

Hydrogen Today



Show Me the Hydrogen



Hyundai Tucson, Toyota Mirai and Honda Clarity Ready for Test Drives

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The first Hydrogen + Fuel Cells North America exhibition made up part of the Solar Power International Conference, September 10-13th, 2017 in Las Vegas, Nevada. Hydrogen + Fuel Cell shows have been held in Hannover, Germany since 1995. Vendors from 30 international companies liked nothing better than to talk about their hydrogen products. Everyone who wanted to could drive a fuel cell Hyundai, Toyota or Honda around the block. I couldn't help hoping there were no fuel leaks as I pushed the button to start the Honda Clarity. Otherwise, it was designed to drive like a very ordinary car.

Continued next page.....

“Quotations”

“Anything not worth doing well is not worth doing.” Warren Buffet

“We can't help everyone, but everyone can help someone.” Ronald Reagan

“There is always an easy solution to every human problem – neat, plausible and wrong.” H.L. Menchen

‘We Deliver Clean Air’

American Hydrogen Association Mission

Hydrogen Today:
Journal of the American
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**** SAFETY FIRST ****

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...

The cars were delivered from L.A. with full cylinders on a flatbed truck because there were no nearby H2 stations in Vegas.

After attending 26 forums almost back to back, I picked up four main obstacles (or opportunities) for hydrogen entrepreneurs.

1. Hydrogen Supply – Current U.S. industrial production is only about 2% of the volume needed for a Hydrogen Economy. You can buy electrolyzers today that will make 20 tons of hydrogen a day. The question is, where will you put it? A hydrogen pipeline grid is probably the best long-term solution for storing and transporting hydrogen, but they cost a \$1,000,000 per mile. It's clear somebody will have to invest in a hydrogen infrastructure *before* there will be significant demand for hydrogen products. Hydrogen fuel stations every 50 miles along the interstate highways would be a good place to start. Large-scale produced hydrogen would cost about \$1.50 per GGE.
2. Solar Hydrogen – While you're considering putting 8 or 10 solar panels on your roof, utilities and investors are already approaching 1GW solar farms with millions of PV panels. The solar people have no interest in electrolyzers or hydrogen compressors. What they are very interested in is a place to store all their wasted photons when the grid reaches capacity and nobody want to buy their electricity. They want a turnkey system where they can plug electricity in and get electricity out on demand. We need to take all the pieces and demonstrate an integrated solar/electrolyzer/fuel cell system. The hydrogen from captured American sunshine can fuel vehicles, power turbine generators, heat residential water or be converted to liquid fuels.
3. Building Codes – Every new hydrogen fuel station gets a couple public complaints about increased traffic, but the real problem is officials who don't understand hydrogen. Every village comes up with unique rules requiring expensive engineering reports.

Installers can't afford to wait two or three years for a permit. Manufactures are establishing equipment certification standards to speed things up. The AHA has started outlining a manual for code officials and city council members to explain hydrogen technology and benefits.

4. Commercial Fleets – In spite of trucker's real desire for the economic and environmental advantages of hydrogen fuel, fleet owners are reluctant to convert. First, they don't have mechanics trained for hydrogen. Unions won't allow diesel mechanics to stick their fingers in 600 volt fuel cells. Second, they can't afford to wait days or weeks for repair parts. As mentioned, a chain of interstate hydrogen stations would allow truckers to travel faster, cheaper and cleaner.

For links to the exhibitor's latest technology, see: <http://www.h2fc-fair.com/usa/> The 2018 show will be September 24-27 in Anaheim, California.

dhh 11/19/2017

Editorial

The AHA is currently negotiating to buy a one acre permanent headquarters near Phoenix. It will be a place for all our grandchildren and their grandchildren to discover hydrogen and study renewable energy.

As a part-time bicycle mechanics instructor, I have to keep up on the latest tools and technology. However, the feature story of a recent trade publication was about the effect of climate change on the bicycle business. As you may know, warmer oceans add more water to the atmosphere and increase the wind's energy.

The flooding last August in Houston from Hurricane Harvey damaged stores and the homes of employees and customers. One shop had to write off 300 water-damaged bicycles. For a long time to come, people will be spending their money at Home Depot, not on bicycles. The hurricane caused \$200 billion damage in total. In the end, all of us will be paying for it. A tenth of that money would build coast-to-coast hydrogen stations.

Hurricane Irma destroyed several bike stores in Florida. Some of them may never be able to re-open. A major wholesale distributor in Miami was without power for four days, during which time they couldn't receive orders or ship parts to the Southeast. Some businesses were without power (and income) for a week.

In the West, too little rain contributed to wildfires in California, Washington, Oregon and Montana. Air full of smoke and ash along with park and road closures brought bike riding to a halt. One store burned to the ground.

What went through the minds of citizens of now dead civilizations? It's just a little bad luck? The government will take care of it? It's not my fault?

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.

22nd World Hydrogen Energy Conference (WHEC), 17-22 June, 2018, Rio de Janeiro, Brazil.
Can you take 5 days of hydrogen? \$1000 (early bird).

https://www.whec2018.com/main_frontend.php

Hydrogen on the Internet

ULEMCO (Ultra Low Emissions Mileage Co.), Liverpool, U.K. These folks are converting Ford Transit diesel vans to dual-fuel hydrogen hybrids. They warm up on diesel before switching over to a range of 40% to 95% hydrogen. The vans have a 150 mile range with hydrogen before switching back to all diesel. CO₂ emissions are reduced 70%, NO_x 40% and particles by 90%
<http://ulemco.com/>

Since *Hydrogen Today* covered the 450 HP Scorpion hydrogen sports car in 2008, Ronn Motors has moved next door to Scottsdale, Arizona, bought a Swedish truck factory to manufacture smart fuel cell mini-buses, plans to install a couple local H₂ fuel stations and they are even working on some model solar hydrogen home designs to go with your hydrogen car.

<https://www.ronnmotorgroup.com/>

Books & Publications

People of Change trilogy by Charles Bensinger, 2016
Timewindow Publications.

Radical Option - Book 1, 267 pages.

Beyond Fire – Book 2, 267 pages.

Primal Source – Book 3, 253 pages.

These novels don't quite feel like science fiction because they could be happening today. As the environment falls apart, Catherine Connelly, a wildlife biologist, a tour boat captain, a shape-shifter and a computer hacker team up to prevent the greedy from monopolizing all the remaining resources for themselves. The rich guys plan to live in luxury while everyone who can't pay dies. Ride along with the heroes in a stolen UFO. There are plenty of close calls. There are a few minor bumps in the wording, but they are only minor distractions. Make sure you get all three volumes at the same time. You won't want to stop reading.

Drawdown: The Most Comprehensive Plan Ever Proposed To Reverse Global Warming, edited by Paul Hawken, 2017. Penguin Books, 240 pages.

Drawdown means to use up, like water in the well or money in your bank account. Or when we start taking more CO₂ out of the atmosphere than we put in. *Drawdown* is a list of 100 ways we could bring that day about. Many of the ideas are obvious – solar and wind power, LED lighting, building insulation, electric and fuel cell vehicles, planting trees and ridesharing. Some are less obvious like growing bamboo or educating girls to release their problem-solving creativity. Their number one solution was a surprise. Because greenhouse gas refrigerants can be thousands of times more potent than CO₂, preventing them from leaking would reduce emissions equivalent to 89,000,000,000 tons of CO₂ by 2050.

After a few pages, it's clear they're talking about some serious changes in everyone's lifestyle. I already recycle the beer cans and they're proposing we become vegetarians and ride the bus. Maybe you should be riding your bicycle to the post office.

After reading *Drawdown*, I'm wondering whether it's too late even if we did every one of these things.



H2 University

Hydrogen Compressors

You can expect a hydrogen output pressure of about ½ to 50 PSI from home-scale electrolyzers. That's fine for cooking or a water heater, but your hydrogen hot rod is going to need some kind of high pressure compression. Most people think of mechanical piston or screw air compressors which are noisy, hot, high maintenance and only put out 150 PSI maximum. Industrial piston and diaphragm hydrogen compressors are available for around \$100,000. For example:

<http://www.pdcmachines.com/fuel-cell-tech/>

If properly designed by a vessel engineer, an electrolyzer can safely self-pressurize to any pressure required. It's going to be expensive.

Paintball or SCUBA compressors can be used if you only need miniscule volumes of compressed H₂.

https://www.ebay.com/sch/i.html?from=R40&trksid=p2386202.m570.11313.TR4.TRC2.A0.H0.Xpaintball+compressor.TRS0&_nkw=paintball+compressor&_sacat=0

Electrochemical compressors use a membrane to transport hydrogen protons from one chamber to another. They operate silently. The HyET HCS100 outputs 5800 PSI. It is supposed to be available in 2018. It can also separate hydrogen from a natural gas carrier.

<http://hyet.nl/hydrogen/technology-and-performance/>

Linde uses a liquid piston compressor in their hydrogen stations. Hydrogen is compressed by pumping an ionic liquid up and down in cylinders with check valves. See how the Linde IC90 works starting at 37 seconds. <https://www.youtube.com/watch?v=usaQrCDORFY>

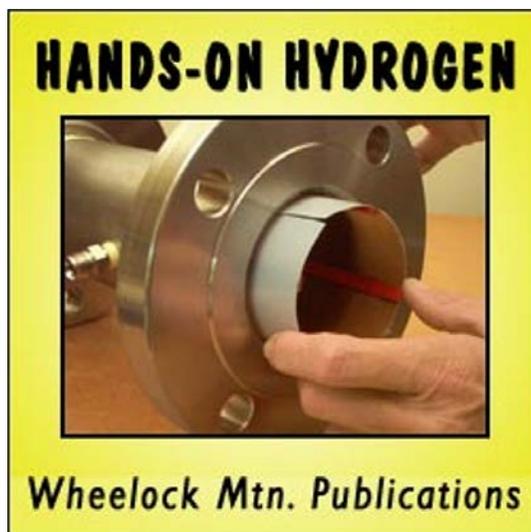
AHA members are working on foolproof control and safety circuitry for a small, complete electrolyzer and compressor system. Send your questions or suggestions to help@clean-air.org

Thanks

Clyde, John, X, Claude, Roy, Warren, Dave, Doug - \$35,000 contributed for new AHA Headquarters.

Harry – Test driving diesel/hydrogen hybrid.

Duane, Warren – EDM research for hydrogen barbecues.



Books 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>

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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

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>

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Prosperity Without Pollution.

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