. A picture is still worth a thousand words. The range should be approximately 300-1000 words. Mail to the above address or to the *Hydrogen Today* editor at editor@clean-air.org Thanks.