



EEVC NEWSLETTER

Published by the Eastern Electric Vehicle Club

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Vol 36 No 2

FEBRUARY, 2016



Affiliated with EAA

IMPROVING NORTHFIELD PUMPED WATER STORAGE

Nancy Hazard

(This piece appeared originally in the Greenfield (MA) Recorder for November 13, 2014. The author is the former director of the Northeast Sustainable Energy Association (NESEA) and a member of Greening Greenfield. Used with permission) – ed.



Nancy Hazard at Tour de Sol, probably in 2008.

Is the Northfield Mountain pumped water storage system a good thing? With relicensing for the next 50 years of that facility on the horizon, and the request to increase the amount of water pumped on the table, there has been much debate on this topic. The need for electrical energy storage and how to meet that need is at the core of this debate.

When it comes to electricity, we are like Goldilocks. It cannot be too much, it cannot be too little. It needs to be “just right.”

To make it just right, there is worldwide agreement that we need energy storage systems to store excess electricity for use at a later time

to make our electrical system as cost-effective and reliable as possible.

Traditionally, energy storage systems were built to reduce the need to build new fossil-fueled power systems that would be used only for those moments when everyone wants electricity — traditionally a hot summer afternoon when everyone wants air conditioning. Today, the utility companies want to increase the amount of water they pump at

Northfield, so they feel more secure that the electric grid is reliable in the wintertime at times when natural gas supplies are low. This has led them to also support a new natural gas pipeline.

Europe has been holding energy storage conferences for the past few years because they have been building fluctuating renewable electrical energy sources, such as solar and wind, to reduce climate change emissions and cost. But to produce more than 20 percent of their electricity with fluctuating renewable sources, they need a way to store excess electricity so that they can use it at a later time.

Countries such as Germany and Denmark are already at the 30 percent mark and have a goal of 50 percent renewables by 2020. While we have only 2 percent renewables today, within the next 50 years, it is my hope that we will break that 20 percent barrier, and we, too, will need cost-effective energy storage systems.

There are numerous energy storage systems such as batteries, hydrogen, flywheels, compressed air and water. All energy storage systems have environmental impacts, and you always have to put in more energy than you can get out. The challenge is to find one that is cost effective. Today, pumped storage, like the Northfield facility, is the most cost-effective technology available. Batteries could take over if we all adopted electric vehicles and some believe that hydrogen will also play a key role, but for today water is best.

That being said, the Northfield Mountain project is flawed. It is a failure from an environmental perspective — it kills fish, makes the level of the river rise and fall unnaturally, and causes unacceptable erosion along the banks of the Connecticut River.

So my question is — how could we make it better?

The best pumped storage facilities are closed-loop systems. They use two reservoirs: one at the bottom and one at the top. Water is pumped from the lower reservoir to the upper one when there is excess energy and then the facility generates electricity when it is needed by dropping the water from the high reservoir to the lower.

In the case of the Northfield Mountain project, they are using the Connecticut River as

their lower reservoir, which causes fish kills, riverbank erosion and fluctuating river levels.

The solution would be to dig a lower reservoir. Let's make this a requirement for relicensing!

This brings me to a topic I often write about: using less and using more renewable energy.

The best thing we can do for the environment is to demonstrate that we don't need so much electricity and natural gas. Studies show we can reduce our electrical use by 10 percent just by remembering to turn lights and appliances off when we are not using them. We can save another 10 to 70 percent by purchasing energy efficient appliances when buying new, and by doing energy upgrades to our homes.

The second thing we can do is produce energy renewably. There are many options, all of which have some negative impacts, but all of which have less impact than nuclear or fossil fueled power plants. Many towns have had solarize programs to help those who own south-facing homes to put solar electric panels on their roofs.

We need to carefully weigh our options as we move forward. If you are interested in studying these issues, please contact me. I would love to study this topic with others.

I believe that together, we can build a better world that is safer, cleaner and more economically resilient.

(Nancy can be reached at nhazard@Worldsustain.net – ed.)

RAISING FUTURE SCIENTISTS **Oliver Perry**

The following is commentary on “How to Raise a Scientist in the Xbox Age,” by Robert Scherrer, chairman of the department of physics and astronomy at Vanderbilt University, appearing in *The Wall Street Journal Opinion*, page A15, December 15, 2015.

Mr. Scherrer points out that he almost seriously injured himself several times growing up experimenting with his chemistry set. In attempting to provide his own children with the same opportunities, he discovered that suitable chemistry sets are no longer available on the market. For fear of injuring kids and creating lawsuits, no manufacturer is

willing to produce chemistry sets that have chemicals reactive enough to teach anybody much of anything. The chemistry sets available do not attract much serious interest. The “high adrenaline” computer related games that dominate today’s society provide immediate intense stimulation unmatched by old fashion chemistry and science investigation sets. The writer admits that if he were born today he would not have discovered the thrill of science. He would simply be lying face down in a ditch clutching an Xbox, a hopeless electronic game junkie.

Today’s gadgets have become magic boxes that are difficult to open and examine. In the authors day one could break open most devices and gadgets, explore their inner parts, and discover how they worked. Why does this matter? Scherrer says that the ability to tinker, to take things apart, and understand how they function is one of the key traits of a scientist. It is no accident that a large number of 20th century American scientists grew up on farms or ranches where they learned how to keep their machinery running themselves. Cell phones and computers do not lend themselves to creative exploration of how they function.

Modern children are also deprived of another key ingredient that has powered many a young person down the road to a career in science: boredom and lots of it. Scherrer grew up in a time period where kids had to create their own games and entertain themselves. They daydreamed, explored their neighborhoods and invented adventuresome activities, the core of what scientists do. How can we expect our future generation to day-dream when they can play computer games 24 seven instead? Scherrer calls computer games “crack cocaine” for science nerds.

So what is his answer for creating young scientists? Parents must cut back on the time allowed for their kids to play computer games. They should schedule unscheduled time for creative thinking. And by all means they should not waste money on the useless science kits from the store. Purchase an old alarm clock and a set of screw drivers, wrenches, and pliers instead. Encourage them to find out what makes that old clock tick.

My response is..... good luck!

PRESIDENT’S MESSAGE Oliver Perry



EEVC president Oliver Perry (right) presents the annual EEVC Member of the Year Award for 2015 to Denny Stichter. Denny’s wife, Connie, is seated in the background. The plaque was presented during the Feb 10th EEVC meeting in room 49 of Plymouth Whitmarsh High School. The meeting was very well attended.

The 2016 21st CAC to be held in Philadelphia, May 21st

Together with Dr. Joel Anstrom from Penn State, the EEVC has agreed to co-host the 2016 21st CAC here in Philadelphia May 21st. The format for the annual event, held on the Penn State campus, will be modified to create more interest and participation. The display component will be significantly enhanced and weighted heavier in the competitive scoring. Dr. Anstrom will be responsible for managing and directing the display, which will take place Saturday morning, May 21st, at the Penn State Grid Star solar home at the Philadelphia Navy Yard. Our display will take place next to the Jr. Solar Sprint racing track at the same time hundreds of students and parents are participating in the annual Jr. Solar Sprint, supervised by the director Joe Bruno. It is hoped that those attending the Jr. Solar Sprint will take opportunity to mill through the display and listen to several technical presentations involving electric vehicle solar charging and electric grid management.

The afternoon is reserved for the “Tour the Town” competitive vehicle travel. Steve Savitz (Methacton High School) and Jurgen Balitzky (EEVC) have agreed to work out the details of this event. A caravan (of all our vehicles) through historic points of interest is one of several considerations. EEVC members please contact Jurgen if you have ideas and concerns

related to this portion of the competition.

Ken Barbour and Jim Natale have agreed to work with the Sports Car of America (SCCA) to arrange for an autocross-type event Sunday.

As for our range competition, Jim Natale, Ken Barbour, Jurgen Balitzky, and Steve Savitz are working on some type of plan that could involve late Saturday afternoon and/or Sunday morning, with monitored charging taking place at the Grid Star Solar Home at the Navy Yard (under the supervision of Dr. Joel Anstrom), Saturday evening. A Saturday evening time of fellowship, presentation, and fireside chats will take place at the solar home Saturday evening while the vehicles might be on charge. Again, anyone having concerns or interests in the planning stages of this facet of the competition, contact one or more of the individuals listed above.

Review of the EAA annual 2015 business meeting

For those of you missing the Feb meeting, it might interest you that we spent a little time reviewing the financial status of the EAA as revealed in their annual spring meeting report. The report was of considerable interest. The slides reviewing the meeting have been made available to EEVC members on our Chat Line. Ken Barbour and Jim Natale have volunteered to represent the EEVC as our EAA liaisons.

SOMETIME YOU CATCH THE WAVE, SOMETIMES THE WAVE CATCHES YOU

By California Pete



This year's el Niño weather phenomenon has so far not given Northern California as much rain as was hoped (with global warming we are gradually turning into Arizona), but it created Pacific storms that led to good conditions for that quintessentially California event, the Titans of Mavericks big-wave surfing surf contest. Held only in years in which surf conditions are favorable, it is actually not viewable from shore (TV stations use helicopters), as the sea-bottom for-

mation that causes the big waves to form is half a mile offshore. In past years some people attempted to watch from Pillar Point, a promontory north of Half Moon Bay, but after a rogue wave killed several there in 2010 the police have blocked access, and the only way to view the event is by video.

Coast washing away (again)

The coastal town of Pacifica, about 15 miles southwest of San Francisco, boasts spectacular views of the ocean, particularly from a series of apartment buildings set atop high bluffs above the sea. But the hundred-foot bluffs are made of slightly-compressed sand, and every time a storm rolls in the sea claims a little more of them. Now many of the apartments that were comfortably back from the cliff face when built in 1961 are teetering on the edge, with several already red-tagged as about to fall into the sea and others town down. Piles of boulders have been put at the bottom of the cliff in an attempt to blunt the water's fury, but to little avail. The sea wants that land, and it will have it.

The same thing happened during the last el Niño in 1997-1998, but some people have short memories, or are good at fooling themselves.

The gas leak is stopped; now comes the court case

The state Department of Conservation has declared Thursday that the gas well near Porter Ranch that leaked for 16 weeks is no longer leaking, and the thousands of households that had to relocate can return. But now the Los Angeles district attorney has filed criminal charges against Southern California Gas Co., so this is unlikely to be forgotten soon. And after the criminal case we can assume that private attorneys are drooling.

Homeless won't come inside

As the time for Superbowl 50 approached the city of San Francisco became concerned that the city's 6600 homeless people would make a bad impression on visitors, and set about moving them out of sight. The folks doing the pushing insisted it had nothing to do with the Super Bowl, but was intended to save them from exposure in the coming el Niño rains. Of course.

One scheme was to take a large building on Pier 80, three miles south of downtown, and try to persuade the homeless to go there.

There were just a few problems: It's miles from the center of the city: "It's boring here" as one homeless guy put it. There are no flush toilets. There are no showers. There are no interior partitions, so it's like an evacuation center in a disaster zone.

For reasons that seem to escape the people in charge of such things, most of the homeless folks prefer living closer to the action, panhandling where there are passers-by, being near their friends, and sheltering with their pets and possessions in the tents that some helpful people have been handing out. Go figure.

Saint who?

The longer I stay around here the more odd things I hear about (mostly from the *San Francisco Chronicle* and the local TV news, I'm afraid, as I seldom get into downtown San Francisco). The latest is the plight of a small, mostly African American church that's being pushed out of its quarters. After being in multiple locations, the storefront church has, for the past ten years, occupied space in the West Bay Conference Center in the city's Fillmore district. The director of the center has refused the church's rent payments for three years, and is preparing to evict it.

What makes this interesting is that the name of the house of worship is The St. John Coltrane African Orthodox Church. It is, according to a Feb 17 *Chronicle* article by Sam Whiting, "the only house of worship in the United States dedicated to the message and music of John Coltrane, the pioneering jazz musician who died in 1967. The sanctuary looks more like a jazz club than a church."

The Fillmore was a jazz hub during and after WWII, but in 1948 a redevelopment program, one of the urban renewal schemes often called "negro removal" by their victims) was put in place, and it led to the gradual destruction of the neighborhood's character.

NEWS UPDATE

Tesla Gigafactory job creation slower than first projected

A February 4 AP story reported that the Tesla Gigafactory in Nevada would produce

fewer jobs than first expected. "A report issued this week by the Nevada Governor's Office of Economic Development said there were 272 people working at the Tesla and Panasonic factories at the end of the year." Once up and running, however, plans remain for a total of 6500 employees.

Nevada turning against solar?

While Nevada may or may not be disappointed in Tesla's progress, state legislatures seem to be teaming up with local power utility NV Energy to put the squeeze on private solar installations. According to an opinion piece by Jacques Lesle in the *New York Times* for Feb 1, the state's Public Utility Commission (apparently packed with members appointed by local politicians who have accepted large sums from the utility industry) has decided to assess heavy — and increasing — fees for solar installations, and is even making the charges retroactive. This end to net metering created a storm among solar users and proponents, and caused SolarCity and Vivint Solar to announce that they were ceasing operations in the state.

According to a piece by Chris Nelder and Mark Dyson in the Rocky Mountain Institute's <http://blog.rmi.org>, this may, in time, lead to grid defection: people opting to disconnect from the utility grid entirely, which would, if anything, accelerate what the Edison Electric Institute called a utility death spiral of customers abandoning the public grid and forcing increased costs to those who remain. Unless, of course, the Nevada authorities pass laws that would make grid connection mandatory.

For more on the situation in Nevada, California (which plans to phase out net metering by 2019) and other states, see <https://enrknol.com/wp-content/uploads/2016/02/EKR-PU-Net-Metering-Policy-Debate-California-Nevada-2-8-2016.pdf>. To see the Edison Electric Institute report, go to www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf

New Powerwall coming from Tesla

In other Tesla news, a Feb 13 article by Katie Mohr in *Manufacturing.net* reported that Tesla Motors CEO Elon Musk has announced that a second version of its Pow-

erwall battery pack is on the way. The first model, which stored 7 kWh and cost \$3000, sold out quickly; the second, expected in July or August of this year, reportedly will offer “moderate improvements.”

Multiple press outlets report that Elon Musk has announced that the company will begin taking orders for the \$35,000 Model 3 beginning March 31 at Tesla stores and April 1 on line. A \$1000 deposit will be required, and production is not set to begin until late 2017.

Extracting fuel from the air

On 02/02/2016 the University of Southern California announced that researchers at the USC Loker Hydrocarbon Research Institute have found a way to convert carbon dioxide from the air into methanol at relatively low temperatures. “The researchers bubbled air through an aqueous solution of pentaethylenhexamine (or PEHA), adding a catalyst to encourage hydrogen to latch onto the CO₂ under pressure. They then heated the solution, converting 79 percent of the CO₂ into methanol. Though mixed with water, the resulting methanol can be easily distilled,” said one of the scientists. Much development still needs to be done, and the process cannot compete with petroleum at \$30 per barrel, but it may bear watching.

Another way to sequester carbon

A more immediately available way to get rid of carbon with, apparently, no drawbacks is the use of so-called bio-char in agriculture. Biochar is the carbonaceous material (essentially charcoal) remaining after biomaterial (in this case generally crop waste) is pyrolyzed (heated in the absence of oxygen). The remaining char contains all the nutrient minerals that were in the original plant material, and when plowed into the soil it can, according to Wikipedia, “increase soil fertility of acidic soils (low pH soils), increase agricultural productivity, and provide protection against some foliar and soil-borne diseases. Furthermore, biochar reduces pressure on forests. Biochar is a stable solid, rich in carbon, and can endure in soil for thousands of years.”

The process is powered by burning the hydrogen-rich gases emitted, leaving the heavy carbon. The end result is sequestration of carbon and improved soil — a win-win.

Buckeye Bullet to try again

A Feb. CNN story by Henry Young reports that the team behind the Buckeye Bullet, “a joint project of Monaco-based Venturi Automobiles and engineering students from Ohio State University,” hope to set a new world land speed record for electric cars this summer with a speed in excess of the old record of 307 mph. “[T]he car — which is more than 11 meters long — boasts an impressive 3,000 horsepower under the hood and an estimated top speed of 372 mph (600 kph).”

COMING EVENTS

SAE 2016 World Congress & Exhibition
April 12-14, Detroit. www.sae.org/congress/
WAVE TROPHY 2016 ++ 11 - 19 JUNE 2016

June 11-16, from the North Sea to the Alps.
www.wavetrophy.com/en/

2016 American Solar Challenge

July 22 - Aug 6, traveling through seven states from Brecksville, OH to Hot Springs, SD. <http://americansolarchallenge.org/the-competition/ascsfgp-2016/>

SAE 1016 Convergence; Theme: Personal Mobility – Creating a Smart and Autonomous Journey

Sept 19-22. Detroit. <https://www.sae.org/events/convergence/>

NOTICE ON DUES

Annual EEVC dues are \$20 with electronic delivery of the Newsletter, or \$25 for a printed copy. Mail checks payable to EEVC to James Natale, 3307 Concord Dr, Cinnaminson NJ 08077, or pay via PayPal to jnatalemicro@comcast.net.

MEETING SCHEDULE

Meetings are held in Room 49, Plymouth-Whitmarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m.

Mar 9

Apr 13

May 11

June 8