

By George Harvey

**FREEDOM OF SPEECH?** 

Imagine being in at a really great indoor rock concert. You got a really good seat, about five rows back from the stage and right in the center of the theater. Exiting will be a chore, because there are ten or fifteen seats between you and either aisle, but the seat is so good that you are willing to take a few minutes longer getting out.

The show starts. Things start heating up. The band's signature fire display has tongues of fire leaping up from the stage. And then the curtains behind the band catch fire.

The next thing you know, the manager



DISTURBED — Inside the Fire live. Wikimedia.org

of the theater jumps up on the stage with an announcement. "Please don't panic," he says. "Everything is under control. The fire you see is all part of the show."

People settle back into their seats, eyes wide at the realism of the act. The band plays on, acting a bit nervous. Within minutes, as the fire grows, firemen arrive, hauling in hoses. "Don't worry," the manager yells. "The firemen are all part of the act."

A fire marshal comes up toward the stage. The manager sees him coming and says into a microphone, "And here is the fire marshal. He will ask you to leave. That is part of the act, as well."

With the air becoming unbreathable, people start to head for the exits in a growing stampede. A kind-sounding announcement says, "There is no need to leave. You can get a refund for your tickets, of course, so do not be alarmed, but the show is still going on."

But the show is not going on, because the band members are racing for the exits themselves. The firemen are wearing air packs so they can breathe, and in the heavy air, audience members are collapsing.

## Not free to be false and dangerous

Freedom of speech is guaranteed by the Constitution of the United States. We may say pretty much anything we wish. But there are limitations, and the best known of these, perhaps, is expressed in the metaphor of a person who is "falsely shouting fire in a crowded theater." Cont'd on p.7



The New Tesla Semi-Truck could very likely change the world's transportation system. Photo: nikolamotor.com

By Thadeus Rumple

Tesla's Elon Musk was all set to unveil the new Tesla Semi-Truck at an event scheduled to take place on October 26 at the Design Center in Hawthorne, California. While there were a few glitches, they were not unmanageable. The roll-out of the Tesla Model 3 was not going smoothly, and there were other problems, but Musk tweeted in satisfaction about his new semi. It has a range of 300 miles, which is impressive. And it looked sleek.

Things were still progressing until Puerto Rico was hit by Hurricane Maria, producing a series of humanitarian, economic, political, and possibly technological shockwaves. While Puerto Rico may be a long way from Hawthorne, it eventually set back Tesla's schedule by weeks. And while that may seem a disappointment for those of us who love road vehicles, what is unfolding seems definitely to be worth being excited about.

When Hurricane Maria hit Puerto Rico on September 20, things were already bad. The local utility, the Puerto Rico Electric Power Authority, had \$9 billion in debt and was already bankrupt. Years had passed since it had resources to keep infrastructure in repair. There were still 80,000 people on the island who had not gotten their power back after Hurricane Irma, about two weeks earlier. When Maria left the island, it was altogether devastated. Governor Ricardo Rossello guickly began

sending messages saying the situation in Puerto Rico was desperate. No one had electric power, and Rossello said he expected it would take months to restore it to the entire island. Water was unavailable to 60% of the people. Many roads were impassable. Food supplies were certainly going to be a problem. The only place where there was cell phone reception was for those operating on backup power.

It took President Trump ten days to appoint a lieutanant general to Cont'd on p.20

## Let the Market Decide ..

## By George Harvey

The world has been stood on its head. The current administration in Washington was put there by a coalition of conservative Republicans and supporters of the "free market." Among them, some seem to support fossil fuels, regardless of what is sacrificed to achieve this.

The conservatives want America to be great. They believe in democracy, the sanctity of the family, and expression of traditional religions. The "free market" supporters want to reduce government costs, eliminate subsidies and incentives, and cut taxes for everyone, even if it means government services vanish. The positions are not really compatible.

EPA Administrator, Scott Pruitt, wants to eliminate costs to the government and business, so he would stop paying for any EPA program he can. So, he is eliminating enforcing environmental regulations and has called for eliminating incentives for renewable energy. He has stopped work on the Clean Power Plan, despite the fact that the EPA was ordered to regulate carbon emissions in federal courts.

Meanwhile, we have had hurricanes, droughts, and wild fires that have cost hundreds of billions of dollars this year alone, in a trend of increasing economic costs that mirror temperature increases due to climate change. Much of corporate America is upset, being too pragmatic to believe climate change is not a real problem.

Energy Secretary, Rick Perry, has focused on the troubles of the coal and nuclear industries. Right *Cont'd on p.6* 



## Happy Trash-Free Holidays

By Jonny Finity

Every year when I was a kid, we used to get two stockings on Christmas. One at home, filled by my mom, and one at my grandparents' house in the afternoon. And every year, as soon as we *Cont'd on p.39* 

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## **Recent Monthly Average Mauna Loa CO2**



The graph shows recent monthly mean carbon dioxide measured at Mauna Loa Observatory, Hawaii.

The last four complete years of the Mauna Loa CO2 record plus the current year are shown. Data are reported as a dry air mole fraction defined as

the number of molecules of carbon dioxide divided by the number of all molecules in air, including CO2 itself, after water vapor has been removed. The mole fraction is expressed as parts per million (ppm). Example: 0.000400 is expressed as 400 ppm.

September 2017: 403.38 ppm

September 2016: 401.03 ppm

Last updated October 5, 2017

In the above figure, the dashed red line with diamond symbols represents the monthly mean values, centered on the middle of each month. The black line with the square symbols represents the same, after correction for the average seasonal cycle. The latter is determined as a moving average of SEVEN adjacent seasonal cycles centered on the month to be corrected, except for the first and last THREE and one-half years of the record, where the seasonal cycle has been averaged over the first and last SEVEN years, respectively.

The last year of data are still preliminary, pending re-calibrations of reference gases and other quality control checks. The Mauna Loa data are being obtained at an altitude of 3400 m in the northern subtropics, and may not be the same as the globally averaged CO2 concentration at the surface. *Read more at http://bit.ly/Oct-CO2*.

## Late-Breaking News You May Have Missed By George Harvey

In the April edition of Green Energy Times, we had an article, "This Is Not a Tragedy – It's the First Act of a Comedy." Now, it looks like the second act has started. More than once in the same week, as I worked on finding news items, I broke out laughing.

Energy Secretary Rick Perry wants to subsidize coal-burning and nuclear power plants. The funny part came soon after he announced his plan, when utilities stepped up to say they were closing down coal-burning plants anyway. The Guardian ran an article, "The War on Coal is Over. Coal Lost."

Environmental Protection Agency Administrator Scott Pruitt announced that the Clean Power Plan is being scrapped. The next thing a variety of utilities announced that they would continue to move away from fossil fuels and toward renewables regardless of Pruitt's announcement. Among them were utilities in Arizona and Texas, where the Clean Power Plan would require the greatest changes.

Pruitt also called for subsidies for renewable power to be abandoned, in keeping with the conservative mantra, "Let the market decide." Meanwhile, the CEO of the American Wind Energy Association has taken up that same mantra, because the market is moving strongly toward wind power and away from fossil fuels and nuclear power.

The fall in the costs of solar panels and wind turbines are not the only problems the fossil fuels industry faces. Electric cars and storage batteries are others. In fact, Royal Dutch Shell has indicated that it will sell all its gas stations in Italy because cars will be electric.

The disruption has begun, opening the comedy's second act. My guess is that in the next act, some of the mighty will fall, much to the amusement of the spectators. Cont'd on p.35

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## ☞ NEWS & VIEWS

## **NEW REGIONAL GREENHOUSE-GAS INITIATIVE PLAN**

#### <mark>By George Harvey</mark>

The Regional Green Gas Initiative (RGGI) is a marketbased program to reduce greenhouse gases in nine states in the Northeast. The states involved are all those in New England, plus New York, Delaware, and Maryland.

The way the RGGI has functioned is to issue a quantity of allowances to emit greenhouse gases each quarter. The allowances are sold at auction four times each year, and they can be traded. Each allowance represents one ton of carbon dioxide, and every power plant in the area has to stick to the number of tons it receives.

Progress can be made on reducing greenhouse gases from the area's power sector by regularly reducing the number of allowances sold at auction. Currently, the amount is reduced 2.5% each year. As it has done

so, the allowances have been sold for prices ranging from \$1.86 to \$7.50 each. The money goes to the states, and each

state uses its at its own discretion. In one state, it might be used to reduce the cost of electricity, while in another it could be used to pay for efficiency measures.

The RGGI is not permanent. It has been renewed regularly at three year intervals since it began. The third of these covered the years 2015, 2016, and 2017. It also depends on overall goals that are reviewed at regular intervals. The current goals extend to 2020.

In August of this year, representatives



of the RGGI states met to determine on a course of action for the future. They decided on a slightly more ambitious plan than what they had been following in the past, with an overall reduction of 30% in the years from 2020 to 2030.

There is a perception among some people that the RGGI allowances are in fact a sort of tax, and that they therefore inhibit economic growth or place a burden on the people of the RGGI states. In fact, the RGGI has lost one state, New Jersey, over such concerns.

There has been a series of economic studies indicating that there is no economic burden resulting from the initia-

tive. Over the first ten years of the initiative, emissions from power generation in the RGGI states dropped by 40%. Meanwhile, the gross domestic products of the states in the RGGI grew apace and thousands of jobs were created in conjunction with it. An analysis of the first threeyear period of operation showed net benefits in the area relating to the initiative coming to \$1.6 billion, and for the second three-year period, the benefits came to \$1.3 billion.

The economic benefits described in the analysis do not include health benefits. The American Lung Association has determined that burning a gallon of gasoline does \$1.30 in damages relating

to health costs, and getting energy from coal costs even more. We cannot trace the use of a specific gallon of gas or a lump of coal to a specific instance of lung cancer, emphysema, or asthma, but that \$1.30 is paid, whether we like it or not, someplace in the market. For people who have pulmonary disease or heart conditions, each \$1.30 is just another economic injury added to their suffering. But it adds to the health costs of all, to our insurance bills, and to our taxes.

When we reduce the amount of fossil fuels used, life does not just become cleaner. It is healthier, less expensive, and possibly more enjoyable.



## It has no benefit, but its price is high

#### By George Harvey

We already pay carbon taxes in Vermont. Most people do not know this. But for anyone who looks, the information on how much we pay is on the record, and it is appalling.

The use of fossil fuels has costs that are only denied by people who can somehow deny that air pollution causes economic damage. And this is a cost that has been calculated for us. It comes to \$1.30 for each gallon of gasoline or heating oil that is burned, according to the American Lung Association. For Vermont, with its clean air, that cost comes to roughly \$1,000 per person per year, which is a figure hidden for most of us in taxes and health insurance. But for those who suffer from diseases caused directly by air pollution – lung cancer, emphysema, asthma, chronic bronchitis, cardiac issues, liver cancer - or those driven by climate change - Lyme disease, bubesiosis, West Nile virus, eastern equine encephalitis - the cost is also in terms of suffering.

The use of fossil fuels has costs that are only denied by people who can somehow deny that climate change has had a depressing effect on agriculture. They should talk to producers of maple syrup, whose revenues have been declining. They should check hardiness zone maps, which show an overall increase of about ten degrees on the coldest winter nights, which determine how far invasive species can penetrate. Our orchards, farms, and forests are all threatened with loss from non-native species. The costs of dealing with this are high and climbing.

The use of fossil fuels has costs that are only denied by people who can somehow deny that climate change drives stronger hurricanes. They make us believe that there was nothing unusual

Cont'd on p.19



"Our new Constitution is now established, and has an appearance that promises permanency; but in this world nothing can be said to be certain, except death and taxes." Benjamin Franklin, 1789. Portrait painted in 1767 by David Martin (1737-1797)

## **US Renewable Energy Grows Another 10% in First Half of 2017**

Renewables grow over 10% in first half of 2017 as consumption of fossil fuels and nuclear power falls. Solar use up 39.9%; Hydro up 16.1%; Wind up 15.7%; Biofuels up 2.3%; Geothermal up 1.8%. Nuclear power drops 3.3%; Fossil Fuels down 1.2%.

Renewables now provide approximately 42% more energy than nuclear.

#### From The SUN DAY Campaign

The latest issue of the U.S. Energy Information's (EIA) "Monthly Energy Review " (with data through June 30, 2017) reveals that domestic production and use of renewable energy sources (i.e., biofuels, biomass, geothermal, hydropower, solar, wind) continued to show strong growth during the first half of the year as the consumption of both nuclear power and fossil fuels declined.

Renewables accounted for 13.49% of domestic energy production during the first half of 2017 compared to 12.61% during the same period in 2016 and 10.88% in 2015. During the first six months of 2017, energy produced from renewable sources was 10.29% higher than a year earlier and 21.34% higher than two years ago. On the consumption side (i.e., energy used for electricity, transportation, thermal, etc.), the pattern of growth is similar with renewables accounting for 11.89% of energy use during the first half of 2017, compared to 10.77% in 2016 and 9.64% in 2015.

Comparing the first half of 2017 to that of 2016, solar production and use has grown by 39.86%, hydropower grew by 16.13%, wind by 15.65%, and geothermal by 1.80%. In addition, U.S. production of biofuels increased by 2.99% and their use expanded by 2.30%. Only biomass energy (i.e., wood and waste) production and use dipped slightly by 0.16%.

By comparison, energy output from the nation's nuclear power plants in the first half of 2017 was 3.27% lower than in the same period in 2016 and 2.29% lower than its 2015 level. As a share of the nation's overall energy production, nuclear power is now less than one-tenth - just 9.44% - and even lower (8.40%) as a share of energy consumption. Moreover, energy production from renewable sources is 42.90% greater than that from nuclear power (and 41.42% greater when comparing consumption levels).

Similarly, notwithstanding a 16.06% increase in U.S. coal production, the nation's overall consumption of fossil fuels (e.g., coal, natural gas, oil) continued its downward slide from 81.73% of total energy use in the first half of 2015 to 80.31% for the same six-month period in 2016, and to 79.46% in 2017. As a consequence, the nation experienced another small (0.59%) decrease in carbon dioxide (CO2) emissions attributable to energy consumption. In addition, the gap between coal-based energy use and that from renewable sources is rapidly closing with coal now outpacing renewables by just 15.62%.

"Notwithstanding desperate efforts by the Trump Administration to prop up nuclear power and fossil fuels, they continue to lose ground to the mix of renewable energy sources," noted Ken Bossong, Executive Director of the SUN DAY Campaign. "Time to wake up and smell the coffee, Mr. President!"

Source: EIA released its most recent "Monthly Energy Review" report on September 28, 2017.

The full report may be found at: https:// www.eia.gov/totalenergy/data/monthly.

The most relevant data cited in this release may be found in, or is derived from, the following tables:

http://bit.ly/EIA\_PrimaryEnergyReviewData http://bit.ly/EIA\_PrimaryEnergyProduction\_SourceData http://bit.ly/EIA\_ConsumptionBySourceData http://bit.ly/EIA\_RenewableEnergyBySource http://bit.ly/EIA\_CO2EmissionBySource

The SUN DAY Campaign is a non-profit research and educational organization founded in 1992 to aggressively promote sustainable energy technologies as cost-effective alternatives to nuclear power and fossil fuels. Contact: Ken Bossong at 301-270-6477 x11

## **TOP EV QUESTIONS ANSWERED**

By David Roberts

Did you join a National Drive Electric Week event in September? If so, you were in good company with over 270 electric car demonstrations across all 50 states demonstrating the benefits of plug-in electric vehicles (EVs) for thousands of visitors. A sampling of responses to some of the most popular questions heard at these events is below.

## 1. What's the best EV?

There are many great EV models. The perfect one for you will depend on individual needs and budget:

• Teslas are at the upper end of the budget scale, but offer unique qualities other automakers are not able to match (at least not yet). Some models offer over 300 miles of range and a dedicated, nationwide network of fast charging enables long distance travel. They also have an "autopilot" system with increasingly sophisticated automated driving capabilities. Deliveries of their more affordable Model 3 are starting, but if you do not already have a reservation, you will likely have to wait a year or more for delivery.

• The Chevrolet Bolt (238 miles of range) and all-new 2018 Nissan LEAF (150 miles of range, coming in early 2018) are also excellent all-electric options that should have plenty of range for regular driving, even in frigid New England winter conditions. The VW eGolf, BMW i3, Kia Soul EV and other options have over 100 mile range and can work nicely for many households, particularly if there is a good lease or purchase deal on them.

• Plug-in hybrids offer the ability to run on electric battery or gasoline and are the most popular models of electric cars today. These are good if you want the flexibility of running on electric or gasoline for longer trips. The Chevrolet Volt, Toyota Prius Prime, Chrysler Pacifica Hybrid, Hyundai Sonata plug-in hybrid, Ford CMax Energi, Ford Fusion Energi and upcoming Honda Clarity plug-in hybrid all offer at least 20 miles of electric range before switching to gasoline-powered operation.



2018 Nissan LEAF – 150 miles of all-electric range. Image: Nissan USA

• The best EV deals are typically found in the used vehicle market, where there is growing availability of several models like the Nissan LEAF and Chevrolet Volt, with some selling for under \$10,000. Just be sure to get the battery and other vehicle components checked out before purchasing used to make sure everything is ship shape.

#### 2. How does EV charging work?

Most EV owners plug-in at home using a standard 120V outlet, also known as Level 1 charging. This will give about five miles of range per hour of charging. Faster charging is available by stepping up to 240V Level 2 charging (like an electric clothes dryer circuit), which provides 10-20 miles of range per hour of charging. More public charging is coming, although typically it is more expensive than charging at home overnight. Fees are assessed through memberships in charging networks that work like E-Z Pass and charge users by the hour, kWh, or session depending on the host. Many stations charge fees of \$1 per hour. DC Fast Charging is available for most all-electric models and provides an 80% charge in about 30 minutes, but at a higher cost due to the additional expense of the equipment and operation.

## 3. What incentives are available?

There is a federal tax credit up to \$7,500 and several states offer incentives (see pages 16-17). Some electric utilities are offering EV incentives or discounts on charging as well. Check with yours.

**INCENTIVES** 

## 4. What about the environmental impacts of power generation and battery manufacturing?

Reducing driving by carpooling, public transit, bicycling or other means are the best ways to reduce your transportation footprint. For those who continue to drive alone, an analysis by the Union of Concerned Scientists found an EV would reduce lifecycle greenhouse gas emissions after six to eighteen months of ownership taking the manufacturing footprint and power generation into consideration. This time period will decrease as cleaner energy sources are increasingly used to power our grid. The map below shows the equivalent miles per gallon emissions for EVs in different parts of the USA, depending on the emissions associated with electric power generation. Automakers continue to search out lower impact and longer life options for batteries and are developing second life applications and recycling options for batteries when they reach the end of their useful life in the vehicle.

## 5. How much does it cost to maintain an EV?

EVs cost less to maintain than the most regular internal combustion engines. Regenerative braking puts energy back in the battery and saves wear and tear on brakes. All-electric models have vastly fewer drivetrain components and no engine requiring oil changes. The batteries are typically warranted for eight years or 100,000 miles (whichever comes first), although do expect to see some capacity loss over that time period. There are Teslas and Volts with hundreds of thousands of miles on them and near-new electric range.

Mark your calendars for next year's National Drive Electric Week festivities September 8-16, 2018. More in-depth electric car information is available at the Drive Electric Vermont website: www. DriveElectricVT.com.

David Roberts is the Drive Electric Vermont

coordinator. He has driven an all-electric Nissan LEAF for the past five years and says "if you have to drive, drive electric."





Electric Vehicle Global Warming Pollution Ratings and Gasoline Vehicle Emissions Equivalents by Electricity Grid Region. Image: Union of Concerned Scientists, 2015.

Incentives are offered

through some electric

utility programs.

Visit: driveelectricvt.com/

buying-guide/purchase-

incentives.

Based on a press release from Burlington Electric Department

On October 3, Vermont utility representatives from Burlington Electric Department (BED), Green Mountain Power (GMP), Stowe Electric Department, Vermont Electric Cooperative, Washington Electric Cooperative, and Drive Electric Vermont, along with Governor Phil Scott and Burlington Mayor Miro Weinberger, announced that new electric vehicle (EV) incentives designed to provide opportunities for all Vermonters to transition from fossil fuel burning vehicles to EVs. The incentives included:

 Additional rebates from BED and GMP for EV purchases by low- and moderateincome Vermonters;

 General Motors employee pricing on Bolt EVs and Volt plug-in hybrids from Shearer Chevrolet Buick GMC Cadillac through October; and

• An extension of the \$10,000 rebate on the purchase of 2017 Leaf EVs from Freedom Nissan as long as the dealer is able to find inventory.

Mayor Miro Weinberger addressed the gathering, saying, "For Burlington to become a net-zero energy city, we must tackle the transportation sector's significant and growing greenhouse gas emissions." He added, "Electric cars powered by renewable energy and driven by Burlingtonians of all backgrounds will be a big part of our city's future. Today's announcement is a step towards this inspiring, achievable vision."

Neale Lunderville, General Manager of BED who hosted the announcement at BED's Pine Street headquarters said, "Sweetening the deals for electric vehicles has literally opened up the doors for all Vermonters to go electric. Our collective, groundbreaking incentives have led to unprecedented growth in EV sales."

Each of the utilities offers its own incentives to its customers, as does each car company, so the combinations of incentives depend on what car the customer wants, and what company is providing that customer with electricity.

Vermont's utilities are offering these impressive incentives as part of their efforts to meet requirements of Vermont's Renewable Energy Standard (RES), which was passed by the Vermont Legislature in 2015 and requires electric distribution utilities to get increasing percentages of their electric sales from renewable energy. The RES also includes an "energy transformation" requirement that electric utilities look for ways to reduce fossil fuel emissions, even where doing so may increase electric consumption. One way utilities plan to meet this requirement is

through various EV incentive programs. EVs reduce fossil fuel use and emissions, and they save customers money on fuel and maintenance costs compared to conventional gasoline-powered vehicles.

When charged during non-peak times, EVs can contribute to a more efficient use of the electric grid and help keep rates stable for all customers. In fact, when charged off-peak, EVs can help put downward pressure on rates by using kilowatt hours during times when the grid has extra capacity. By adding energy use without requiring additional infrastructure costs for more power plants or poles and wires, EVs can help make the per unit cost of providing a kilowatt hour less expensive overall. It is especially

ris especially noteworthy that the incentives are very impressive. For example, with a manufacturer's suggested retail price starting at approximately \$30,000, BED cus-

tomers have been able to purchase a new 2017 Nissan Leaf from Freedom Nissan for as low as \$11,300. And Shearer Chevrolet Buick GMC Cadillac is offering employee discounts to customers, which also combine with utility incentives to produce very low costs, below dealer invoice by thousands of dollars.

But potential customers should note that though the incentives were originally intended to last to dates in September or October, they have been extended and may still be available. As noted above, for example, Freedom Nissan is offering rebates as long as it can find inventory.



## **New Hampshire Starts Drive Electric Coalition**

By Randy Bryan



Drive Electric NH Founders: Cathy Corkery of the NH Sierra Club, Randy Bryan of ConVerdant, Brianna Brand and Kate Epsen of NHSEA. Courtesy photo.

There is a new clean transportation coalition in New Hampshire created by New Hampshire Sustainable Energy Association [NHSEA], New Hampshire Clean Tech Council [NHCTC], New Hampshire Sierra Club [NHSC], and ConVerdant Vehicles to support and encourage sales of electric vehicles. The approach will consist of assembling and coordinating the diverse electric vehicle [EV] interests around New Hampshire to more effectively educate and motivate the public to try electric vehicles.

The idea for this coalition began last summer as Randy Bryan\* was surveying around New Hampshire about electric cars. "I was struck by the poor level of understanding of electric cars. Clearly, New Hampshire EV boosters had been talking to the choir for too long and much more effort was needed to reach out. There were pockets of EV knowledge and interest, but a state-wide coordinating voice was needed," said Bryan.

Kate Epsen, Director of NHSEA, has accepted leadership to build the coalition and oversee its activities, along with the help of Brianna Brand. Brand is NHSEA's Project Coordinator, Cathy Corkery - New Hampshire Sierra Club, Michael Behrmann - NH Clean Tech Council, and Randy Bryan - ConVerdant Vehicles. A steering committee is being gathered from various interested parties around the state; including utilities, car dealerships, hospitality, fleets, New Hampshire government, non-government associations, and regional organizers. The committee will adopt goals and coordinate materials as we welcome new members and plan activities around the state. Any organizations interested in participating should contact Randy Bryan, randy@converdant.biz, 603-496-3501 or Brianna Brand, brianna.nhsea@gmail.com, 603-226-4732.

Green Energy Times will be hosting a series of educational and informational articles about the EV developments throughout the state of New Hampshire, following the publication of this edition of G.E.T. Be sure to contact Randy or Brianna with your questions, thoughts and concerns.

\* Editorial note. Randy Bryan has been an advocate for electric cars for over eight years. His company, ConVerdant Vehicles, has converted vehicles to plug-in hybrids, including his own Prius in 2008 and developed and sold inverters that turn a Prius into an emergency generator. He is one of the co-founders of Drive Electric NH.



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## **SMART COMMUTING IN NH & VT**

Transportation emissions are among the worst offenders that add to the rising CO2 levels in our atmosphere. In recent months we have learned that our efforts have begun to reduce the detrimental air quality counts (NHDES), but as you may have learned from numerous other reports such as the International Panel on Climate Change (IPCC), http:// climatechange2013.org/, global warming is still advancing faster than expected.

How do we get our emissions down now? By making new commuting choices!

**Lots of choices.** Smart Commuting is all about knowing your options and planning ahead. There are many choices to get around in New Hampshire and Vermont, The first place to start in Vermont is "Go Vermont" for statewide choices to travel more efficiently. Whether getting around town, commuting to work or school, or planning a day trip, share the driving or ride with someone else to help save our planet and to save approx. \$2,000 annually. The statewide VT site also lists services for commuters, tourist, and shoppers.

In New Hampshire you'll find a similar site at "NH Rideshare" where you can find carpools, transit routes and schedules, bike and walk trails and links to statewide transportation information.

When carpooling, remember to use the local Park n Ride lots to meet your connections. Start your trip planning at connectingcommuters.org or nh.gov/dot/programs/ rideshare/ for statewide choices.

## **IN NEW HAMPSHIRE**

**UPPER VALLEY RIDESHARE (UVRS)** - Carpool matching, benefits and support for commuters in/out of Upper Valley. 802-295-1824 x208. **uppervalleyrideshare.com**.

ADVANCE TRANSIT (AT) – Free weekday bus for Lebanon, Hanover, Enfield, Canaan, NH, and Norwich and Hartford, VT. Dartmouth and DHMC Shuttles. ADA & Travel Training Services. 802-295-1824. advancetransit.com

CARROLL COUNTY TRANSIT - Services and connections to Belknap County. 888-997-2020 tccap.org/nct.htm

CITY EXPRESS - Serves Keene. 603-352-8494 hcsservices.org/services/transportation/cityExpress.php

SCS TRANSPORTATION - Services for Sullivan County.. 603-542-9609. SCSHELPS.ORG

**CONCORD AREA TRANSIT (CAT)** - Serves Concord 603-225-1989 **concordareatransit.org CONTOOCOOK VALLEY TRANSPORTATION (CVTC)** - Monadnock Rideshare for the southwest region 877-428-2882 **cvtc-nh.org** 

**COOPERATIVE ALLIANCE FOR REGIONAL TRANSPORTATION (CART)** - Serving the Chester, Derry, Hampstead, Londonderry, Salem and Windham, limited service to Plaistow. 603-434-3569 cart-rides.org

DARTMOUTH COACH - Services to Boston, Logan Airport and NYC 800-637-0123 dartmouthcoach.com

MANCHESTER TRANSIT AUTHORITY (MTA) - Manchester, with links to Nashua and Concord. 603-623-8801 mtabus.org/services/local-buses

NASHUA TRANSIT SYSTEM (NTS) - Buses and trolleys with bike racks. 603-888-0100 RideBigBlue.com

NH RIDESHARE – Your Source for Transportation Alternatives. nh.gov/dot/programs/rideshare/

WINNIPESAUKEE TRANSIT SYSTEM (WTS) - Services Belmont, Franklin, Tilton, Laconia. 603-528-2496 bm-cap.org/wts.htm

## IN VERMONT

UPPER VALLEY TRANSPORTATION MANAGEMENT ASSOCIATION (Vital Communities) - Works with UV employers and communities to promote and improve commuting options. 802-291-9100 vitalcommunities.org/transport/index.htm

VERMONT PUBLIC TRANSPORTATION PUBLIC TRANSIT - Lists transit, ferries and more at aot.state.vt.us/PublicTransit/providers.htm

**AMTRAK** - Long distance train service. Discounts for AAA members and student advantage card. (800) 872-7245 **amtrak.com** 

**CHITTENDEN COUNTY TRANSPORTATION AUTHORITY** - Burlington bus service with links to Montpelier, Middlebury and commuter route to Milton. **cctaride.org** 

CONNECTICUT RIVER TRANSIT - Services in Bellows Falls and Springfield. crtransit.org

**GO VERMONT** - Offers carpool matching and commuter connections in VT 800-685-7433 connectingcommuters.org

**GREEN MOUNTAIN RAILROAD** - Day trips from White River, Champlain Valley, Bellows Falls and Rutland. rails-vt.com

**GREEN MOUNTAIN TRANSIT AGENCY** - Local service in Barre, Montpelier, Grand Isle, Stowe and Lamoille. 802-223-7287 **gmtaride.org** 

**GREY HOUND/VERMONT TRANSIT** - Long distance bus services. 1-800-231-2222 grey-hound.com/

LAKE CHAMPLAIN FERRIES - Transport between New York and Vermont via Lake Champlain. 802-864-9804 ferries.com

MARBLE VALLEY REGIONAL TRANSIT- For Rutland, Killington, rural Manchester, Poultney and Rutland to Bellows Falls. City routes Free on Saturday. 802-773-3244 thebus.com/

**RURAL COMMUNITY TRANSPORTATION (RCT)** - Buses, vans, and volunteer drivers. Routes via The Jay-Lyn, The Highlander (Newport - Derby Line); The US RT2 Commuter (St. J. to Montpelier) and Free routes to rural areas. 802-748-8170 riderct.org

**STAGE COACH** - Commuter buses from Randolph and Fairlee to Dartmouth, Local village buses. 800-427-3553 **stagecoach-rides.org** 

## Burlington Awarded \$480,000 for Electric Buses

By Green Energy Times Staff



A BYD electric bus. Photo from Wikimedia Commons.

In September, Vermont's congressional delegation announced that the United States Department of Transportation had awarded a grant of \$480,000 to the Vermont Agency of Transportation to help buy two electric buses to be used by Green Mountain Transit in Burlington. Senator Patrick Leahy, Senator Bernie Sanders, and Representative Peter Welch had jointly sent a letter in support of the grant to Transportation Secretary, Elaine Chao.

The effects of air pollution from transportation are especially important in Vermont. The state's rural population and visitors use quite a lot of fuel, and the effects are costly for the health of the residents. When the American Lung Association in California studied transportation-related health effects in ten states, including California and New York, the cost per capita was highest in Vermont, at \$480 per person per year.

This should not be surprising to anyone who understands the use of energy in the state. Vermont has 47% of its carbon emissions from the transportation sector, where the national average is 28%. Getting Vermont's carbon emissions under control and reducing problems with pollution both demand more attention to transportation than to anything else.

We might well consider the carbon emissions of the people living in Burlington. If they heat with heat pumps, cook

## Let the Market Decide ...

Cont'd from p.1

now, there is only one nuclear plant under construction in the United States, and the owners of the only coal-burning power plant under development said they will probably give up on it. So, Rick Perry has decided we should subsidize electric plants that can store at least three month's fuel, meaning nuclear and coal plants.

Perry's move has been opposed by a wide number of environmental groups. But it has also been opposed by just about everyone who has no way to profit from the proposed subsidies, and this divides supporters of gas from supporters of coal.

Of course, many politicians loyal to whatever fossil fuels industry financed their campaigns are still saying that the weather damage, which has been mounting rather steadily for over four decades, is just the luck of bad weather.

But the coal industry cannot recover. And the gas industry, which has been putwith electricity, and ride electric buses, the greatest source of their carbon emissions might just be the food they eat.

The City of Burlington, Green Mountain Transit, Burlington Electric Department, and the Vermont Energy Investment Corporation have all been studying electric buses for the city for some time. Green Energy Times had an article on the subject, "Electric Bus Trials in Vermont and New Hampshire", in the February, 2017 issue. More recently, in the June, 2017 issue, we had the article, "Electric Buses Trials in Vermont and New Hampshire."

A joint statement from the congressional delegation said, "Public transit is already an excellent way to reduce carbon emissions, by giving people the option to get out of their cars and into buses. By using electric buses instead of fossil fuel burning buses, we reduce those emissions even further. Since these electric buses will be charged by Burlington Electric Department, which gets 100 percent of its electricity from renewable energy sources, they are just about the cleanest way imaginable to transport area residents."

The importance of carbon emissions was also highlighted by a statement in the joint statement. It said, "At a time when global climate change is causing devastation all around the world, from more frequent and stronger hurricanes, wildfires, drought, and flooding, this is exactly the kind of investment we should be making."

ting coal out of business, has gone into what appears to be a severe recession of its own. Over the last year, the amount of electricity generated by natural gas has been down every month from what it was in the same month the year before. The average decline is over 10%.

Most utilities seem to be supporting neither Pruitt's position nor Perry's, but the American Wind Energy Association has taken up the mantra: "Let the market decide." The lowest prices for electricity in power purchase agreements from fossil fuels is about 4.8 cents per kilowatt hour. The lowest costs from solar or wind are already lower than that, even when battery backup power is included.

So, Republicans are stuck with a tough choice: Do they support their own principles, a healthy economy, and their constituents? Or do they support the fossil fuels industry?

I am sure they will let us know.

## ENERGY NEWS

## **VERMONT CLIMATE ACTION COMMISSION COLLECTS IDEAS**

#### By Rick Wackemagel

Responding to federal inaction and a request from Vermont environmental organizations, Vermont Governor Phil Scott established a Climate Action Commission last July to accelerate progress toward Vermont's greenhouse-gas emissions and renewable-energy goals. The Commission is finishing its first action - collecting its first round of ideas. Assessing its prospects, Commission Chair, Peter Walke, says, "This Commission comes together during a unique opportunity that our predecessors did not benefit from. Low-carbon alternatives are now economically competitive. As the Vermont Council on Rural Development's national summit on the climate economy showed, Vermont now has a chance to meet its aggressive goals in a way that drives prosperity for all Vermonters."

Governor Scott's first two charges to the Commission were:

1. Drafting a plan for reaching Vermont's renewable-energy and greenhouse-gas emissions goals, while supporting economic growth; increasing affordability; and ensuring access to low-carbon alternatives for all Vermonters.

2. Holding public scoping sessions to collect ideas from Vermonters.

The Commission has 21 members, drawn from the public, private and nonprofit sectors, and representing economic sectors engaged in collecting, distributing, conserving and using energy. They were selected to provide a broad spectrum of viewpoints that would produce robust consensus on near-term actions to take. This group meets once a month. Meet-

VERMONT CLIMATE ACTION COMMISSION MEMBERS

Organization or business
Agency of Natural Resources
VT Council on Rural Devel.
Dynapower
Vital Communities
Grassroots Solar
Stevens and Associates
U-32 High School
Casella
VT Natural Resources Council
Department of Public Service
Green Mountain Power
Energy Action Network
St. Albans City
Audet's Blue Spruce Farm
Vermont Energy Investment Corp.
Agency of Commerce /Comm. Devel.
Agency of Transportation
Bourne Energy
R. J. Turner Company
UVM Grossman School of Business
BROC Community Action

ings are open to the public. Date, time and location are available on the Commission's web page, at http://bit.ly/vt-climate-action. The four scoping sessions have been completed. Total attendance was about 275. Public testimony from the first three sessions was available on the Commission webpage when this article was written.

Ideas submitted will be read, categorized and evaluated by the commissioners. The evaluation will include the ideas' abilities to help meet the five goals in the Governor's first charge and other criteria developed by the commissioners. Commissioners will identify three, or perhaps a few more, high-priority, specific, concrete actions to recommend to the Governor and the Vermont legislature in January for immediate consideration. Full results for all ideas received will be included in a report in the summer of 2018. That report will include descriptions of the ideas and assessments of their expected impacts.

A wide variety of ideas, from simple to complex, were suggested. Listing all 273 here is impossible. A smattering follows: • New construction ideas included, among other things, renewable-energy production from all the usual suspects at both community and commercial scale, electric- and hydrogen-vehicle charging stations, bio-digesters, park-and-ride lots, and Western-corridor rail.

• Information and education about low-carbon alternatives will help consumers understand their choices and choose wisely.

• Ideas for reducing use of fossil fuels in transportation included promoting computerized or cooperative car sharing and carpooling, establishing markets in which local producers and consumers could buy and sell goods and services, expanding broadband and mass transit, subsidizing electric-vehicle purchases, and raising parking fees.

• Pricing carbon will create an incentive to reduce fossil-fuel use. The revenue could be returned to residents and/or businesses, and/or used to finance energy-efficiency and/or renewable-energy investments, and/or to reduce taxes.

 Job training can open new opportunities in renewable energy and energy efficiency.

• Carbon can be sequestered through appropriate farming practices and other emerging technologies.

• We can improve our planning processes by creating a cabinet position on climate change, by developing a process to integrate regional and town energy plans with utilities' Integrated Resource Plans, and by building on existing plans and analyses.

• Technology-development ideas ranged widely, including developing more stringent energy-efficiency standards for appliances; developing hardware to use surplus renewable electricity to split water into hydrogen (to fuel trucks and heavy equipment) and oxygen; and organizing a technology-development council to identify, prioritize and develop opportunities to reduce weatherization costs.

Recognizing that not all good ideas will have been presented by January, the Commission continues to accept and assess new ideas. Making recommendations is not the final step. The Commission will also identify leaders to shepherd recommended ideas through development into implementation, then monitor and evaluate results. This first round is focused on mitigation, i.e., preventing greenhouse-gas emissions. A second round will focus on adaptation, improving Vermont's ability to bounce back after extreme weather events and to cope with other impacts of global warming. Taking on the role of coordinating development and implementation, and regularly repeating the process of identifying and assessing opportunities could ensure that we are progressing in a cost-effective manner.

It's a case of the more the merrier. If you have ideas you would like to suggest, send them to anr.vcac@vermont.gov.

Rick Wackernagel lives in Burlington, Vermont and is a member of the Energy Committee of the Sierra Club Vermont Chapter.



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A NEW METAPHOR

#### Cont'd from p.1

The original of this metaphor arose with a legal opinion drafted by Oliver Wendell Holmes, Jr., in a case that focused on freedom of speech.

The story above may serve as a new metaphor we might think about. A group of people can be endangered by a false statement that nothing is wrong when, in fact, something is.

We could argue that the theater manager was guilty of fraud. Fraud is covered by laws in the various states in the United States. It is covered both by civil law and criminal law. In the former case, it does not usually require clear and convincing evidence, but by the preponderance of evidence. Civil cases often result in financial awards to cover the losses of the victims.

On the other hand, if we could prove that the theater manager acted in a premeditated manner and someone died, he could be found guilty of homicide.

But even without proving that the manager knew something was wrong, we could prove he or she should have known and ignored the evidence, especially if warned by an expert, such as the fire marshal. Even without a death, the manager could be



**Rock concert fire show—Les Panchyshyn** Image from Wikimedia Commons

found guilty of reckless endangerment. Climate denial as a violation of freedom of speech

There is a point at which climate deniers are exercising freedom of speech. And there is another point at which they are falsely endangering people. Under certain circumstances, whether a climate denier believed what he was saying becomes irrelevant, if it can be shown that he was acting in strong self-interest in the face of experts telling him he was wrong. In this country, and elsewhere, we have

In this country, and elsewhere, we have industry leaders who may benefit financially from preventing action on climate change. We have political parties that they have supported. Politicians they support make pronouncements to move the public not to support moves that experts say are necessary. And the necessity can be a matter of life and death.

Indeed, this is not just about future projections. The environmental damage, the financial loss, and even the deaths, are already going on. We are seeing increases in all these things that are inexplicable, unless we account for climate change in the calculations.

It is not necessary to refer to sensational news stories, which abound but are anecdotal evidence. In Vermont, where I live, we have a series of diseases that have all been increasing greatly though they were absent in 1990. They include Lyme disease, babesiosis, West Nile virus, and eastern equine encephalitis. Hundreds of new cases of Lyme disease alone are being reported each year, but authorities estimate that only one case in ten is reported.

Arguably, these diseases are being impelled through the state by increasing temperatures. They, or their vectors, would be killed off by the coldest nights of the winter, but those coldest temperatures are, on average, about 10°F higher than they were 35 years ago.

Both animals and plants are also victims of the higher winter temperatures. Moose do not have any instinct to Cont'd on p.24

## SOLAR PHOTOVOLTAICS 🐼

# Upper Valley Aquatic Center is Swimming in Solar

The Upper Valley Aquatic Center (UVAC), in White River Junction, Vermont, has to deal with energy loads many people might never think about. For example, the center's pools put a lot of water vapor into the air, especially as people are splashing about in them, and that vapor has to be removed to eliminate the discomfort and other problems associated with high humidity. The traditional approach to this is to operate equipment that requires a lot of electric power.

Richard Synnott, UVAC's Executive Director, addressed the cost of dealing with humidity with the help of a very impressive, high-efficiency ventilation system that reduces electricity usage. But that is just one big load. He has known for years that the center could save money each year by having its own solar array. So he looked for a solar installer, and because non-profit organizations cannot take advantage of incentives, he also had to find a way to finance the system.

In time, Synnott settled on Norwich Solar Technologies (NST) to provide a turnkey solution for the array. He did this partly because it was very nearby, but also because of recommendations he had received. NST located and purchased nearby land for the solar system and did all the design, permit-



Happy sheep lunching under the solar panels. Photos courtesy of Norwich Solar Technologies.

The Upper Valley Aquatic Center's solar array in Hartford, Vermont.

ting, engineering, and construction work. They worked with New Energy Equity of Annapolis, Maryland, for financing.

Troy McBride, the Chief Technology Officer of NST, explained to us that the UVAC solar array was special for a number of reasons. First of all, UVAC is an important community asset in White River Junction, Vermont. For many local people, McBride told us, UVAC is "a sort of cultural icon."

"We were delighted to work with UVAC," McBride said. "It is a winwin-win. The first win was that there was no upfront cost because of the way it was financed, so they save substantial money right from the start. The second win is for the environment, because they use a lot of electric power. And the third win is for more local energy generation and local energy employment."

The UVAC array was built in Hartford, Vermont. As a 500-kilowatt (AC) system, it is expected to produce about a million kilowatt-hours of electricity per year. It has 2,184 solar panels, REC 335 Twinpeak 72-Series, and fourteen CPS inverters.

Because of the financing of the project, UVAC did not have to spend any up-front money at all. Over the time that New Energy Equity owns the system, it will save the aquatic center about \$25,000 per year. At select dates during the contract period, and the end, UVAC has an option to buy the system at a much reduced price. The system is net-metered with Green Mountain Power, and the estimated savings over the first twenty years of operation come to about \$800,000.

The vegetation that grows under solar

panels needs to be kept down so the panels are not shaded by plants. Among the things that will grow under solar panels are grasses of types historically used for grazing sheep. The UVAC solar array is across the street from Sunrise Farm. As a matter of synergy, the UVAC solar system is being mowed by the farm's sheep, which are sent over from time to time to perform this vital function. "It is super fun to do this," said Chuck Wooster of Sunrise Farm. He called combining solar and agriculture on the same land "an environmental two-fer."

The idea of having agriculture with solar power on the same land is not unique. It is fairly common in the United Kingdom to graze sheep under solar panels, though it is not quite so much done here. Troy McBride told us that there are some other arrays in New England where this is done, and Barrington Power has been known to buy its own sheep specifically to keep grass down. Speaking for Norwich Solar Technologies, McBride said, "We are looking for more places to find synergy between solar power and agriculture."





## **ORAN CALL STATE OF SOLAR PHOTOVOLTAICS**

## The Elizabeth Mine Cleaned Up for Solar Another Awesome Superfund Project in Vermont

#### By George Harvey



In 1809, the Elizabeth Mine, a source of copper ore, opened in Orange County, Vermont. With the exception of a lapse of a bit over twenty years from 1901 to the 1920s, the mine continued to produce copper for about one and a half centuries.

Originally, Elizabeth Mine was a strip mine. Ore was extracted from two large pits in the ground. In 1886, underground mining was begun. Over its lifetime, the mine produced over 4250 tons of copper. During World War II, it was one of the twenty most important sources of copper in the United States. It went into decline after the war, however, and was finally closed in 1958.

The ore at Elizabeth Mine was of rather low grade, and this meant there was a



lot of waste left over from extracting the copper, which was done on site. When the mine closed, that waste remained in a variety of forms, leaching various toxic substances into the west branch of the Ompompanoosuc River, a 25 mile long tributary of the Connecticut River.

Because the toxins were leached by naturally flowing water, largely rainfall, through large piles of waste, the damage would continue to go on until the waste was cleaned up. The Elizabeth Mine was declared a Superfund Site, and the Environmental Protection Agency (EPA) and the Vermont Agency of Natural Resources started (VTANR) developing a plan for dealing with the waste in 2000.

Cleanup, an EPA project with work by

Left: View of tailing and waste rock capped storage and barren ground next to the north cut. Photo credit: EdwardE-Meyer, wikimedia.org. Right: Elizabeth Mine Solar Farm consisting of 19,990 solar modules of 345 watts. It is expected to generate enough electricity each year for about 1,200 households. Photo courtesy of Weston and Sampson Engineers.

the Army Corps of Engineers, began in 2010, with an expected cost of \$70 million. We might note that the cost of cleanup was about 82¢ for each pound of copper the mine ever produced. But cleanup had to be done, because the site was contaminating the rivers all the way to Long Island Sound.

One thing that can be said about brownfield sites, in general, is that there is not a lot that can be done with them. They cannot be used for parks or farms because of dangers from remaining toxins. In the cases of open pit mines and landfills, the land itself is sufficiently unstable, that it makes no sense to put any sort of structure on it. Nevertheless, such a site can often be used for a utility-scale solar installation. In 2011, Brightfields Development and Wolfe Energy approached the EPA and the VTANR with the idea of developing the Elizabeth Mines Superfund site once remediation was complete. The original partners brought in Greenwood Energy to handle financing. In turn, Greenwood brought in Conti Solar to manage the design and construction. The engineering firm was Weston and Sampson.

Because of the nature of the site, where the ground can settle in time, the solar modules had to be supported by ballasted systems. These were supplied by Solar FlexRack, pre-cast, and moved to the site by trucks. The ballast systems had a total of 19,990 solar modules mounted on them, each of 345 watts. The photovoltaics were manufactured by Hyundai.

Power from the site will be supplied to the utility, Green Mountain Power. Even the task of connecting the site to the grid was not trivial. Four miles of utility power lines had to be put in, and a regional substation had to be upgraded. These upgrades included upgrading service to local subscribers, as well. There also had to be ten miles of optical fiber installed.

The 28-acre site sits on the border between the towns of Strafford and Thetford, Vermont. As a former superfund site, it had little use to anyone. Covered with solar panels, however, it is expected to generate enough energy each year to cover the electricity needs of about 1,200 households.

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## SOLAR PV - VERMONT - NEW HAMPSHIRE 🐼

## Standard Solar Shines in the Capital

By George Harvey



S<mark>olar array in Washington D.C. Photo courtesy of Standard Solar.</mark>

In this issue of Green Energy Times, we have stunning news in the article, "The World's First LEED Platinum City," which you can read on page 19. Perhaps more stunning than the news is the fact that the city in which it happened is a notorious hangout for powerful people who want to save the coal industry. Yes, the first LEED platinum city is none other than Washington, D.C.

In the course of researching that article, we came across a really exciting story. It is about Standard Solar, a company that finances and develops solar systems and has importantly added to the growth of solar power projects in the Washington area.

We can see clearly that what is going on in Washington at the local level is very different from what is happening at the federal. The federal government has its agenda, which is heavily influenced by those who put their money into national politics. But the local government in the District of Columbia thinks its own thoughts, which are clearly intended to address the environmental and economic issues it faces.

We may think of developing a solar system as a project for field technicians, but financing is necessary to enable that work. Financing is one of the biggest problems local governments face, because governments, as not-for-profit organizations, cannot get tax breaks. Of course, the same is true of many other organizations, including schools, churches, museums, and many others. These organizations need special attention from financial companies that specialize in solar development.

Standard Solar is one such specialist. The services it provides are available all over the country, but Washington, D.C. offers a special example of what it can accomplish.

This year Standard Solar had installed thirty new solar systems on the roofs of local government facilities, including public schools, fire stations, and police facilities in the District of Columbia. For this, it worked closely with the district's Department of General Services (DGS).

Over the time these systems have been installed, they created about 140 good jobs for people of the Washington





area. Tony Clifford, Standard Solar's Chief Development Officer, highlighted the effect on the local economy, saying, "As a Washingtonian, I know how important these projects are for the District's local economy, and we commend and celebrate the DC government for their dedication to becoming a green city."

The rooftop systems installed by Standard Solar have been brought to a combined capacity of seven megawatts. Please notice, this is seven megawatts of rooftop solar. They will produce about 20% of the electricity used for the buildings on which they sit, which are generally large buildings using a lot of power. They reduce costs for the local government just as they reduce pollution, moving the district closer to the greenhouse gas goals it has adopted in its continuing support of the Paris Climate Accord.

Clifford is very aware of the fact that the progress done by the local government of Washington, D.C. may have a profound effect on communities elsewhere in the country. "Installing solar in urban-rooftop environments may seem challenging to some, but through careful planning and innovative installation approaches, those challenges are readily overcome," he said. "The DC DGS project and others like it clearly demonstrate how transferable this type of success can be throughout cities

in the United States." Across the country, Standard Solar has financed, developed, or maintained over







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## 🐼 SOLAR ETC. - NEW YORK

## FORMER LANDFILL TURNS TO SOLAR IN SARATOGA SPRINGS, NY

By Joanne Coons



A 2.6MW solar park covering 14.6 acres at the capped Weibel Avenue Landfill. Photo courtesy of Onyx Renewable Partners L.P.

A beautiful clear sunny sky brightened the ribbon cutting for the City of Saratoga Springs' 2.6-megawatt solar installation at a former landfill. The project used only 14.6 acres of the possible 65 acre site, leaving room for expansion. The Spa Solar Park was "energized" on August 22, 2017. The system's 7,992, 325-watt panels will supply approximately 40% of the energy used by the city. This is about the equivalent of powering 370 homes and offsetting about 1,605 metric tons of CO2 emissions. The project is a success story of engaged citizens coming together and eventually forming a non-profit group called Sustainable Saratoga. They formed the idea, or planted the seed for the good use of the former Weibel Avenue Landfill and partnered with local government to make this happen. There are many beneficial outcomes of this project including good use of vacant land, planning for the future energy security of the town, doing their part to combat global climate change,





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increasing health benefits for cleaner air, water and reduced respiratory disease, and providing renewable energy jobs.

Onyx Renewable Partners L.P., the city's partner, constructed the Saratoga Springs Spa Solar Park and owns, operates, and maintains the facility.

Joanne Coons is an adjunct professor at Hudson Valley Community College, TEC-SMART facility teaching PV Theory and Design. She organizes Capital Region NYSES (New York Solar Energy Society) monthly meetings and is a member of the Town of Clifton Park GREEN Committee.



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## SOLAR PV – NEW HAMPSHIRE 📀

# **Off-grid Training Center**

#### **By Georae Harvey**

There are a lot of builders, and even a lot of solar installers, who have it a little easier because of the availability of grid power. Grid electricity often makes it possible to power tools and equipment without doing any more than running a cord to an outlet.

By contrast, building without any available electricity may require a bit of creativity. For any building that is off grid, the power has to be made available before it can be used.

Chris Milner, owner of Milhouse Enterprises, has had enough experience to have a standard approach to building without grid power. Simply put, you start with whatever it takes to put up the solar system, and power the rest of the construc-tion with that.

A recent project in Milford, New Hampshire, is an example of his approach. And though Milner did not intend it, the example became a training ground for electric and building inspectors. There is nothing better than a well-planned and executed system to provide a benchmark for achievement, and this particular site was certainly that.

The property is at the top of a mountain.

While such a site can be great for a view, bringing in electricity can be very much a problem. With slopes of 35 degrees and ledge rock almost at the surface for much of the way, installing utility poles was going to be expensive, and in this case, the home was to be a mile from the nearest utility line. The owner was looking at installation costs that might be as high as \$100,000 just to get grid power.

Clearly, a solar system, in fact a great solar system, can be had for half of that amount. A friend who had put in such a system suggested that his installer, Milhouse Enterprises, had all the experience needed to provide such a system.

The fact is, this particular solar system had to be no less than great. The owner wanted eventually to be able to charge a Tesla with solar power. So the solar array and batteries had to provide all the household needs plus transportation.

First things have to come first, and this was a bootstrapping situation. Milner explained, "We try to get the solar in as quickly as possible, once the foundation is covered." The initial building project was to be designed around getting the power

to build the building. This meant that work started with a couple of gas-powered generators, horrible, noisy, polluting beasts that require fuel to be brought in. They provided the power for enough construction of the basement, foundation, building shell, and the southfacing half of the roof. Once that was done. it would be possible to install rooftop solar panels, the electric lines, and the batteries in the basement. The photovoltaic

system has 66 SolarWorld panels providing 18,810 watts. They provide power to 24 Deka Unigy two-volt batteries for a 48-volt system. The system has two Schneider inverters supplying 100 amps of standard household 120/240 volt service.

This was going smoothly with installation - Milner even got help from the building contractor moving 4,500 pounds of batteries - when the state electric inspector showed up and events took an unexpected turn. After looking everything over, he asked if he could bring in other inspectors to show them how a clean and well-organized off-grid solar system should look

And so, Milhouse Enterprise's master electricians became tour guides for groups of state and local inspectors. Many of the inspectors knew the code but had never seen an off-grid system so clearly laid out.

We would like to congratulate Chris Milner on work that is, literally, exemplary!



prises; below: Battery system. Photos courtesy of Chris Milner



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## Living in the Future with Renewable Energy

This article appears courtesy of ReVision Energy



Matt Thomas and his family are living a solar dream thanks to the help of ReVision Energy, a well-known solar installation company from Portland, Maine. Pictured here are his two children. Photos courtesy of ReVision Energy.

Matt Thomas has wanted to live in a house powered by solar energy since he was a kid, when science fiction stories like "Star Trek" got him to dream of a futuristic, self-sustaining world. Flash forward to today, and Matt's dream is within reach for all of us!

In 2015, as the parents of a five-year-old son, Matt and his wife Carrie, decided it was a good time to make the investments for the long haul, and start reaping the rewards of a transition to a 100% solar-powered lifestyle. They were living in the home where they planned to raise their family. It was a chance to "live in the future," he says. Here's their story:

## **Solar-Powered Transition Begins**

Carrie and Matt called ReVision Energy and arranged a site visit to their home in Bowdoin, Maine. Matt felt there was a good, professional connection. "I didn't even bother to get a second or third opinion from other companies," he said, "I liked what I saw with ReVision so I hired you guys to do it."

Matt and Carrie did the "Trifecta" – combining a 26-panel solar array with a heat pump and heat pump water heater to meet nearly 100% of their home's electric, space heating, cooling, and water heating needs. They did not stop there, though! They are proud drivers of a Chevy Volt, a plug-in electric vehicle that will drive on solar power exclusively for its 40-plus mile battery range.

Now that they're powered on solar, Matt continues to convert gas-powered appliances to solar power – he has a full suite of lithium-ion battery-powered lawn equipment, and even a fully-electric home-brewing system. Their abundant solar power goes to good use every day. Matt remarks, "I figured I have it, I might as well use it!"

**Solar-Powered Transport & Household** 

Since they began using the solar array to charge their Chevy Volt they have noticed substantial savings. "For my commutes and getting around it's been great," Matt said, "I've noticed a lot of savings. I would've spent at least \$100 in gas last month, and if I didn't have solar, it would cost me about \$25 in electricity, but because I have solar it costs me nothing!"



"The last time I remember filling up on gas was sometime last winter," he adds. When they conclude their lease on the Volt, Matt expects they will invest in a fullyelectric vehicle such as the Tesla Model 3, a Chevy Bolt, or maybe the next-generation Nissan Leaf.

Battery Backup Gives Ultimate Flexibility This fall, the Thomas's, their son, Wesley, now seven, and one-year-old daughter, Eva, will take another big step forward in energy independence with the addition of a 15.9kWh Pika Harbor Plus Smart Battery to their home. Pika Energy is a Mainebased manufacturing business (based in Westbrook) who are creating world-class smart electronics for the grid of the future.

The Thomases will be taking advantage of Pika Energy's signature product, the Pika Energy Island, which enables instant communication between

Cont'd on p.14



Matt Thomas' arsenal of lithium-ion power tools are recharged by his solar panels.





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## **RENEWABLE ENERGY**

# New Hampshire Man Helps Local Camp REAP The Benefits Of Solar Energy

By Chris Gillespie



A close-up view of one of the solar arrays on Furlone's property. Courtesy photos: Craig Bell of Solar Source.

## USDA and FAA Approve Two Solar Systems (65.6kW and 61.5kW) Near Dillant Hopkins Airport

Residents of Swanzey, NH might be surprised to learn that there are several solar photovoltaic (PV) arrays located on the eastern boundary of the Dillant Hopkins Airport.

The arrays are on the 13.5 acres of property that belong to Bob Furlone, the retired owner of American Construction who now focuses on another area of interest, real estate development.

"They're hard to see," said Furlone about the solar arrays in a recent phone interview with Green Energy Times. "I don't think people know they're even there."

Furlone's property is home to three solar arrays: one 8kW roof-mounted system and two ground-mounted systems, one which is 65.6 kW and another that is 61.5 kW. All of the arrays were installed by Solar Source based in Keene, NH.

"Solar Source is a joy to work with. Right from breaking the ground to the follow-up—they're right there," said Furlone about the commercial and residential solar specialists. "They're a top-notch organization."

After having the 8kW rooftop system installed on top of a building he was renting out in 2011, Furlone set out to design a storage facility for his property that would be topped by another rooftop solar array. However, after analyzing the various other needs and costs of the prospective storage facility. Furlone decided to scrap the project and keep the only component that he was really excited about: the solar array. This became the first groundmounted 65.6kW system on Furlone's property.

The funding for this solar array was aided by a grant from the USDA's REAP, or Rural Energy for America Program. As outlined on the USDA's website, REAP "provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements." The article, "New Hampshire Rural Renewables," on page 15 of this issue discusses the REAP program further.

After a lengthy application process, Furlone was approved by the USDA for his grant. Given his property's proximity to the Dillant Hopkins Airport, Furlone also had to receive approval from the FAA before building the solar arrays.

Furlone participates in the State of New

#### Hampshire's group net-metering program, where he hosts the utility meters that the solar electricity generation flows through before entering the electric grid. Besides the host, there are others who benefit from the solar electricity production. One of the members of the group Furlone hosts is the Cheshire YMCA's Camp Takodah in Richmond, NH, an overnight camp that specializes in programs for boys and girls ages 7 through 15. The solar electricity generated on Furlone's property helps offset part of the camp's energy demand.

In addition, Furlone partakes in the EPA's Green Power Partnership by selling the rights to the non-power attributes of the solar arrays produced on his property in the form of Renewable Energy Certificates, or RECs. RECs allow others who do not have or cannot have a solar or wind system of their own to purchase renewable energy while incentivizing investors like Furlone to install solar PV systems.

Although applying for government funding and selling RECs can be difficult at times, Furlone encourages other real estate developers and likeminded entrepreneurs to join the growing renewable energy marketplace.

"You have to understand tax law, and you need to have a certain appetite for federal taxes, but you end up getting accelerated depreciation, which is important," said Furlone, adding that he has no regrets about entering the business.

For Furlone, working with solar arrays and RECs has been rewarding, both as a long-term business venture and as a way of helping protect the environment.

"[My wife and I] are big believers in this. It's a really good business investment," said Furlone. "We're very pleased with what we've done so far, and we're, hopefully, going to do more."

Although Furlone is uncertain about what or when his next move will be with solar power, he remains committed to doing his part to foster sustainable sources of energy.

"My wife and I believe in renewables they're the way to go. It doesn't matter that the cost of gasoline keeps going down," said Furlone. "Just keep plugging away with renewables. That's the way to solve the climate crisis."

Chris Gillespie is a contributing writer for Green Energy Times. He can be reached at chris@greenenergytimes.org.



The first solar array was built on Furlone's property in spring 2015.



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## Living with Renewable Energy

#### Cont'd from p.13

multiple renewable energy power sources and one or more battery banks. The result for Matt's family is a system that is able to more efficiently consume their on-site produced solar electricity, hedge against utilities gaming net metering policy, and offers instantaneous (and silent) home backup power in the event of a grid outage.

Matt is thrilled to be partnering with two of Maine's leaders in the renewable energy space. "Pika has great, responsive customer service and worked closely with me on an ideal setup," Matt said. "They have the best system anyway, but I also like supporting local businesses."

Self-sufficiency is also important to Matt and his family. "I don't like relying on somebody else," he said, "In the wintertime I don't want to be waiting for someone to come plow me out of my driveway. I don't want to have to be reliant on an oil tanker coming up and filling up my tank for hot water and heat, either."

He paused and adds that before their upcoming Pika installation, he'll be removing their oil tank and boiler altogether. "The boiler's been off for over a year. Time to get rid of it!"

This article appears courtesy of ReVision Energy, Maine/New Hampshire's only Benefits (B)-Corp Certified Solar Installer, recently rated number 1 in New England by Solar Power World. ReVisionenergy.com.



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## **RENEWABLE ENERGY**

## FIRST SOLAR-POWERED SOUP KITCHEN Gets Ready to Harness the Sun

#### "Do you want to pay for electricity or feed more hungry people?"

The Nashua Soup Kitchen & Shelter (NSKS), which provides food and shelter to thousands of people in need, is set to become the first solar-powered nonprofit in Nashua, and one of the first solarpowered soup kitchens in the northeast. The NSKS Board recently contracted with ReVision Energy for the installation and operation of a 39.3-kilowatt solar photovoltaic array, augmenting its longstanding commitment to energy efficiency and sustainability while saving thousands of dollars in electricity costs per year. "Do you want to pay for electricity or

"Do you want to pay for electricity or do we want to get more food to hungry people?" said NSKS Executive Director Michael Reinke. "Partnering with ReVision Energy, we will model sustainability and devote even more of our donor's dollar to helping meet the most basic needs of our community. It's a no-brainer."

Nashua Soup Kitchen & Shelter is expected to save roughly \$176,282 over the life of the solar array, offsetting a significant share of its electric load. The 131 solar panels, mounted on both flat and pitched roof sections of the NSKS facility in downtown Nashua, are expected to produce approximately 43,080 kilowatt-hours of clean electricity per year, thereby reducing more than 45,000 pounds of carbon pollution annually. The panels come with a 25-year warranty and are expected to produce efficiently for at least 40 years. A web-based monitoring platform will allow NSKS to track the array's performance in real time.

"ReVision Energy is honored to partner with such a vital nonprofit on the front lines of fighting hunger and homelessness in our community, and we are inspired by their longstanding commitment to sustain-

ability," said Dan Weeks, Director of Market Development at ReVision Energy. "As a Certified B Corporation, we consider it an integral part of our mission to make solar and other clean technologies accessible to nonprofits, thereby saving them thousands of dollars a year to do even more of the important work they do."



The Nashua Soup Kitchen and Shelter, located at 2 Quincy Street, is dedi cated to providing shelter and food to those in need. Courtesy photo.

ReVision Energy will own the system through a Power Purchase Agreement (PPA) with NSKS. The agreement is an innovative financing tool that allows nonprofits to benefit from solar power on a cash flow-neutral basis and with no upfront cost. Under the terms, NSKS agrees to purchase electricity from ReVision Energy at a fixed rate below its current cost





of electricity. At year seven of the agreement, the nonprofit will have the option to purchase the system at a significant discount, enabling it to generate free solar power for decades to come.

"The PPA arrangement gives NSKS the ability to leverage the economic and environmental benefits of solar power while allowing ReVision Energy to make community investments that align with its core values of creating positive change in the world," Weeks added.

Reinke said NSKS has long been committed to being a good steward of the earth's resources. After a \$2.7 million capital campaign, NSKS completed renovations of a former VFW building in 2014 including comprehensive weatherization and other energy efficiency measures. Its food pantry and community kitchen provide a means to reduce food waste and encourage the consumption of healthy and nutritious food while setting an example for the larger community.

From a financial perspective, the solar array will also benefit the NSKS's bottom line. Its current budget includes more than \$20,000 a year in electric costs, which will be significantly reduced by solar. Although no upfront *Cont'd on p.25* 

## **Renewable Energy For Rural New Hampshire**

New Hampshire Rural Renewables Offers Renewable Energy Planning Assistance To Rural Businesses and Agricultural Producers

A new program is now available in rural regions of New Hampshire to provide free technical assistance to business owners and agricultural producers, helping them evaluate and assess the potential for using renewable energy at their business. Lakes Region Community College, along with Plymouth Area Renewable Energy Initiative (PAREI) and New Hampshire Sustainable Energy Association (NHSEA) are teaming together to provide this free technical assistance. Rural businesses interested in installing solar photovoltaic, solar thermal, wood heat, and other renewable energy technologies can receive helpful educational information and preliminary site evaluations at no cost. This Renewable Energy Development Assistance two-year grant is part of USDA Rural Development's Rural Energy for America Program (REAP), which has a variety of energy efficiency and renewable energy grant and loan programs.

According to Andy Duncan, Energy Training Manager at Lakes Region Community College (LRCC) who is coordinating the NH Rural Renewables effort, "our goal is to help businesses reduce their energy costs with sustainable solutions. We can help them take a close look at whether a renewable energy project is technically and financially feasible for their site. If a business likes the idea of renewables or energy efficiency, we want tohelp them take the next step, explore their options and make the process less complicated."

The development assistance provided by NH Rural Renewables will be vendor neutral. "Our project team will work with business owners to help them become more knowledgeable about their options so they are more informed when it comes time to get quotes from renewable energy vendors," said Duncan. The team will also be leveraging energy efficiency technical assistance from the utility-based NHSaves @ Work program as well as the Rural Energy Development Assistance grant team at the NH Community Development Finance Authority. "We like to say 'reduce then produce," said Duncan. "Energy efficiency and renewable energy work well together."

The Plymouth Area Renewable Energy Initiative will be lending their expertise to help in this endeavor. They will draw from their 14 years of renewable energy experience using field experts and interns to assist with the site evaluations and preparing reports for the interested business owners. "This is a fantastic hands-on educational opportunity for emerging energy professionals. We will be providing at least four different internship experiences as part of our participation in Rural Renewables", said Sandra Jones, Co-Founder of PAREI.

"We often hear about the high cost of energy in New Hampshire -- and many businesses are not aware that renewable energy technologies are a viable option to control their costs. As New Hampshire's only statewide organization dedicated solely to clean energy advancement, we are excited to work with farmers and small business owners to harness the economic and environmental benefits of locally produced renewable energy," said Kate Epsen, the Executive Director of the New Hampshire Sustainable Energy Association. "NHSEA will also bring the expertise of the long-standing NH Wood Energy Council -- a group of dedicated members leading the deployment of modern wood chip and pellet heating -- to this new program. Epsen adds, "We want to capitalize and streamline our collective decades of energy expertise for the good of our rural economy."

USDA Rural Development recognizes that energy efficiency and renewable energy technologies help rural businesses achieve economic sustainability. The Agency supports businesses making energy investments through REAP and has an upcoming grant deadline of October 31, 2017. Technical assistance programs such as NH Rural Renewables can help prepare businesses to access these federal funds. Businesses seeking information about REAP can contact USDA Energy Coordinator Ken Yearman at (802) 828-6070 or by email at kenneth.yearman@vt.usda.gov.

Interested businesses and agricultural producers can go to www.lrcc.edu/nhrr which has renewable energy information, web links, and a short survey. This survey will get the process going and will determine the business' eligibility for the technical assistance. For more information, email nhruralrenewables@gmail.com or visit the www.lrcc.edu/ nhrr website, which also has contact information for LRCC, PAREI and NHSEA, who make up the NH Rural Renewables team.

To learn more, contact Andy Duncan, Lakes Region Community College Energy and Workforce Development at 603-366-5329, aduncan@ccsnh.edu, or Kate Epsen, NH Sustainable Energy Association, at 603-777-7700, kate@nhsea.org.



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## FEDERAL V

## FEDERAL INVESTMENT TAX CREDIT

The federal investment tax credit (ITC) for most technologies, including solar, wind, heat pumps, and fuel cells, is 30% of expenditures. For commercial geothermal generating systems, microturbines, and combined heat and power the ITC is 10% of expenditures.

## USDA RURAL DEVELOPMENT PROGRAM

USDA Rural Development Program - Rural Energy for America (REAP)

Finance the purchase of renewable energy systems, and make energy improvements; energy audits. Funding is awarded on a competitive basis; grant funding cannot exceed 25% of eligible project costs and combined loan guarantees and grants cannot exceed 75% of eligible project costs.

Applicants include Feasibility studies/ regular REAPs: agricultural producers and rural small businesses. Energy audits and renewable energy development assistance: local governments, tribes, land grant colleges, rural electric coops, public power entities. Grant must be used for Construction or improvements, purchase and installation of equipment, energy audits, permit fees, professional service fees, business plans, and/or feasibility studies. Find more at www.rurdev.usda. gov/NH-VTHome.html or call 802-828-6080 in VT or 603-223-6035 in NH

## BIOREFINERY ASSISTANCE PROGRAM

USDA Rural Development offers opportunities to producers to develop biofuels through the Biorefinery Assistance Program. The program provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries.

The Biorefinery Assistance Program was established to assist in the development of new and emerging technologies for the development of advanced biofuels and aims to accomplish the following:

• Increase the energy independence of the United States

• Promote resource conservation, public health, and the environment

• Diversify markets for agricultural and forestry products and agricultural waste materials

• Create jobs and enhance economic development in rural America

For more information go to www.rurdev.usda.gov/BCP\_Biorefinery



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• Go to www.grassrootsfund.org/grants/ or call 802-223-4622 for more info.

## VERMONT

## CLEAN ENERGY DEVELOPMENT FUND

The Small Scale RE Incentive Program, administered by Renewable Energy Resource Center (RERC), provides funds to help defray the costs of new solar thermal and advanced wood pellet heating systems. For more information: www.RERC-vt.org or call (877)888-7372

## Solar Thermal Incentives – per rated capacity of system

## • Note that these incentives end on Dec. 1, 2017! Reservations by 12/1/17 have 6 mos. to be installed.

• \$0.40 per kWh/year for residential and commercial customers

• \$0.80 per kWh/year for Special Category customers

\*\*special customer category limited to municipalities, non-profit housing authorities, public schools., and non-profit hospitals and health care centers. All incentives are subject to availability and may change.

## Pellet Heating

 Advanced wood pellet heating systems --\$3000 per boiler/furnace

• Custom Rebate \$1.25/ft2 of heated space, \$25,000 max (\$20,000 max for heating system and \$5,000 additional incentive if system includes thermal storage, \$10/kBtu thermal capacity).

 Details at www.RERC-vt.org or call (877)888-7372

## **VT TAX CREDITS**

• Vermont offers an investment tax credit for installations of renewable energy equipment on business properties. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit from 2011 to 2016. For solar, small wind, and fuel cells this constitutes a 7.2% state-level credit for systems and for geothermal electric, microturbines, and combined heat and power systems, this constitutes a 2.4% state-level tax credit.

## Tier III programs

• Additional incentive offers may be available through your local utility provider, contact your utility for more information.

## **EFFICIENCY VERMONT** Lighting (must be ENERGY STAR®)

 ENERGY STAR LEDs supported by Efficiency Vermont incentives available at Vermont retailers for as low as \$.95.

#### **Home Efficiency Improvements**

 improvements: air sealing, insulation and heating system upgrades - up to \$2,000 in incentives - using participating\* contractors

## Appliances (must be ENERGY STAR)

• Dehumidifiers - \$40 mail-in rebate

• Clothes Washers - \$40 rebate for CEE Tier 1 qualifying models, \$75 rebate for CEE Tier 2, 3 or ENERGY STAR Most Efficient

• Refrigerators - \$40 rebate for CEE Tier 1, \$75 for CEE Tier 2, 3 & ENERGY STAR Most Efficient

• Clothes Dryers - \$50 to \$400 rebate on select ENERGY STAR electric models

#### Heating/Cooling

LP/Oil boilers & furnaces - \$250 rebate\*
Select smart thermostats - up to \$150

- mail-in rebatesolar hot water \$950 rebate post
- installationheat pump water heater \$300-\$500

point of purchase discount

• central wood pellet boilers (excluding outside wood systems) - \$2,000

• circulator pumps - \$15-\$600 point of purchase discount

• cold climate heat pump \$600-\$800 point of purchase discount

## Residential New Construction

• enroll in Residential New Construction Service – up to \$2,000 in incentives and free home energy rating and expert technical assistance throughout construction and eligible for ENERGY STAR label

• Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives (contact EV\*)

#### **Other Opportunities To Save**

• Advanced Power Strips – coupons at register at participating retailers\*

 Pool Pump – up to \$600 rebate on qualifying ENERGY STAR models

 Meter Loan – borrow "Watts Up" meter to measure the electric consumption of your appliances

• Commercial Refrigeration Evaporator Fan Motors - \$60-\$100 each w/ point of purchase discoun

1. \*all rebates/incentives subject to availability, limits and may change – for complete incentives and requirements, and for participating retailers/contractors, visit efficiencyvermont.com or call 888-921-5990

## NEW HAMPSHIRE

## Renewable Energy Incentives Offered Through the NH Public Utilities Commission

#### Commercial Solar Rebate Program Category 1:

≤100 kW AC incentive levels for PV systems:

\$0.70/watt (lower of AC and DC) for new solar electric facilities

0.65/watt (lower of AC and DC) for new solar electric facilities

• Expansions to existing solar systems are not eligible.

## ≤100 kW AC equivalent incentive levels for solar thermal systems:

• \$0.12/rated or modeled kBtu/year for new solar thermal facilities fifteen collectors in size or fewer;

• \$0.07/rated or modeled kBtu/year for new solar thermal facilities greater than fifteen collectors in size; and

• Expansions to existing solar systems are not eligible.

## Category 2:

> 100 kW AC and  ${\leq}500$  kW AC incentive level for PV systems

\$0.55/Watt AC for new electric facilities.Expansions to existing solar systems are

#### not eligible. Contact CISolarRebate@puc.nh.gov or

at (603) 271-2431.

Note: Category 2 may have a waitlist.

For C&I solar program details, go to: http:// www.puc.nh.gov/Sustainable%20Energy/ RenewableEnergyRebates-CI.html

PACE

While we at Green Energy Times try to keep things up to date, incentives are always changing. Be sure to check with the appropriate sources for the latest information.

The state also has passed PACE (propertyassessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes. Visit http://cpace-nh.com/index.html for

more information.

## **Residential Solar PV Rebate Program**

• Residential PV & wind program and C&l solar program (which includes solar thermal) are closed at least until September 1st. **Contact karen.cramton@puc.nh.gov** 

## Residential Solar Water Heating Rebate Program

• \$1500 - \$1900 per system based on annual system output

#### Commercial Bulk Fuel-Fed Wood C&I Pellet Central Heating Systems

• 40% of the heating appliance(s) and installation cost, up to a maximum of \$65,000. An additional 30% up to a maximum \$5,000 is available for thermal storage. Systems must be 2.5 million BTU or less

#### **Residential Wood Pellet Boiler/Furnace**

• 40% of installed system up to \$10k

• Must meet thermal efficiency and particulate emissions standards

Contact barbara.bernstein@puc.nh.gov

#### www.puc.nh.gov – Sustainable Energy or tel. 603-271-2431 for more information and current program status

## LOCAL INCENTIVES

Some towns provide property tax exemptions for renewables – visit www.bit.ly/ NHtownRenewablesTaxBreaks

These are offered on a town-by-town basis.The state also has passed PACE (prop-

erty-assessed clean energy) enabling

the PACE mechanism to finance clean

**NH Electric Cooperative** 

**Vehicles and Electric Car** 

• NHEC offers a \$1,000 incentive on a

Battery Electric Vehicles (BEV), \$600 on a

Plug-In Hybrid Electric Vehicles (PHEV), and

NHEC offers incentives on Electric Vehicle

Supply Equipment (EVSE) of up to \$2,500

(only Commercial and Municipal members

**NH Home Performance with** 

Sponsored by all NH electric and natural

of Energy. Fuel-blind eligibility using the

gas utilities in partnership by the U.S. Dept.

Home Heating Index (BTUs of heating fuel

/ conditioned square feet / heating degree

days). Must provide at least 12 months of

heating fuel history. Once qualified, eligi-

hensive energy audit for \$100 (rebated if

improvements installed), and 50% instant

rebate for eligible weatherization improve-

Visit www.NHSaves.com/HPWES for

more information and an online Home

**NH ENERGY STAR Homes** 

· Incentives for new homes which meet

ENERGY STAR guidelines. Incentives include

• HERS rating fees paid by the utility, rebates

for ENERGY STAR lighting, appliances –up to

Visit www.NHSaves.com/newhome for

\$4.000 based on the HERS score.

more details.

ble homes get a \$450 value compre

**Incentives for Electric** 

**Charging Stations** 

\$300 on Électric Motorcycles.

are eligible for incentives)

**ENERGY STAR** 

ments up to a \$4,000.

Heating Index calculator

• Pre-approval is required.

Visit: https://www.nhec.com/

energy/pace/index.htm

for more information.

legislation which will allow towns to use

energy projects through property taxes

Visit http://www.nh.gov/oep/programs/

## **NHSaves Residential ENERGY STAR Products Program**

Mail-in rebates for ENERGY STAR-certified clothes washers (\$30), clothes dryers (\$40) room air conditioners (\$15), room air purifiers (\$40) and refrigerators (\$20), dehumidifiers (\$25), 2-speed pool pumps (\$200), and variable speed pool pumps (\$500). Refrigerator/freezer recycling available – unit must be in working condition - includes free pickup and \$30 rebate.

· Visit www.NHSaves.com/ appliances for more information and rebate forms.

Instant rebates available on certain ENERGY STAR- certified LED light bulbs purchased through participating NH retailers, and instant or mail-in rebates available on ENERGY STAR certified light fixtures (varies by retailer, see store associate or rebate form for details).

Rebates are available only to residential electric customers of the four NHSaves utilities Visit www.NHSaves.com/ lighting for

more information and rebate form.

## PAREI

• To explore the possibility of a solar installation. Plymouth Area Renewable Energy Initiative. www.plymouthenergy.org www.nhsaves.com

## **NHSAVES Online Store**

• Our extensive online store offers discounted pricing for residential electric customers of the four NHSaves utilities on a large variety of LED light bulbs and fixtures, as well as offering additional products to make your home more efficient, such as lighting controls, advanced power strips, thermostats, water saving devices, and various weatherization products. Orders and product fulfillment are handled by our vendor, EFI.

• Visit www.NHSaves.com/lighting-catalog.

## **Energy Star® Residential** Heating, Cooling, & Water **Heating Equipment Rebate**

• Rebates of up to \$500/ton on Air Source and Geothermal Heat Pumps. Rebates of \$500 - \$600 on Heat Pump Water Heaters. Rebates of \$100 on WiFi Thermostats

 Program details and application at www. NHSaves.com/heating cooling

## **Other NH Electric Utility Programs**

See also individual utilities for additional programs and variations. NH electric utilities may offer low or no interest on-bill financing for energy efficiency projects. Visit www.NHSaves.com/resource/ for individual utility contact information.

## **Business Programs**

Includes programs for: small and large business, new equipment and construction, seminars, lighting incentives, and catalog, and low and no interest financing programs.

Visit www.NHSaves.com/ for information about NH business incentives for electricity efficiency.

## **NH Weatherization Assistance Income-Eligible Programs**

Home Energy Assistance and NH community action Weatherization Assistance Program. Financial assistance paying fuel bills, and free weatherization improvements for qualified applicants. Funding from U.S. Dept. of Energy, NH utilities.

Visit www.nh.gov/oep/programs weatherization/index.htm for application criteria, FAQs and local program contacts

## MASSACHUSETTS

## **Commonwealth Solar Hot** Water (SHW) Programs

 Applicants must be served by National Grid, Unitil (Fitchburg Gas and Electric), Eversource or a participating Municipal Light Plant community

• Homeowners are eligible for a base rebate amount of the lesser of \$4,500 or 40% of the installed cost. The system may also be eligible to receive additional funding ("adders") which increase the amount of the rebate. Adders are detailed in the program manual at http://files. masscec.com/get-clean-energy/residential/commonwealth-solar-hot-water/ SHW\_Program\_Manual\_Small\_Scale.pdf

 Visit http://www.masscec.com/programs/commonwealth-solar-hot-water

## MassSave Heat Loan SHW

 Through this loan program, customers may borrow at 0% interest the costs of a Solar Domestic Hot Water and/or Thermal Heating system. Apply through receiving the MassSave Energy Audit. You can borrow up to \$25,000 at 0% interest for a 7 year term.

## **Energy Efficiency**

 After conducting a free residential Energy Audit, residential customers are eligible for up to \$25,000, commercial loan up to \$100k at 0% interest heat loan with terms up to 7 years to cover the following energy efficiency improvements: atticwall-basement insulation, high efficiency heating systems, high efficiency domestic hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows

 Available only to utility customers of W. Mass Electric, National Grid, Berkshire Gas, Nstar, Unitil and Cape Light Compact

Visit www.masssave.com/residential/ heating-and-cooling/offers/heat-loan-program Please call 866-527-7283 to schedule a free home energy assessment.

## **Massachusetts Solar Ioan** Program

Mass Solar Loan focuses on connecting homeowners who install solar PV systems with low-interest loans to help finance the projects.

 The \$30 million program, a partnership between the Massachusetts Department of Energy Resources (DOER) and MassCEC, will work with local banks and credit unions to provide financing to homeowners interested in solar electricity. DOER's program works with banks and credit unions to expand borrowing options through lower interest rate loans and encourage loans for homeowners with lower income or lower credit scores.

• Since 2008, the solar electric industry in Massachusetts has grown into a robust economic sector with over 1,400 businesses and 12,000 workers, with enough solar electricity installed in the Commonwealth to power more than 100,000 homes.

 Mass Solar Loan will continue to grow this sector, while allowing more homeowners the ability to achieve the cost savings and environmental benefits of this clean, renewable energy source. www.masssolarloan.com. The most updated loan principal buy down rate based on household income can be found at www.masssolarloan.com/loan-support-incentives.

## DEPT OF ENERGY RESOURCES

• Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Résources (DOER) SREC 2 program. Systems sized under 10kW single phase or 25kW three phase have an extension until the new incentive program starts in 2017. Note: appropriate, approved Data Acquisition System monitoring must be utilized for PV systems >10kW in order to qualify to sell ŚRECs.

 Next solar incentive information can be found at http://www.mass.gov/eea/ energy-utilities-clean-tech/renewableenergy/rps-aps/development-of-the-nextsolar-incentive.html

MA State Income tax credit for residential solar hot water or PV systems are eligible for a one-time 15% off system cost, capped at \$1000 max tax credit.

• No sales tax on residential solar hot water or PV system.

• There is no increase in property tax assessment for residential solar hot water or PV systems for 20 yrs.

## MA SREC II Policy

Massachusetts' Solar Renewable Energy Credits Program, SREC II prioritizes sites, by using an SREC factor based on the type of installation.

• The credits provided for energy produced by a system are calculated b multiplying the factor times a full credit value.

· Full credit is given for residential, parking canopy, emergency power, or communitybased systems, or any other system of less than 25 kW.

· Larger systems get a factor of 0.9, if they are building-mounted or at least 67% of the power produced is used at the site. If a larger system meets neither of these criteria, but is built on a landfill or brownfield site, or if it is less than 650 kW, then it gets a factor of 0.8. Systems that gualify for none of the foregoing get a factor of 0.7.

- Expect changes in spring 2018.

• http://bit.ly/Mass\_SREC\_II.

• MA State Incentives can be found at: www.masscec.com/get-clean-energy

## Woodstove Change-out Program

 The Commonwealth Woodstove Change-Out program, a partnership between MassCEC, the Massachusetts Department of Environmental Protection and the Department of Energy Resources, offers rebates to assist Massachusetts residents in replacing non-EPA-certified wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves.

Standard rebates range from \$500 to \$1,750 per change-out, and low-income rebates range from \$1,500 to \$3,000, based on stove specifications

 http://www.masscec.com/get-clean-energy/ residential/commonwealth-woodstovechangeout?utm\_source=Woodstove%20 Change-Out%20Announcement&utm\_ campaign=Woodstove%20&utm\_ medium=email

## **Electric Vehicles**

MOR-EV provides rebates of up to \$2,500 for the purchase or lease of zero-emission and plug-in hybrid light-duty vehicles. Visit: https:// mor-ev.org/

**UP-TO-DATE INCENTIVE INFO CAN BE FOUND AT:** WWW.DSIREUSA.ORG

## **NEW YORK**

## **RENEWABLE ENERGY INCENTIVES** OFFERED THROUGH Serve

Welcome to the 2017 New York solar incentive and rebate information: 169 programs and incentives at:

http://dsireusa.org (enter your zipcode) Programs and Services from NYSERDA: https://www.nyserda.ny.gov/All-Programs

## New York State Energy Research and Development Authority.

- Business & Industry
- Communities & Governments
- Partners & Investors
- Cleantech & Innovation
- Residents& Homeowners

## Home Energy Waste

Getting a home energy assessment can help you take control of your energy costs. It can identify where your house is using the most energy and which improvements would have the biggest impact on your bottom line. Heating and cooling costs frequently account for 50% of residential energy bills. Identifying your energy waste can lead to big savings. Visit: http://bit.ly/ny-nrg-waste.

## **RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NY-SUN**

### http://ny-sun.ny.gov/

NY-Sun is structured around customized Megawatt (MW) Blocks targeted to specific regions of the state. To learn more, see the Megawatt Block Incentive Structure.

The Megawatt (MW) Block Dashboard provides real time information on the status of block and current incentive levels by sector and region. Block status is updated as applications are submitted, so click the refresh button to see the current status.

 https://www.powerclerk.com/nysuninitiative/dashboard.aspx

#### **Residential and Small Business** http://ny-sun.ny.gov/Get-Solar/Residents-And-Small-Business

**Commercial and Industrial** http://ny-sun.ny.gov/Get-Solar/Com-

## mercial-and-Industrial

#### **Community Solar**

 http://ny-sun.ny.gov/Get-Solar/Community-Solar

## **Commercial/Industrial PV Installer** http://ny-sun.ny.gov/For-Local-Govern-

ment/Local-Government **Residential/Small Commercial** 

## **Solar PV Installer**

 http://ny-sun.ny.gov/Get-Solar/Find-A-Solar-Electric-Installer

## **Financing Options**

 http://ny-sun.ny.gov/Get-Solar/NY-Sun-Financing

#### **Clean Power Estimator**

 http://ny-sun.ny.gov/Get-Solar/Clean-Power-Estimator

#### Geothermal

• rebate of \$1500 per ton of installed capacity for residential/small-scale systems, \$1,200 per ton for commercial/large-scale systems up to \$5000

Electric car • buyers in New York State can now get a rebate of up to \$2,000 on qualifying EV models from participating dealers. See https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/ How-it-Works.

## **BUSINESS & FINANCIAL**

## TIMES HAVE CHANGED FOR Clean Energy Investing

By Todd Walker



It seemed like a sure thing. As solar power and other clean energy technologies exploded after 2000, investors hungrily gobbled up shares from start-ups. Everyone wanted to get in on the ground floor of the "next big thing."

But it didn't quite work out that way. Consumer and business demand was there to be sure. But the relative ease of getting into the business – especially on solar panels – plus the inability to invent truly breakthrough clean energy products with strong patent protection, soon resulted in a flood of overcapacity and commoditization, exacerbated by the entry of low-labor-cost products from overseas.

Stock prices suddenly plummeted, then companies started folding. In many ways it reminded people of the "dot.com" market meltdown on the late 90's that shared a similar problem – too many underfunded start-ups, too many product clones.

#### Image: Wikimedia Commons

But it's important for today's investor to understand that times have changed. Today's clean energy companies have become more sophisticated, are much better funded, and the industry as a whole has diversified into many different sectors – from panel and turbine manufacturing to commercial power production, alternative energy financing to business-tobusiness clean energy markets. There are many more directions to choose from.

Moreover, there are many more easy ways for average investors to participate in this sector with instant diversification – always a smart idea in any kind of investing. These include professionally managed clean-energy mutual funds, exchange traded funds, or personal investment management firms who specialize in socially responsible or impact investing.

## Tips for Green Energy Investing Today

In fact, clean energy has become such a large and growing part of the worldwide economy that today one would be remiss to not include some portion in a total portfolio. But there are some important guidelines to remember to improve your chances of success when investing in this dynamic sector. **1. For the most part, clean energy invest**-

ments remain "aggressive" investments. By "aggressive" I mean investments from younger, growing companies that can offer the highest potential returns, but also higher volatility. For that reason they should only occupy a small percentage of your portfolio – typically no more than 20%. Such compa-

nies may also take years to jump, so you need to be willing to invest for the long term. **2. Understand the different types of clean** 

## energy investments.

Today there are many clean energy players in the U.S. and internationally – manufacturers, installers, utilities, lenders, cleantech companies and more. Consider diversifying among a variety of them.

## 3. Usually stay away from individual stocks

or bonds unless you are an expert. Due to the selection research involved and lack of adequate diversification in small-moderate sized portfolios, most average investors would be wise to avoid choosing individual securities. Instead ...

#### 4. Focus on Clean Energy Mutual Funds, Exchange Traded Funds (ETFs) or an experienced personal financial advisor. All these professionally managed options allow you to invest in collections of clean energy securities with easy, one-step investments. There are many types available to you through companies like iShares, Powershares, Calvert and First Trust. Or you could retain a personal financial advisor for customized recommendations and management.

## 5. Don't let the Trump administration put you off.

Finally, do not let the anti-environment, and subsidy Trump administration scare you away from clean energy investments. The economic reality is that renewable energy is now far outpacing fossil fuels and should continue to do so even without subsidies. Recent talk of eventually banning fuel-burning cars by leading countries is just one more huge plug for clean energy. Its time has certainly come.

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#### www.greenvest.eco

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Todd Walker is a financial advisor and co-founder of Greenvest, a New England/New York based personal financial advisory firm specializing in socially and environmentally responsible investing. Securities offered through Vanderbilt Securities, LLC, member, FINRA, SIPC, registered with MSRB. Advisory services offered through Vanderbilt Advisory Services, LLC. Clearing Agent: National Financial Services, LLC. Supervising Office: 55 Main St, Suite 415, Newmarket, NH 03857 (603) 659-7626.

## Regional Energy Organizations Lean into the Future with Long-term Goals

#### By Hope O'Shaughnessy

A number of regional New England organizations formed to address urgent environmental issues are expanding their mission to include access to renewable energy and sustainable communities.

One such organization, the Stop the New York Fracking Gas Pipeline (SNYFGP) has grown from its urgent mission of stopping a proposed fracking project in upstate NY and is sponsoring the 2017 Renewable Energy and Sustainable Fair in Rensselaer, NY. The annual fair grew out of a call to action for long term solutions and changes in response to the constant need to confront government and industry infringements on public health and safety.

SNYFGP's founders are Robert Connors and Becky Meier. Connors and Meier themselves received the 2016 Jim Perry Progressive Leadership Award, honoring leaders of grassroots social change in the Capital District, from Citizen's Action of New York. Meier was awarded the Good Earthkeeping Award from the Columbia County (NY) Environmental Management Council in 2015.

Meier and Connors also have personally

been able to gain access to a more renewable future. Meier shared that she and Connors "just had a geothermal heating and cooling system installed at our home in Canaan, NY."

Meier is also interested in the option of promoting community solar. "I think our next push will be to educate people about community solar opportunities. This is a good option to use for electricity if you cannot or do not want to install solar panels at your home. You can buy a share from a community farm that offsets your electricity use."

A seacoast New Hampshire organization is also busy forging a path into the future that will make renewable and sustainable living more accessible. Mike Bellamente, co-owner and managing director of the Green Alliance of Greenland, NH has many events planned to educate consumers "to increase the profits of businesses that are having the least impact on the environment and to encourage more sustainable business practices through 'businessto-business' mentoring and strength in partnership." "Our core reason for being in business is to help steer consumers toward products and services that will reduce their environmental impact. To that end, I think I'm most proud of the work we do to showcase Green Alliance business partners who are leading the charge toward a sustainable future," Bellamente said. His outreach reaches far and wide with articles as well as educational events and radio broadcasts that spur conversation around important issues such as water and air quality, organic or locally grown food, climate change and sea level rise.

Bellamente added that the uniqueness of the seacoast organization is "...I think the fact that we're less advocacy driven and more practical in our strategy to help consumers employ the 'power of the purse' to affect change across their communities."

The Western Massachusetts Green Consortium (WMGC) of Amherst, MA, is paving the way for increased renewable energy and sustainability awareness. Nancy Bair, President of WMGC, leads this group based out of the Pioneer Valley. Their monthly Green Nights typically attract a mix of local residents and legislators as well as industry professionals. Past Green Night presenters have included Dr. Ellen Moyer speaking about her book, *Our Earth, Our Species, Our Selves: How to Thrive While Creating a Sustainable World* (December 2016) which quickly became Amazon's #1 "Hot New Release" in the categories of Green Business, Nature Conservation, and Environmentalism. WMGC also supports the work of local Climate Action Now (CAN) and builds their audience through mutual support for events.

The Vermont Environmental Consortium (VEC) in Rutland, VT led by Miles E. Waite, PhD is another exemplar of energy and environmental awareness in northern New England. One of the VEC's signature efforts is to increase awareness of green careers. This fall they are sponsoring several career panels, which are free to members and non-members. The panels will be presented by VEC board members.

Like the Western Massachusetts Green Consortium, VEC has mixers which are networking opportunities that include speakers. The VEC works across *Cont'd on p.19* 

## **BUSINESS & FINANCIAL**

## THE WORLD'S FIRST LEED PLATINUM CITY

#### By George Harvey

The Leadership in Energy and Environmental Design (LEED) rating system, which was developed by the U.S. Green Building Council (USGBC), was designed to help builders and renovators achieve high standards of human and environmental health in their structures. It is said to be the best known and the most widely used green building rating system in the world.

The system has grown rapidly, since its start in 1994. Numerous programs for specific building types or areas were developed over the years. In 2009, USGBC began working on LEED for Neighborhood Development, which was launched the following year. More recently, in 2016, two programs were developed, LEED for Cities and LEED for Communities. Like the original projects focused on buildings, those for neighborhoods, cities, and communities are awarded ratings of Certified, Silver, Gold, and Platinum, with Platinum being the highest level of achievement.

In August, the USGBC announced that it had awarded LEED Platinum status to a city for the first time. Somewhat to the surprise of some people, the world's first LEED Platinum city is Washington, D.C. (http:// bit.ly/DC\_LEED\_platinum)

LEED for Cities certification is based on outcomes, rather than intentions. It is evaluated on an ongoing basis. The metrics used cover energy, transportation, waste, and water. Additionally, there is focus on the human experience, including prosperity, equity, health, safety, and education. The performance is tracked using Arc (http://arcskoru.com/), to provide transparency and monitor progress.

In Washington, D.C., an event to present the LEED Platinum certification to the district was held on the steps of the Dunbar High School, which has the highest LEED certification rating of any school in the United States. It is, however, one of three LEED Platinum schools in Washington. There are sixteen other schools in the dis-



U.S. Environmental Protection Agency. Wikimedia Commons

trict that are LEED certified at other levels. The award was presented to the District of Columbia's Mayor Muriel Bowser by Mahesh Ramanujam, President and CEO

of the USGBC. Much of the credit for the award goes to actions taken under her tenure. "Washington, DC is setting the bar for smart cities all around the world by leveraging technology and data to achieve sustainability and resiliency goals, creating healthy and safe communities where citizens can thrive," said Ramanujam.

Today, 58% of all commuting in Washington D.C. is either on public transportation or by human power, walking or biking. Of the district neighborhoods, very nearly two-thirds are walkable. The district is building one of the largest solar arrays every established by a U.S. city. It has made one of the largest power purchase agreements ever entered into by a city in this country. All buildings run by the district government are powered 100% by renewable energy. The hope is that over half of all electricity used within the district will be provided from renewable sources by 2032, as the residents and businesses follow the district government's lead.

The guidance behind these achievements came from plans and programs established very recently. Climate Ready DC is a plan that was launched last year so the district could better adapt to a changing climate in which heat waves, storms, and flooding will be more dangerous. This year, after President Trump abandoned the country's leadership position on the Paris Climate Accord goals, the district announced it would seek to achieve those goals, at a minimum.

It appears that there are some people in Washington D.C. we can be proud of.

## The Carbon Taxes We Already Pay

## Cont'd from p.3

in the 2017 hurricane season, which is not over but has already broken a string of records. It is a position that can be supported by neither science nor economics.

Hurricane Harvey may actually have doubled the cost of the previous record hurricane cost. In only about two weeks, it was followed by Hurricane Irma, the most powerful hurricane on record that formed over waters of the Atlantic Ocean. In only about another two weeks, that was followed by Hurricane Maria, which had a lower central pressure than either Harvey or Irma. The total cost of these may be as much as \$300 billion. In Vermont, that cost will be borne by everyone who pays federal taxes or flood insurance.

Hurricane Harvey has been judged to be a 25,000 year flood event. And it was just the first of three category-four storms to hit United States territory in one month, a higher figure than we had ever had in any previous year. Nevertheless, President Donald Trump says we have had worse. (A high IQ sometimes only makes for a bigger fool.)

For anyone who is interested, the total cost of flood insurance premiums increased, over the period of 1978 to 2016 by a factor of 47. Of that increase, about 15% can be accounted for by the combination of inflation, increased population, and increased property values, relative to the dollar. That does not include increases resulting from this year's damage.

Other costs of climate change include those associated with the droughts in California and Montana. I have read that in 2017, half the U.S. wheat crop was lost due to drought, which was worsened by climate change.

These are taxes we all pay, and their costs are high. How many people would like to be able to avoid the health costs alone, leaving an extra \$1,000 per year for each person covered by the family budget?

But though we all pay the hidden taxes, there are only a tiny number of beneficiaries. We can, however, trace who the beneficiaries are, and we can do that by following a money trail. Our congress and White House are

Our congress and White House are run by people who deny science. Their campaigns were financed by people who are heavily invested in the fossil fuels industry, which is hurt by any reduction in the use of their products. These are not the 1% of Americans who are rich. They are perhaps the 0.0001%. We pay with our health and wealth. They profit. And they pay politicians to keep it that way.

they pay politicians to keep it that way. We can stop paying a set of taxes that are heavy burdens, for which no one voted, no legislature debated, and no governor put pen to paper. We can do that by putting a price on carbon.

Vermont Governor Phil Scott has made it perfectly clear that it is his intention to veto any carbon tax that makes it to his desk. He needs to consider the hidden taxes we already pay, before he does that.

## Regional Energy Organizations Cont'd from p.18



Green Alliance table in Portsmouth, NH at the 2017 Earth Day Party. Pictured (L-R): GA intern Diana Sarni, GA Co-owner Chad Butson (middle) and GA loyalty card holder on the right. Photo: Green Alliance

all strata of citizens involved in environmental awareness and that is what makes VEC so unique. Waite described that the "VEC is not focused on a single interest or sector like many trade groups are. Rather, we have a wide variety of interests represented by a wide range in members, all loosely tied to environmental or 'green' industries. Our members include environmental consultants, educators, planning commissions, attorneys, and developers."

The VEC will continue to infuse a very forward looking approach to its efforts. Waite added "several years ago, the VEC conducted an important survey of Vermont's Environmental Business Sector. The project, funded by grants from the Vermont Community Foundation and the Redducs Foundation, established current conditions with respect to environmental business education and training needs, and the opportunities and resources available in Vermont to meet those needs." He added, "The survey also addressed sustainability practices of businesses and educational institutions and the value to members and potential members of the VEC. Responses were received from 250 firms and 100 educational and training institutions." Armed with insights from that project, the VEC promises to provide an inspiring look into a greener future.

Hope O'Shaughnessy is a Massachusettsbased freelance writer who has written for the Daily Hampshire Gazette (Northampton, MA) and The Republican (Springfield, MA).

**GreenHomesForSale.com** The premium venue for buying and selling green, energy-efficient, sustainable and ecological homes, developments and land since 2004.

## So Feature: Transportation Solutions

According to the U.S. Department of Energy, transportation accounted for 27% of our country's carbon emissions in 2015. Many people think that 27% will be very difficult to eliminate, but the solutions are out there. We have cities in the Northeast that are planning on achieving net-zero emissions, including both for heat and for transportation. Burlington, Vermont is doing this just as we are going to press. We will report more in our December edition. This feature section is just a sampling of solutions that we hope will benefit our readers as well as our future.

## GM's 100% Wind Powered Manufacturing Plants Building GM's 100% Electric Cars

## By George Harvey

Two recent announcements from General Motors (GM) have created quite a lot of talk. Both shed light on renewable power, but they were very different in their natures. One was about manufacturing, and the other about products.

The first announcement came in late September. General Motors said that it will power every manufacturing plant it has in Ohio

and Indiana with wind energy. The 100-MW Northwest Ohio Wind Farm, owned by Starwood Energy Group, will supply all the power it produces to GM. Swift Current Energy's HillTopper Wind Project in Illinois will supply another 100 MW.

This announcement was somewhat unsurprising, because the cost of electricity from wind farms has dropped to less than half that of electricity from combined cycle natural gas, the cheapest fossil fuel. Power purchase agreements from midwest wind farms are averaging below two cents per kilowatt hour (2¢/kWh), but the best prices from combined cycle natural gas are about 4.5¢/kWh. And while wind power is not steady in its output, that has proven not to be an obstacle.



Photo courtesy of Starwood Energy Group.

The next big news story from GM produced a good deal more excitement, discussion, and speculation. GM is embracing electric vehicles for its future. In fact, the company's executive vice president of global product development, Mark Reuss, said that GM is "committed to an all-electric future."

This does not mean that production of internal combustion engines (ICEs) will stop overnight, but it does mean they will be rapidly phased out. Two all-electric cars are scheduled to be introduced next year, and at least 18 more are set to come out by 2023.

No date has been given for termination of production of ICEs. Reuss said it will not be like "flipping a switch." The indications are that ICE production will end at different times in different countries, and the exact dates will depend on market and regulatory conditions.

GM makes about 10 million cars per year. Its largest market, in terms of the numbers of cars sold, is China, which is phasing out the use of ICE-powered cars. Other countries with similar policies for large markets include India, UK, and France. Also, a number of cities around the world

have plans to ban cars with ICEs in the near future.

Clearly, it is necessary for GM to develop new products because of restricted markets. Other car manufacturers have already announced similar moves. Volvo, Volkswagen, and Daimler AG, the parent company of Mercedes-Benz, are all moving toward drastic reductions in production of ICE-powered cars.

GM has already had some experience with all-electric vehicles. The Chevy Bolt is a battery-powered car, but it is also a first entry. The new GM electric cars will need to be made more efficiently than the Bolt, because the company loses money on each Bolt it sells. Asked about this, Reuss said confidently, "This next generation will be profitable. End of story."

## EASYJET: AN ALL-ELECTRIC AIRLINER



An all-electric airliner. Photo courtesy of theconversation.com

Major European carrier EasyJet announced that it is teaming up with U.S. startup Wright Electric to build an allelectric airliner. The aircraft they have in mind would handle short routes of 335 miles or less – think New York to Boston or London to Paris. EasyJet said the new aircraft would cover 20% of its passenger journeys.

Read more at www.greenenergytimes.org and search for September 28 Green Energy News.

## Tesla – in South Australia



Elon Musk at the South Australian battery event. Image taken from a Tesla video.

#### By Green Energy Times

On September 28, 2016, the state of South Australia experienced a violent storm that tore down important transmission lines. A series of faults over the course of less than three minutes blacked out the entire state for a long time, apart from those areas on micro-grids.

After studying the situation, Tesla CEO Elon Musk suggested a solution. "The state," he said, "could more safely rely on renewable energy backed up with batteries." He offered to build an 100-megawatt battery, the largest in the world, and he backed the deal with a promise: If Tesla could not have the battery built and running within 100 days from the time the contract to build it was signed, the battery would be free.

It took months to get through the necessary legal work, including approving the project as a concept and putting it out for bids. Tesla won the bid, and went to work.

The contract was signed on September 29, 2017. After signing, Musk put on a special event, to which 500 people were invited. It was a colorful show, with big screens and lights. And less than 100 minutes after the contract was signed, the event was powered by the batteries Tesla had already installed. About half the battery system was already up and running.

## TESLA MAKES HELPING PUERTO RICO JOB ONE!

#### Cont'd from p.1

supervise disaster recovery. He quickly gave his administration an A+ grade on its efforts and told the Puerto Ricans that there had been worse storms. (We might mention some facts for the record. Hurricane Harvey was a 25,000year event and the most expensive storm ever to hit the country by a wide margin. Two weeks later, we had Hurricane Irma, the most powerful storm on record to have formed over waters of the Atlantic Ocean. Two weeks after that came Hurricane Maria, the most intense of the three, in terms of central pressure.)

On October 5, an individual named Scott Stapf tweeted a question, "Could @elonmusk go in and rebuild #PuertoRico's electricity system with independent solar & battery systems?"

Elon Musk responded on the same day, tweeting, "The Tesla team has done this for many smaller islands around the world, but there is no scalability limit, so it can be done for Puerto Rico too. Such a decision would be in the hands of the PR govt, PUC, any commercial stakeholders and, most importantly, the people of PR."

This produced a response from Governor Rossello within only about two hours, "@elon-Musk Let's talk. Do you want to show the world the power and scalability of your #TeslaTechnologies? PR could be that flagship project."

In very short order, Musk and Rossello were

on the telephone. Their conversation lasted twenty-five minutes. But the results of the conversation have the potential to be historic.

Elon Musk soon announced that the Tesla Semi-Truck unveiling would have to wait until November 16th, while batteries were made for Puerto Rico. As this is written, several hundred Tesla batteries have already arrived, along with a number of Tesla employees, who are setting them up with solar panels to produce microgrids.

Elon Musk is a man who clearly likes to put on a good show. Delaying the Semi-Truck presentation was probably not entirely easy for him. But it seems that when he gets into something he thinks is important. he acts deci

he thinks is important, he acts decisively. He donated \$250,000 of his own money to Puerto Rican recovery efforts.

Elon Musk and Tesla are not the only ones helping out. Google is testing a new technology to restore internet service. Facebook has donated \$1.5 million to relief organizations. Other organizations that are helping out include Airbnb, Uber, and Lyft. But Tesla's efforts in Puerto Rico might actually result in widespread use of renewably-powered microgrids



Power lines are down all over Puerto Rico. Photo: Jeff Miller, Western Area Power.

that can act independently of any fossil fuels. As I write this, three weeks after Hurricane

Maria hit, only 15% of the people on the island have electric power. The federal government's reaction to the crisis has been labeled "genocidal neglect." And President Trump is sending tweets blaming the Puerto Ricans themselves for the humanitarian crisis and saying that federal help cannot last forever.

One Vermont installer is crowdfunding a solar system in Puerto Rico. Anyone interested can visit http://bit.ly/Puerto-Rico-fundraiser.

**TESLA SUPERCHARGERS** Available in New York's Hudson Valley

By Joanne Coons



Above: John Cole, owner of Cole's Collision Center speaks to the attendees at the ribbon cutting ceremony in celebration of the installation of 20 TESLA Supercharger stations at the Crossgates Mall in Guilderland, NY. Right: The twenty TESLA Supercharger stations that can charge a TESLA in 30 minutes. Courtesy images: Cole's Collision Center.

TESLA retail dealers are located. Five is the maximum number of showrooms TESLA is allowed to have by state law, a limiting factor for ordering. By the representation of governmental leaders at the event, hopefully more dealerships will be allowed to operate in the state and open up the market for electric vehicles. This is critical because 27% of greenhouse gas emissions come from transportation. Changing from fossil fuels to renewably-produced electric

is critical in greenhouse gas reduction. Also attending the event was John Cole, owner of Cole's Collision Center John has received the extensive TESLA training as



Five is nice, but twenty is glorious!!!! That is the number of TESLA Supercharger stations that have been installed and celebrated with a ribbon cutting at the south side of Crossgates Mall in Guilderland, NY. Normally there are banks of five charging stations at a site. This is the largest station in the northeast.

In attendance were state and local representatives, a TESLA spokesperson

and salespeople, mall officials, Alliance for Clean Energy New York, Capital Region EV Club, Cole's Collision Center, and a multitude of TESLA owners enjoying their free charge to give them another 300 miles in 30 to 45 minutes.

5

Build them and they will come. In New York, you will need to drive to the Hudson Valley, because that is where the five the capital region's first TESLA authorized body shop .So the stage has been set to be a successful owner of a low maintenance, energy-efficient TESLA. With the affordable Model 3 now in production, the Crossgates Mall EV charging stations and all TESLA charging stations will be put to good use. No more range anxiety, just a smooth, safe, clean, quiet drive.



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Joanne Coons is an adjunct professor at Hudson Valley Community College, TEC-SMART facility teaching PV Theory and Design. She organizes Capital Region NYSES (New York Solar Energy Society) monthly meetings and is a member of the Town of Clifton Park GREEN Committee. Joanne is the NY team leader for Green Energy Times.

The equivalent price of gasoline, called an 'eGallon', is about 71¢ for an EV powered by solar.

## Drive on Sunshine, Save Big Bucks Want to Save \$23,000 on Your Next Vehicle? Switch to Solar + Electric Car From Revision Energy: revisionenergy.com



Switching to electric transport leads to the next logical thing: powering those miles on sunshine. Here, SolarChampion Mark Boren recharges his Nissan LEAF off the solar panels of his Dover, NH home.

## WHY ELECTRIC VEHICLES?

We rely on cars. Cars bring us to work, to the grocery store, to school and soccer practices, and up to camp.

As much as we love where cars may take us, very few of us love taking care of them. Maintaining and fueling vehicles is not just a headache, but also a drain on the wallet, and the planet.

Electric vehicles offer a solution to the hassles of vehicle ownership. They are cleaner, faster, and far less expensive than the traditional gasoline-powered cars, especially when powered by solar electricity.

## Fewer Moving Parts = Less Stuff to Break

No more thrown belts, blown gaskets, cracked cylinder heads, or spun rods. No more oil changes. Simplicity does not mean compromise, however. EVs are incredibly speedy, with instant torque at 90% efficiency (stored energy to locomotion) compared to less than 35% for internal combustion engines. That's largely because internal combustion engines operate at extremely high temperatures, and vast amounts of energy are lost as gas engines expel heat into the atmosphere. Plus, waste pumped out of a gas-powered car's exhaust system contains high levels of climate-damaging greenhouse gases (among other pollutants), contributing some 30% of total climate disrupting pollution in the USA.

Even with electricity sourced from the electric grid, EVs offer both a better environmental option and economic option. Simply by swapping out gasoline for grid-sourced electricity, an EV is roughly half the cost to drive vs. a gas-powered car. But it gets better - way better. Source your electricity with solar power, and your cost to drive is roughly one third that of a gas equivalent. The equivalent price of gasoline, called an 'eGallon'', is about 71¢ for an EV powered by solar. Now we compare

the costs of driving and maintaining a gaspowered car vs. a 100% solar-powered one - in the course of 100,000 miles, you can save over \$23,000!

How we came up with 71¢ for a solar "eGallon"? Why electric cars are safer than gas-powered ones? How a move to electrification empowers an autonomous car future? Answers and more at http://bit.ly/ driveonsunshine.

This article is reprinted courtesy ReVision Energy, Maine/New Hampshire's only Benefits (B)-Corp Certified Solar Installer, recently rated #1 in New England by Solar Power World.



Photo courtesy APRS. Electric vehicles are much cheaper to maintain than gaspowered vehicles because they have fewer moving parts. A typical gas-powered car has 2,000+ moving parts; a typical EV has a few dozen (Source: CNBC).



In addition to fuel savings, EVs are free from many routine maintenance items that must be replaced in a gas-powered car. These include parts (spark plugs, mufflers, belts, water pumps, and starter batteries) as well as fluids (transmission fluid, engine oil, coolant, and, well, gasoline).

## HEATING & COOLING 🍭

## The Montshire Museum of Science's Path to Minimize Its Carbon Footprint

From an energy audit to a new wood pellet boiler heating system and more to come

By Chris Gillespie



The interior of the Montshire Museum of Science. Courtesy photos.

This winter will be the Montshire Museum of Science in Norwich, VT's first being heated by a new wood pellet boiler system.

As stated on the Museum's website, the Montshire is located on a 110-acre site near the Connecticut River and is home to more than 140 exhibits relating to the natural and physical sciences, ecology and technology. Originally opened to the public in 1976 in Hanover, NH, the Montshire moved to its current location in Norwich in 1991, where it hosts 160,000 visitors annually.

The Montshire's journey to acquiring its wood pellet boiler system started when the Museum adopted a new multiyear strategic plan, with one of the major goals being to strengthen the Museum's core base of operations while being aware of and minimizing the Museum's carbon footprint.

The Museum's first step was to conduct an energy audit, which it completed with the help of Efficiency Vermont and Zero By Degrees, LLC. The audit revealed many different ways the Museum could adapt its operations systems to make them more sustainable. The top two recommendations were to upgrade the Museum's atmospheric building control system and install a wood pellet-based heating system.

"The wood pellet-based system was new information for us," said Marcos Stafne, Ph.D, Executive Director of the Montshire. "[Prior to the audit] we did not think something like that would work for us." Following the audit's recommendations, the Museum worked with Lyme Green Heat (LGH), a company based in Lyme, NH that specializes in wood pellet boiling systems, to figure out which kind of heating system would be the most effective for the building.

Together, the Montshire and LGH decided to replace the Museum's conventional boiler with two 56kW MESys/ OkoFEN fully-automated wood pellet boilers and a 16-ton capacity Brock Silo for pellet storage. Given Vermont's cold winters, the Museum opted to keep their small, secondary oil boiler in a mechanical room on the Museum's first floor, which will activate in the event that the wood pellet boilers cannot meet the demand on their own when it is frigid outside. Overall, the wood pellet boilers are expected to provide enough energy to heat the entire building 90% of the time.

"Our building was not originally built with efficiency in mind," said Stafne, adding that high efficiency circulator pumps were added to the heating system in order to boost system efficiency. "We want to do the best that we can with the technology today."

Stafne says that depending on how well the wood pellet boilers perform, they will likely become the centerpiece of some museum programming and, potentially, even become the focus of their own exhibit down the line. "As a science museum, we always want people to know how their world works," said Stafne about the Museum's choice to embrace renewable energy. "We want people to know about available solutions that help fight big problems like climate change."

The best way the Montshire can teach people about the steps they can take to reduce their own carbon footprint, according to Stafne, is through programming. The Montshire partners with sustainability advocacy groups and other nonprofit organizations to host meetings where experts and community members can come together to discuss green energy and sustainable living.

As for the future, Stafne says the Museum is going to continue to look at other renewable energy options to see which might be the most effective for the building.

The Montshire Museum of Science is located at 1 Montshire Road, Norwich, VT.



The Museum's new wood pellet boilers.

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and is open daily from 10 a.m. to 5 p.m. For more information, visit www.montshire. org or call 802-649-2200.

Chris Gillespie is a contributing writer for Green Energy Times. He can be reached at chris@greenenergytimes.org.



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## HEATING & COOLING





Froling Energy of Peterborough, New Hampshire, recently completed the installation and commissioning of a biomass boiler system at the Merrimack County Department of Corrections facility in Boscawen, NH. The Merrimack County Complex site has two prison facilities close to each other. One has been continuously active, while the other was vacant for a number of years, in need of updating. The overall project included major renovations to the older jail, as well as a boiler house and enclosed walkways that would connect the two facilities.

The biomass boiler system installed at the prison has a number of innovative features that significantly reduced costs and made the project financially viable. One is a high efficiency boiler. Another is the new biomass fuel it burns. And the site is the first in the United States to employ a new rake-type chip management and storage system.

The Viessmann Vitoflex 300-UF boiler is one of the most efficient, clean burning



Viessmann Vitoflex 300-UF PDC / Pellet Boiler with 4.2 million BTU/hr net output. Photos courtesy of Froling Energy.



The currently occupied Merrimack County prison at right is tied into the new biomass boiler building and the second prison (not seen to left) through a long enclosed corridor that also contains the heat pipes from the boiler.

biomass boilers available anywhere. Viessmann boilers have also proven themselves to be among the most reliable biomass boilers. The model KPT-1250 deployed here has a maximum heat output of 4.268 million BTUs per hour. It is expected to offset over 120,000 gallons of fuel oil each year.

The new fuel, screened semi-dry wood chips, has a number of advantages. Having just 25% moisture content, the fuel burns cleaner in the Viessmann boiler than green chips. Using just a multi-cyclone on the exhaust, the boiler meets all New Hampshire

regulations for particulate emissions. Wetter fuel usually requires the installation of an expensive electrostatic precipitator.

The new storage system is a Javo Toploader, an innovative overhead rake-type chip management system that is much less expensive to construct. Live-floor trucks back right into it to drop off loads of chips. The Toploader then gets to work, gradually pulling the chips forward, towards the boiler feed augers. The new storage area's maximum capacity is 60 tons of screened semi-dry wood chips. Froling Energy has years of experience with commercial biomass boilers. That experience was demonstrated with this biomass boiler system installation, one of the largest in the company's history. Froling Energy provided engineering, procurement, and construction services to John-

Dandelion Energy Inc. Phone: 845-706-3087 www.dandelionenergy.com Renewable heating & cooling you can afford Jake Kornack -owner 55 Railroad Place Suite 308 Saratoga Springs NY 12866



and the entire biomass system with heat distribution pipes to the two jail facilities. This project received a \$200,000 RFP

Grant from the Renewable Energy Fund of the New Hampshire Public Utilities Commission. Overall funding for the project was provided through a revenue-neutral Energy Performance Contract managed by Johnson Controls.

Froling Energy's website is www.frolingenergy.com



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## No Is Not Enough

by Naomi Klein, Haymarket Books, June 13, 2017, 288 pages, \$13

Book review by Roger Lohr

Naomi Klein's newest publication, No Is Not Enough: Resisting Trump's Shock Politics and Winning the World We Need is a culmination of her previous work and a call to heed the document called "Leap Manifesto: Caring for the Earth and One Another."

Klein documents trends that impact average people's lives such as the power of private wealth over the political system, global imposition of neoliberalism that uses racism and fear of others as a potent tool, the rise of Superbrands, the damaging impacts of corporate free trade, and the deep hold by conservatives on climate change denial. Factors such as these have led to the election of Donald Trump.

But the results of the election and much of the major political parties (including Clinton and Obama) were to be expected, since the collective mind has been clouded with "crush the other guy" and "win at all costs" exemplified by popular TV shows such as Survivor, The Amazing Race, Big Brother, and yes, Trump's Apprentice.

Three quarters of No Is Not Enough is focused on revelations about the corrosive value system that places profit above the well-being of people and the planet, but Klein says that there is an overwhelming need to not just worry about the world



chart a credible and inspiring path to

We need to

a different future...one that will require building as we go. Many interest groups say no to imminent threats, but we also need to work on building the "yes" that is the world we want and need.

In the past a cooperative commonwealth was developed, where work was but one element of a well-balanced life that left plenty of time for family, leisure, recreation, and art. While it seems that the utopian imagination has atrophied, we should remember that our ancestors forged a great democratic experimental government, and they did it with very little...we now have so much more, and we must do the same. One cannot read the last chapters of No Is Not Enough without reflecting on the 1770s and the American creators of the Declaration of Independence, the Bill of Rights, and the U.S. Constitution.

Capitalism had its run but without controls it seems to result in unwanted

outcomes for the planet and humanity. The need is to shift from a system based on endless taking from the Earth and from one another (extraction to feed perpetual growth rooted in ever-increasing consumption) to a culture based on caretaking - the principle that when we take, we also take care and give back. This is a shift in values and morality.

The Leap Manifesto is gaining momentum in Canada and around the world. It includes stated values such as respect for indigenous rights, internationalism, human rights, diversity, and environmental stewardship. Small steps are not what are needed - it will take a leap to:

 Respect inherent rights and title of original caretakers of the land;

• No new infrastructure projects that lock us into increased use of fossil fuels into the future (if you don't want it in your backyard, it doesn't belong in anyone's backyard);

Universal program to build energy-efficient homes and retrofit existing housing (lowest income communities to benefit first):

Training for workers in carbon-intensive jobs to take part in the clean energy economy;

High speed rail powered by renewables and affordable public transit to unite every community;

Invest in decaying public infrastructure;

- · Moving to a far more localized and
- ecologically-based agricultural system;

An end to all trade deals that interfere with attempts to build local economies, regulate corporations and stop damaging extractive fossil fuel projects;

Immigration status and full protections for all workers;

 Expanding the sectors of the economy that are already low-carbon: caregiving, teaching, social work, the arts, and public-interest media;

End to fossil fuel subsidies. Financial transaction taxes. Increased resource rovalties. Higher income taxes on corporations and wealthy people. A progressive carbon tax. Cuts to military spending.

These examples of the Leap Manifesto are based on a simple "polluter pays" principle. It calls for town hall-type local meetings across our countries and the renewal of democracy at every level of government working toward a system in which every vote counts and corporate money is removed from political campaigns.

Klein closes No Is Not Enough saying now is the time for boldness. Now is the time to leap.

Roger Lohr is the founder and editor of XCSkiResorts.com and prolific national writer on cross country skiing. He lives in Lebanon, NH.

## A NEW METAPHOR

Cont'd from p.7

groom for ticks, because they have never lived in places warm enough for ticks to thrive. Now they are being bled to death. In some cases, moose have been found with as many as 70,000 ticks on them. One state scientist in New Hampshire told me that in recent years, 80% of moose calves born in that state and Maine were killed by ticks. But moose are just one indicator out of many. Species in all regions are affected.

With the higher winter temperatures, the growing season is also longer. This has been really good for those of us in Vermont who want to plant paw-paws or peaches. It has not been so good for those who produce maple syrup. And it has not been so good for people who run ski resorts. And it is not good for tourism based on fall colors.

I am talking about damage that has already happened, and which is continuing. Nearly all experts agree that changes threatening our native species, our finances, and our health are coming because of carbon emissions resulting from our use of fossil fuels

## Air pollution in general

Greenhouse gases are just one set of air pollutants. There are types of air pollution that have been around for years but are not typically part of the discussion on climate change. They have been a problem for a long time, and they have been recognized for a long time.

Recently, a study from MIT found that 200,000 premature deaths happen every year in the United States due to air pollution. This was covered by CleanTechnica in the article, "This Stealth Terrorist Killed ~53,000 Americans Last Year," by Zachary Shahan, which referred in its title to those that were caused by emissions from the transportation sector. The figure of 200,000 means another American is killed every 2 minutes and 38 seconds, on average.

of deaths from air pollution worldwide is estimated by the World Health Organization to be about 7,000,000. That is another human being killed about every 4.5 seconds. It is comparable to deaths rates associated with World War II. The overwhelming majority of these deaths would be prevented by using renewable power instead of fossil fuels and unventilated indoor burning.

## Economics

There is something rather horrifying about the idea that innocent human beings have to be put at risk for business to function. Nevertheless, the conventional economic wisdom of the past is that bad air was the "smell of progress" and deaths of innocent people was an unfortunate result of actions that were needed to keep the rest of us all alive. As heartless as that seems, the idea appealed to reason in a way that appeared hard to refute. Without coal and oil, we would all be cold and hungry, and the numbers of innocent deaths would only be greater.

This idea has increasingly come under scrutiny. One recent report questioning it by Mark Z. Jacobson et. al. was published in Joule. This was covered in the Clean-Technica article, "100% Renewable Energy For 139 Nations Detailed In New Stanford Report," by Steve Hanley, and by my article in Green Energy Times, "Roadmaps to Slow Climate Change and Eliminate Air Pollution"

Jacobson argues that the economic benefits of switching from the status quo to a system without burning fossil fuels or biomass and without fossil fuels would greatly outweigh the costs. Approximately two permanent jobs would be created for every one lost. Furthermore, the cost of switching away from fossil fuels is only a quarter of the cost of continuing business as usual. If these are the case, then there simply is no argument in favor of continuing the use of fossil fuels. In fact, the economic argument is against them.

## Homicide without justification

The devastation of Hurricane Harvey brought the third 500-year flood in three years to Harris County, Texas, within which Houston lies. This is just another in a long series of bits of anecdotal evidence that climate change is real and dangerous. One funny thing about anecdotal evidence, however, is that when there is enough of it, it passes from being merely anecdotal to being statistically significant.

The statistical evidence for climate change can be seen in the fact that over the past forty years, the cost of flood insurance has increased at a rate that is seven times as fast as the combined effects of inflation increases in real estate values relative to inflation, and population increase.

The argument that this is because of developments in vulnerable areas flies in the face of both simple mathematics, which would require huge percentages of the buildings to be in vulnerable areas for such to be the case, and the effects of the Flood Insurance Reform Act of 2004. We might also wonder why the supposedly conservative people who suggest this argument would provide reasons to increase regulation, which they philosophically oppose, unless they are grasping at straws.

## Manslaughter, murder, or crimes against humanity?

What we have before us is a situation in which innocent lives are being lost without any justification. Not only that, there are those in the political arena and in the market place who are actively promoting measures that would prevent the lives from being saved. They are the men and women who jump up on the world stage and yell that nothing is wrong, despite the fact that the evidence of accepted science is overwhelming against them.

Indeed, there is a movement to hobble scientific research. That movement is apparently aimed at preventing not only scientists, but the public, from knowing what is going on, and how wrong it is.

The arguments denying climate change appear to go far beyond what is protected by the First Amendment to the Constitution of the United States. It would appear to be quite literally a cover for homicide, committed by certain leaders of industry, in which elements of our leadership are accomplices



My Chemical Romance concert. Photo from Wikimedia Commons.

## Warm Oceans Bring Massive Floods and Storms

By Dr. Alan K. Betts



As individuals we are all very concerned about our children's future. In contrast, our society ignores the misery that climate change

will bring to the future of all children, as well as much of the life on Earth. This odd disconnect, which so many can rationalize away, reflects a clash of values that we avoid discussing. Society runs on an economic system where money and profit rule, and the future is discounted. With this strange logic, the future rapidly becomes devalued compared to our greed for present wealth. Life on Earth in the future, including our children's lives, is treated as nearly worthless.

We love our children and are proud of our individual freedom, but we have been fooled to tolerate an immoral economic system, where the rich and powerful can exploit the Earth, the poor, and our children. Yet still we chant its mantra of endless material growth.

The truth is just the reverse. Climate change exposes our current economic system, based on exploitation and profit, as both valueless and almost useless for dealing with the future. This is hard for us to grasp. Yet we must because the Earth does not discount the future. It just stores the energy from the sun that cannot escape to space as we burn more fossil fuel, and add greenhouse gases to the atmosphere. It takes time for the oceans to warm and the ice-sheets to melt, but they are warming and melting, and sea-level will rise for centuries. Inexorably climate change will accelerate on our present path.

The warmer ocean drives stronger storms. The flood of biblical proportions that Hurricane

14 PM AST Wed Sep 06 201

to Houston is a bitter reminder. Some will claim it is just another five hundred year flood (the third in three years). Politicians still pretend that climate change and the warming of the oceans is a myth. But the Earth cannot forget, and fittingly this flood struck the coastal oil industry of Texas. But tragically the poor suffered the most.

Harvey brought

We can retreat from the coasts, and the damage to our fossil fuel industries benefits the Earth for a brief moment; although the conscious choice of an escalating carbon tax would be much better. However

the damage to our forests and food supply, and the increase in extreme weather, floods and droughts from a warming climate will bring much hardship. This will expose the brutal cruelty of our present administration, whose primary goal seems to be to protect the value of fossil fuel assets, regardless of the hundreds of millions of people and species that will die

04 UTC ( 204 PM AST)

later this century. Then came Hurricane Irma which strengthened to a category 5 storm. Over the warm oceans, it became the strongest storm ever recorded in the Atlantic. It was approaching St. Thomas where my daughter and grandchildren live. With maximum winds nearing 180 mph, I helped them move to a safer location, where they huddled, terrified. I spent hours glued to the Puerto Rico radar, watching as the eyewall grazed the northern shore, doing immense damage. After five days, they were evacuated safely

to Puerto Rico by a catamaran bringing in emergency supplies. But after a brief week of recovery, they had to look for another safe shelter as Hurricane Maria approached Puerto Rico as a category 4 storm, doing immense damage. As it crossed the island, power and communications were destroyed. I know my daughter is alive from a brief garbled voicemail, but I do not know where they are on the island.

Irma went on to batter Cuba, Florida and Georgia, where millions lost power for weeks. With no air conditioning, people suffered in shock. But when will they realize that like us in the northeast, resilience means well-insulated homes cooled by efficient heat pumps run on solar power?

Climate science has been subject to extraordinary scrutiny, because so much is at stake. Dealing with climate change requires fundamental changes in our political, economic and financial system, and society doesn't want to face this. Protecting wealth and profits now is more important than the future of our children and of life of Earth. Denial is the only way that the rich and powerful can try to hide from the savagery of this strategy.

For 50 years I have studied weather and climate science. Long ago in what we call the Carboniferous period, lush vegetation in a tropical hot-house climate removed CO2 from the atmosphere for millions of years, and laid it down in the oceans to produce the fossil fuels. As CO2 in the air fell, the earth cooled and eventually the icecaps formed. If we burn all these fossil fuels this century, we will push the Earth once again back to a hothouse climate with disastrous consequences. Right now we are wasting our time and our resources. It is time we changed course, and made the rapid shift to an energy efficient society, powered by renewable energy.

Dr. Alan Betts of Atmospheric Research in Pittsford, Vermont is a leading climate scientist. Browse alanbetts.com.

## Vermont Research Climate Change News VT Clímate Action Commission: Transportation, Trout, and Regionalism in Sustainability

The eye of Hurricane Irma as it grazes the northern shore

of St. Thomas on September 6, 2017 as a strong category 5

storm. Warning boxes are shown near the eye. Puerto Rico

is to the west and St. Croix to the south. Credit: National

Weather Service Puerto Rico/Virgin Islands Radar.

By Kirsti Blow, Center for Research on Vermont



As Vermonters begin to welcome fall, the state's environment goes through its many visible changes – and as the legislative session looms, policy concerns are coloring the public discourse.

The prevalence of "fuel poverty" is a hotbed issue likely to be contested, especially following Efficiency Vermont's recent report documenting energy expenditures and burdens. The study found that transportation costs—for which there are few assistance programs, especially in rural regions—made up the largest portion of energy spending. Thermal (heat) and electricity spending, however, also constituted a significant amount of the energy cost. In parts of Rutland and St. Albans, the combined average electricity and thermal burdens were estimated to be over 12 percent of median income.

Definitions of fuel poverty are variable, but families spending more than 6 to 10 percent of household income on heating and electricity costs are considered to be living under the umbrella of fuel poverty. Under these standards, some Vermonters are highly fuel impoverished—a reality that becomes inescapable when winter descends.

This issue may be something of a surprise to citizens who view the state as a hub of sustainable energy. To be fair, the Vermont government is unusual in its promotion of green energy—and has created a regional identity characterized by environmentalism and independence from the status quo.

Richard Kujawa and his associates at Saint Michael's College studied this phenomenon in a recent paper, examining Vermont's relationship with Quebec and the Vermont-Canada border as a "regionalism" in sustainability. The authors see this as a facet of a larger movement toward regional sustainability, even as society collectively faces the global need to reduce emissions.

Within Vermont's borders, degrees of sustainability have varied across different sectors and environmental components. The state's wooded areas are under the constant siege of suburban and residential sprawl—1,500 acres of forestland disappear annually, according to a recent study conducted by Wildlands and Woodlands. That figure leaps to 24,000 lost acres each year when the margins are expanded to the entirety of New England's forests.

Although Vermont's vanishing forestland is dire for species that called the newly developed areas home, all is not lost for the state's wildlife. On the contrary, wild brook trout populations have remained stable since the 1950s, according to a new report by Vermont Fish and Wildlife.

After collecting data from 138 streams within 17 watersheds, the researchers found that the state's official cold water fish is thriving—despite the specie's decline as a whole.

This is especially good news for Vermont's aquatic environments—since brook trout need cold, clean water at high elevations to survive, their survival is indicative of a healthy freshwater ecosystem.

The state has made definitive strides

toward sustainability, but still requires unyielding attention—from citizens and lawmakers alike—to ensure that we continue to collectively prioritize "green" initiatives.

Kirsti Blow is a junior public communication major at University of Vermont. She writes the briefs for UVM's Vermont research newsletter published by the Center for Research on Vermont. Learn more at http://www.uvm.edu/~crvt/. Kirsti is also a communications and marketing intern for NOFA-VT.

## **SOUP KITCHEN**

## Cont'd from p.15

payment was required to go solar, the project received a \$7,000 challenge grant from a donor-advised fund at the New Hampshire Charitable Foundation.

"We feed the hungry and shelter those without a home. Our mission is possible only because of our volunteers and our supporters, and, as an organization, we are able to direct the generous bounty of the earth to those in need," Reinke said.

The Nashua Soup Kitchen & Shelter's website is www.nsks.org. ReVision Energy's website is www.RevisionEnergy.com.

## 🚯 Building Efficiency - Energy Efficiency

insulation for R-20, Paradigm R-5 triple-

glazed windows, and meticulous atten-

tion to air-sealing throughout. While the

original farmhouse had 14,000 CFM50 of

air leakage, the finished building had just

reduction to a level lower than the German

Passive House air tightness standard (0.60

With a well-insulated and tight enve-

lope, it became possible to heat and cool

the structure with two Mitsubishi 24,000

Btu per hour cold climate heat pumps

serving five zones, installed by E&M Mechanical. Heating and cooling is distrib-

uted into individual offices when doors are

closed with Panasonic fans on thermostat

controls in order to minimize the number

of heat pump indoor heads. Water heating

Cont'd on p.27

is provided with a Rheem

156 CFM50 (0.45 ACH50) - a nearly 99%

ACH50). This is one of the most airtight

buildings around.

## Vermont Zero-Energy Office Building Combines New With the Old

## ENERGY FUTURES GROUP CONSTRUCTS GREEN AND SUSTAINABLE WORK SPACE

By Richard Faesy, Energy Futures Group



Energy Futures Group building from the south. All photos courtesy of Richard Faesy.

Energy Futures Group (EFG), a sevenperson clean energy consulting firm based in Hinesburg, Vermont, recently completed construction of their new zero-energy office building and moved in the end of September 2017. The 1850s-era farmhouse was renovated, and a new addition was constructed with an eye to maintaining the historic character of the building, becoming an energy efficiency showcase and installing enough solar photovoltaic panels on the roof to provide 100% of the annual all-electric building's heating, cooling, hot water, lights and appliance energy needs.

EFG began working with the Town of Hinesburg in mid-2015 to purchase what was their old police station and a capestyle farmhouse for 150 years before that. After completing Hinesburg's regulatory process for subdividing the building and the land on which it sits from the remaining town green, as well as Vermont's land use development, storm water and wastewater, development review and permitting processes, EFG purchased the property with the help of Greentree Real Estate and Four Seasons Sotheby's International



Retail/office rental space in the EFG building.

#### Realty in October 2016.

EFG simultaneously worked closely with Pill-Maharam Architects, Reiss Building and Renovation and Energy Balance on an integrated design process that would ensure achieving the project's goals.

The final building would maintain the footprint, look and key structural elements of the old farm house while adding a new two-story, 1,200 square foot addition off the back, providing EFG its office of the future as well as several desirable rental spaces. The design and construction would emphasize use of local and green materials and finishes as well as a state-of-theart, net-zero

energy package. As advocates for a clean fossil-fuel-free energy future, EFG wanted to demonstrate that a net-zero energy commercial building can be constructed – without heroic measures – even for a winter climate as harsh as Vermont's. The result integrates building science, technology, renewable energy and smart design into a package that is beautiful, inviting, healthy and self-sufficient.

EFG enrolled in Efficiency Vermont's **Commercial New Construction Net** Zero program to receive technical assistance and incentives worth more than \$10,000. They also worked with the local Merchants Bank (that became Community Bank during the construction process) to secure a loan for 80% of the project costs. Without many zeroenergy "comparables" in the market, EFG had to work diligently to identify an appraiser sufficiently competent in valuing the solar and efficiency of the building. EFG completed the Appraisal Institute's Green and Energy Efficient Addendum (available at www.appraisalinstitute.org) to help the appraiser understand the special features and benefits of the project. Providing this assistance to the appraiser and lender helped secure the loan for the \$600,000 project.

De-construction and re-building began shortly after the closing in late 2016 and ran through the summer of 2017. Working with a 150+ year old structure posed its challenges. The Reiss Building crew spent the better part of two months excavating by hand and trolley system the perennial

Were used as trim, posts, caps and accents throughout the building to blend the old with the new. All of the 12-inch window sills feature a piece of the beautiful old sheathing, and all the baseboard and

Old Hinesburg police station before transformation into Energy Futures Group building.

interior window and door trim also shows off the character of repurposed old wood. The original wide pine floor was preserved upstairs in the old building, and new prefinished brown maple was sourced locally from Exclusively Vermont Wood Products in Bristol for the rest of the wood floors.

wet basement, fixing the stone foundation,

removing the old cistern, and replacing

expensive to dismantle the building, save

all of the old wood, and reuse it in a new

structure with the same look and lines of

the old building, part of the deal with the

original building, which meant keeping as

much of it intact as possible. The original

round spruce log rafters spaced three feet

or so apart were replaced with deep scis-

new straight ridge line. However, the rest

of the original frame was preserved. Many of the old rafters, posts, beams,

sor trusses to allow for full insulation and a

sheathing and decking that were removed

Town was to "preserve the frame" of the

the sills. While it would have been less

Energy efficiency was a central focus. This includes 18 inches of cellulose in the ceilings for R-60, walls with 12 inches of cellulose in the new addition section and a combination of foam sheathing, low-GHG spray foam and cellulose in the walls of the old farmhouse for R-40, spray foam basement walls for R-20, continuous sub-slab and edge expanded polystyrene SNOWDOG CONSTRUCTION, LTD. Repairs Remodeling Renovations Energy Efficient Retrofits Energy Efficient Retrofits Energy Efficient Retrofits

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## 🚯 Building Efficiency - Energy Efficiency

## **ENERGY-EFFICIENCY IS A KEY DRIVER OF SUCCESSFUL BUSINESS OUTCOMES**

From The Energy Alliance Group of Michigan

When the relationship of a strong energy strategy and successful business outcome is clearly understood, energy will never be ignored or overlooked as "just another cost of doing business."

...a small group of leading edge companies report they now see energy as a key business value driver, and are deploy-ing new technologies and strategies to turn energy into competitive advantage." — Harvard Business Review

An awareness of the benefits associated with a business energy strategy is on the rise as noted by Harvard Business Review. Listed below is a small sample of the many benefits:

1. Productivity increase - a small increase in overall staff productivity from improved comfort<sup>1</sup>, reduced noise or better lighting often generates revenue that dwarfs the marginal benefit of efficiency upgrades.

2. Reduced maintenanc e - accounting benchmarks often take into consideration only the "first costs" of efficiency projects. A réduction in maintenance is ignoréd even though it yields dramatic dividends via a long term expense reduction and increased production uptime.

3. Building value - According to the U.S. Department of Energy<sup>2</sup>, "The average commercial building wastes 30% of the energy it consumes." Reducing waste increases Net Operating Income (NOI) which drives a building's market value.

4. Increased occupancy - "Environmentally friendly office buildings have higher rents and occupancy rates as well as more satisfied tenants." Professor Avis Devine<sup>3</sup>

5. Competitive advantage - anything a business can do to reduce costs and improve efficiency typically builds a competitive advantage. "The choices a company makes about its energy sourcing and consumption can profoundly influence its cost structure." Harvard Business Review

6. Improved cash flow - wasted energy represents money that is already being spent. Reducing wasted energy improves cash flow and the savings, along with energy specific financing<sup>5</sup>, can then be used to pay for the upgrades with no additional expense. Since in many cases the energy savings are greater than the entire cost of the project, essentially it is a "free" upgrade.

Source links available in our posting of this article at: bit.ly/GET-key-driver

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## ZERO-ENERGY OFFICE BUILDING Cont'd from p.26

Prestige heat pump water heater. All lights are LED, and appliances are rated ENERGY STAR. Mechanical ventilation is provided to each office by two Venmar E15 Energy Recovery Ventilators installed by Memphremagog Heat Exchangers. All of the energy for the building comes from 34 roof-mounted 320 watt LG photovoltaic panels, situated on the east-, south- and west-facing roofs for a total of 11 kW, installed by Scott Johnson Electrical. This array will generate approximately 13,000 kWh per year, enough to serve the building's entire annual energy needs. Using an eGauge monitor, each major energy enduse in the building is tracked, recorded and displayed in real-time to encourage occupant interaction with the building.

EFG is extremely pleased with the

outcome of the project. It is functional, comfortable, beautiful, fun and will serve as an enduring beacon of what our energy future can be.

For more information, visit https://www. energyfuturesgroup.com/zero-energyproject/ to view a video of the construction process and final result, including a time-lapse sequence from a camera that was set up in the building next door to take a picture every hour during construction

Richard Faesy is co-founder and principal of Energy Futures Group (EFG). EFG provides expert consulting services informed by national and international experience in the design and evaluation of energy efficiency and renewable energy programs and policies. For more information visit https:// www.energyfuturesgroup.com/



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## **W** Building Efficiency - Energy Efficiency

## **A NET-ZERO CONCRETE HOME** THE LOW COST OF LONGEVITY made these buildings in a community of

By George Harvey



Homerun House, a net-zero concrete demonstration home where the concrete modulates the temperature and a solar PV array is employed. Photos courtesy of Dave Sellers.

Tell an environmentalist that you are building a net-zero home out of concrete, and you will very likely elicit a response of "Huh?

Award-winning Vermont architect Dave Sellers, however, has a story about net-zero buildings and concrete. In the end, if good care goes into the design of a concrete building to ensure that it needs no fossil fuels for comfortable living, justi-fying the use of concrete may be a simple matter. Believe it or not, this very practical issue may be determined by aesthetics.

Sellers said of this, "It is not just that it be net-zero. That is a dead end. It must also be beautiful."

From an environmental point of view, the thing that makes concrete attractive is its lasting qualities. It can outlast wood by a factor of eight or ten, because it does not rot or burn. There are concrete buildings still in use that were built in ancient times. The best known is possibly the Pantheon in Rome, which is nearly 1,900 years old. Today, concrete can be much higher quality than what the ancient Romans had, so it could be made to last even longer.

So the carbon footprint associated with construction may be slightly higher than it would be for a similar building of wood, especially compared to other building materials. But that carbon footprint is for a much longer period, if the structure is made of concrete. Concrete can be better than wood, given the overall lifetimes of the buildings.

And this explains the matter of aesthetics. "If you want people to use a building for five hundred years, it has to be beauti-ful," Sellers said, "otherwise they will tear it down."

Sellers' whole approach to building, and evidently to living, includes the frugal use of materials. It is a matter he has been studying and working with since he got his Masters in Architecture from Yale School of Architecture in 1965.

"A bunch of us got out of grad school at Yale and decided that our education was incomplete," Sellers said. "We didn't know how to make anything. We came to Vermont. We had \$2000, and we got some land for \$1000 down and \$1000 per year. For practical purposes, it was free land, free labor, free food, camping out. We



like-minded thinkers."

Over the course of fifty years, Sellers did a lot of experimental building. "We became experts on plywood," he said. "And then we realized concrete was a better material. We got a lot of forms that were left over from a building with lots of arches, and we reused them. We used the forms to make a concrete building with a lot of arches, and we called it the Archie Bunker. When we were done with the forms, we used them for a class on how to make furniture out of scrap lumber."

Sellers is now about to open a new building called the Homerun House. Another name for it is HOTFU, a name given it by a French volunteer, engineer Audrey Martinez. HOTFU is an acronym for "house of the future."

One of Sellers' principles is that nothing should be wasted. There is no burn pile, nothing goes to a landfill. Wood forms be-

come furniture. There is always a purpose for any extra concrete.

Another is that nothing should be used that can rot. Window forms are made of used blackboard slate instead of wood. Many of the windows were made at the site, with some having as many as five layers of glass. Large windows were made of Plexiglass for safety. Windows that were purchased came from three different manufacturers, and one was made with a single thickness of glass, so they could be compared as an experiment.

Homerun House has no interior walls, because they are not necessary. The floor is special. Aside from the fact that it has covered troughs in it for plumbing and electric circuits, it has a false floor over three feet of soil in an atrium section of the living area so plants can be planted in it. Currently, they are planned to include citrus trees, bananas, and pineapple.

The house has passive solar heat, of course. The concrete modulates the temperature. Where necessary, there is spray foam insulation on

Cont'd on p.29





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## 🚯 Building Efficiency - Energy Efficiency

Cont'd from p.28





Top: Homerun house.; below: Homerun house interior, looking into skylights.

the walls and ceiling rated at R-40 to R-55. A concrete house is easy to air-seal, but care has to be given to ventilation; there is a wall in this house that is fourteen feet long that will tilt in or out for fresh air. There is also a fireplace, but not to heat the house. It is there for people to gather around when they return from skiing.

Homerun House will be a demonstration house, and so will be given to the Madsonian Museum of Industrial Design. It is being opened to the public, possibly as soon as November.

Sellers has an interesting view of a possible future. He pointed out that if houses were built so they would be long-lasting and beautiful, we could come to what he called a "Third Golden Age." Someday, he said, "You could walk down any street in the world, and it would be lined with beautiful buildings." Just imagine how different the world can be.

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## Tortorice's Tips: Natural Ventilation and Moisture Problems

Is Natural Ventilation Enough to Overcome Moisture Problems?

By Bob Tortorice



In the winter, does moisture form in the bottom corners of your windows? Photo: diy.stackexchange.com

Moisture is the silent killer of houses. Just as with cancer, you may not know it's a problem until it's too late. But, in a way that's similar to many cancers, if detected early, a moisture problem in your home is almost always curable. And luckily, with a lot of money your house can always be repaired no matter when the problem is discovered.

Fifty-plus years ago, houses were built so leaky that moisture was never an issue. Even though a family of four will produce 40 gallons of moisture per month, the house was able to dissipate the moisture through the air leaks in the walls. Other than the frost that formed on the windows, no other problem was created by this potential build-up of moisture. Of course, what was known but not addressed was the fact that heat escaped through these same "holes" in the house. At less than one dollar per gallon the "pain" of paying for oil was tolerable. But, since the oil crisis of the '70s, oil and gas have quadrupled in cost, giving rise to modern, energyefficient homes that are built much tighter than those older homes. Unfortunately, the building codes that require builders to build tighter also say, "If the bathroom has a window, then a fan is not required." The

problem with this approach is that nobody opens this window in the winter, when ventilation is at its critical point.

Moisture follows the air through the "holes" in the walls, but when it hits a cold surface like the back side of your sheathing in the wall or attic it condenses, turns to liquid and runs down the wall where it is absorbed into the wood and with the help of fungi and insects, the wood starts to rot.

A simple two-ply test can reveal how efficient your ventilation is:

Take one or two sheets of two-ply toilet paper and, with the bathroom fan running, place the paper against the fan grill. It should stick to the grill; if not, clean or replace the fan ASAP. You're paying for electricity that's not doing anything and, worse yet, you think that you're venting the moisture from your shower, but you're not.

Other tests you can use to check for ventilation:

1. During the winter months does moisture form in the bottom corners of your windows? Look for water stains on the windowsill.

2. Look at the nails in the attic roof, the points protruding through the roof's decking. Are they rusted? If so, then moisture has condensed on them.



Window condensation is a red flag that there is a problem. Photo: www.cornerstone-exteriors.com

3. Newer homes are more susceptible WinnoistuiteProblems than older homes because we are building more energyefficient homes, but not adding more mechanical ventilation. Don't believe the builder who says, "I build houses that breathe." Well-vented attics, bath fans or energy recovery ventilators are the only way to properly vent your home. Bob Tortorice, Vice Chair of Build Green NH, of the Home Builders & Remodelers Association of New Hampshire and President of the North Country Home Builders and Remodelers Association of New Hampshire, has over 30 years of green building experience. He is the owner of Building Alternatives, Inc. and Alternative Energy Audits in Franconia. To learn more, call 603-823-5100 or go to www.buildingalternatives.com.



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## **High-Performance Homes**

## Nanogrids: A Whole-Building Approach to Distributed Energy Resources

By Eric Wallace, Steven Winter Associates

#### **Distributed Energy Resources**

Distributed Energy Resources (DERs) are a growing part of the energy landscape in the United States, and they are becoming an ever more attractive opportunity for households, companies, and building owners to gain control of their own energy needs. By 2024, it is estimated that solar PV plus energy storage will represent a \$14 billion industry [1]. These resources are installed on the customer side of the utility meter and include distributed generation, such as combined heat and power (CHP) and solar photovoltaics (PV); energy storage assets, such as batteries; energy efficiency and demand management; and building energy management software. When deployed correctly, DERs have the potential to reduce the carbon footprint of the electric grid, increase grid reliability and resiliency, and defer the need for costly upgrades to grid distribution and transmission infrastructure [3, 4, 7].

Under the umbrella of its Renewing the Energy Vision (REV) initiative, New York State is planning to create strong market incentives to promote development of these resources. This effort is intended to not only to combat climate change through reduced carbon emissions, but also to increase grid resiliency and reliability. This is needed not only in the state of New York, but across the northeastern US as climate change leads to a greater frequency of extreme weather events like Hurricane Sandy.

While all can provide value to both consumers and the grid, DERs can often have competing behaviors. By taking a whole building approach, multiple DERs can be combined to provide value that is greater than the sum of the value provided by each resource independently. In this sense, buildings can be considered to be comparable to the grid as a whole.

Whereas communities are being developed into microgrids, a building can act as a standalone nanogrid.

#### **Solar Photovoltaics**

Solar PV costs have dropped dramatically over the past several years [6], supported by strong policy at the federal and state levels. Distributed PV systems, typically installed on building rooftops, convert sunlight into electricity, providing an excellent means for consumers to generate clean, renewable

energy on site and reduce electricity bills. The output of these systems is greatest when the sun is at its peak, meaning energy production is not much different than a building's load profile throughout the day. For this reason, solar PV on the building nanogrid is most analogous to flexible generation assets on the larger grid.

Available roof space and sun access are often the limiting factors in PV system size and production, but a PV system optimized to operate alongside a combined heat and per (CHP) plant would be sized according to the daily variable loads of a building. Although excess PV generation can be fed back to the grid, CHP greater than 10 kW (residential scale) is not eligible for net metering [8]. This means that without complex controls, the building nanogrid cannot feed power back to the main grid, requiring curtailment of CHP electricity generation and reducing overall efficiency of the nanogrid. Preventing this starts at sizing both the CHP plant and PV system appropriately for baseload and variable energy demand, respectively.

## **Combined Heat and Power**

Also known as Cogeneration, CHP is one of the most popular and cost effective DERs. A CHP plant, typically fueled by diesel or natural gas, is used to generate electricity. [Alternatives exist to fossil fuels – ed.] Simultaneously, the waste heat in the exhaust is used to heat water, typically for domestic

hot water but can also be used for space heating, thereby reducing the load on the boiler plant [4]. In our nanogrid analogy, CHP is most similar to baseload power on the grid – traditional thermal resources like coal, nuclear, and natural gas. As is the case with many of these power plants, CHP plants are most efficient when operating continuously near full utilization.

CHP can be sized according to either the electrical or thermal loads of a building; however, the electrical efficiency of the machine is much more sensitive to utilization levels than the thermal efficiency. For example, one study found that electrical



When paired with appropriate software, battery storage can combine multiple services to drastically alter a building's load profile and optimize nanogrid performance [5].

of the emissions are offset by a reduction in emissions from the boiler. Additionally, although a natural gas CHP plant emits more CO2 per unit energy than a combined cycle natural gas plant, some of this efficiency loss is offset because the energy is being produced at the point of use and therefore bypasses any losses in transmission and distribution. Lastly, the impact of a CHP plant on overall emissions will depend on the regional energy mix; a natural gas CHP plant could result in a net reduction of greenhouse gas emissions if installed somewhere with a high percentage of coal power, but would likely increase emissions somewhere that relies primarily on natural gas, nuclear, and/or renewables. Cont'd on p.38





Solar PV has seen drastic reductions in cost and is a key component of nanogrids.

efficiency was four times greater at 100% vs 10% utilization, whereas the thermal efficiency only had a 4% difference across the same output levels [2]. Because of this, CHP is best designed to meet the baseline electrical demand of a building.

The downside to CHP, of course, is that it burns fossil fuels and therefore emits carbon dioxide. And while it is possible to burn biofuels for CHP, units that run on natural gas and/or diesel are far more common. There are, however, a few mitigating factors for these emissions. Firstly, because the waste heat of the CHP plant is captured and used to heat water, some

## **PLAINFIELD, NH SCHOOL'S SOLAR** — just a small part of bigger renewable plans for the town

#### By George Harvey

The Plainfield Elementary School, in Meriden, New Hampshire, is now being supplied with electricity from its own solar array. It was installed by Norwich Solar Technologies (NST), of White River Junction, Vermont, in the early autumn of this year.

The solar array is made up of 378 photovoltaic (PV) panels, each of 355 watts, giving it a capacity of 134,190 watts (DC). It stands on a piece of property across the road from the school building itself, behind the parking lot.

There was some initial concern over the siting from local residents, as often is the case with such installations. The main problem was a question of what impact the array would have on a local hiking trail. NST presented three design alternatives, and after considering the concerns, offered an approach combining their elements.

The School Board entered into an agreement with NST in the first week of May. Soon after, the issue was taken up by the town's Zoning Board and the Planning Board. With their approvals, construction was undertaken as a summer project.

The array is installed behind the meter. This means that the school can draw electricity directly from the array. It is still on the electric grid, and so can draw electricity from that source any time the array is not producing sufficient power. Excess electricity produced by the array goes to the grid under net metering.

All of the design, permitting, and construction of the array was done by NST. The company will be around a while longer, because it remains responsible for system operation and maintenance of the system.

There were details of the system that are not immediately apparent, when a person casually thinks about an ordi-



Above: The school's solar array. Photo: Norwich Solar Technologies. Below: Plainfield Elementary School. Courtesy photo.

nary PV installation at an existing site. In this case, the interconnection and system upgrades were not trivial. The school needed a new transformer, as well. The cost of these upgrades was about \$80,000.

Non-profit organizations, including public schools, cannot benefit from the incentives that are available to those who pay taxes. A

for-profit partner is normally brought in to help with financing for this reason, and this produces financial benefits for all. In this case, Barrington Power, which specializes in such financing,



provided the services, and will own the system for at least the first several years of operation.

Barrington Power entered into a 25year power purchase agreement with the school, under the terms of which the cost of electricity is reduced by 5%. The agreement also specifies dates at which the school can purchase the array at a fair market value.

The Plainfield School array is expected to generate about 160,000 kilowatt hours of electricity each year. This will offset close to 100% of the school's electric use, which costs about \$24,000 each year. Generating that much power from fossil fuels would produce about 115,000 pounds of carbon dioxide.

Joel Stettenheim, the CEO of Norwich Solar Technologies, said, "Having gone there, I am very pleased that we were able to work with Plainfield Elementary School to complete a highly successful process. Prior to the solar array,

the school and its energy committee completed energy upgrades that transformed the building from a fairly low performing facility to one that is near the top in the state. Bringing in solar power now is the crowning piece and was a nice conclusion to an excellent deliberative process for the town and the school."

Terry Donoghue, the project manager who oversaw the installation, is especially excited about not only the Plainfield Elementary School, but also

the Meriden community. "There is a lot of support for solar in the community," he said. "In fact, many people are hoping to see the town vote to go one hundred percent renewable at the town meeting next spring."

# PRINCETON UNIVERSITY'S MICROGRID IS STILL AN INSPIRATION

#### By George Harvey

In 1996, Princeton University replaced its old coal-fired heating plants, which had been around since the 1920s, moving to natural gas as a fuel source. This was not a simple change, however, as it had a set of implications that went beyond merely switching furnaces.

The new plant was a single, cogenerating (cogen) central system that supplied both heat and electricity to about 180 buildings. It was built around a turbine that can be described as very much like the jet engines that are found in aircraft.

In a cogen system, the efficiencies of such engines can get to be very high, approaching 85%. The engine turns a generator, just as most gas turbine generators would, but the heat in the exhaust gas is captured to be used for the buildings.

The generator produces up to about 15 megawatts, which is only slightly less than the university typically uses. When demand is low on campus the turbine supplies all of the university's power. At other times, some power is drawn from the grid. Sometimes, the university even supplies power to the grid.

In time, the cogen system had two very important alterations. One was a change

to make it capable of running entirely independently of outside grid power. This turned it into what is called a "microgrid," capable of standing alone. The second was the addition of renewable energy in the form of a solar photovoltaic system.

When Hurricane Sandy struck the mid-Atlantic area, shutting down the power grid, Princeton became an island of light

and warmth, because its microgrid continued to function almost flawlessly. After an initial twenty minutes without power, the university was back to nearly full function. Though there were limits to the amount of power available, this did not represent a problem. On the other hand, the university was used by all sorts of people who were



East Pyne Hall, Princeton University. Photo by Andreas Praefcke, Wikimedia Commons

dealing with the difficulties of the storm. They came by to refresh themselves, warm up, and get together.

Since that time, the microgrid at Princeton has been an inspiration to people from all over the country. They have studied it, so they could understand better how to use microgrids in their own communities. Commercial operations, schools, hospitals, and emergency shelters have been installing such systems.

In a well-known example, Green Mountain Power installed a solar-powered microgrid at the high school in Rutland, Vermont, which serves as an emergency shelter. That system includes a number of other buildings, even including a few homes. It has both an extensive solar array and a large battery backup system.

Another interesting example that came into view recently belongs to Ameren, a large electric utility based in Saint Louis. Located in Champaign, Illinois, it is the only customer-connected microgrid that operates at the high voltages used by utilities, according to Ameren. It is powered by an array of several hundred solar panels and one wind turbine. The system has the latest battery technology for backup power with redundant backup from natural gas. It supplies power to 192 commercial and residential customers. Ameren is currently testing the Champaign microgrid, checking its ability to operate without any connection to the grid. Initial tests have gone well.

## SUSTAINABLE EDUCATION

## Hollis, NH Public Schools – Solar on the Roof, Solar in the Classroom SUSTAINING SOLAR GOLD SPONSOR

"We can't wait to start integrating the data from our new rooftop solar energy systems into the everyday curriculum at our schools," says Nicole Tomaselli, Ćurriculum and Instruction Administrator for the Hollis, NH Public School District. And it won't be long before this is a reality as construction is just wrapping up on a 129kW rooftop solar PV system at Hollis Primary School and a 125kW system at the Hollis Upper



A 125kW PV rooftop solar array at the Hollis, NH Upper Elementary School. Photo courtesy of KW Management. Right: Hollis students learning about energy and their new solar PV system. Photo courtesy of NECSS.

Elementary School. This is the largest solar installation in NH owned by a public school district. The solar project is a part of a larger project at the school that includes conversion from oil to propane heating with high efficiency boilers, electrical and insulation upgrades and LED lighting.

This project is a great example of why solar energy projects at schools are so important. The practical use of solar PV energy provides saving in the school's electrical cost while also providing educational benefits to the school and community. This is why New England Commercial Solar Services (NECSS) developed the Solar On Schools Program.

KW Management, Inc. of Nashua, NH was chosen as the contractor to engineer, procure and construct the solar PV systems at each school. By partnering with NECSS and

their new Solar On Schools Program, KW Management is able to offer high-quality design and equipment, as well as worldclass curriculum resources. According to KW Management's president, Mark Weissflog, "We believe that solar energy offers an exciting and unique way to augment STEM education in all grades which is why we are now offering this Solar On Schools Program to all schools across New England."

The solar energy systems include data acquisition systems, including a weather station, that allow system data to be viewed on any web browser enabling every classroom and every student at home or at school to use this data. Educators and administrators at the schools are now working closely with NECSS to integrate the energy data collected from the rooftop solar into their curriculum.

"KW Management and NECSS are very knowledgeable and excited about the educational benefits of solar technology,"

says Tammy Fareed, Vice Chair of the Hollis School Board. "A recent photo opportunity for the project with a few students quickly turned into an engaging mini education session about how the technology works. NECSS has been working with our IT and curriculum staff to develop data-display systems for our buildings. In the coming weeks, our staff will receive training on the technology and curriculum resources provided through the Solar On Schools Program."

NECSS was created to help mitigate climate change through education and deployment of commercial scale solar energy

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systems. KW Management, Inc. is a recognized leader in the commercial, public and utility solar industries with over 20 years of solar design, procurement and installation construction with a wide breadth of full-service electrical competences in the renewable energy field.

Ted Vansant is founder and president of New England Commercial Solar Services, offering 17 years of solar design, construction and financing experience for schools, businesses and municipalities.



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VPIRG: understand the clean energy resources available to VT - www.vpirg.org/cleanenergyguide VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - www.veic.org

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#### **NEW NOVEL RELEASE**

**Many Rivers** is a new novel by Garrett Connelly. It has been released in serial form chapter by chapter, starting this April, 2017. Many rivers is rated UP and VF; ultra progressive and very fun. Individual chapters arriving weekly have proven a temporary diversion for those recovering during a long healing process, e.g. joint replacement. You may set up a weekly chapter arrival of Many rivers or buy the entire story at www. ferrocement.com in the English section. There is a link to read the first chapter on line.

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## 🞾 IT'S A GREEN LIFE ... AFTER ALL



# Ingredient of the Month

#### By Larry Plesent

Most of what we call medicinal drugs are in fact synthetic versions of the healing molecules found in plants. Plants, it seems, have been fighting cancer, viruses, bacterial and insect pests for half a billion years. Since plants and people are part of the same ecosystem and share DNA with all living things, their solutions often work for us two legged critters too.

The pain reliever we call aspirin, for example, is a modern version of the ancient Gaelic recipe for infusing the inner bark of white willow in vinegar. Tamoxifen, recognized as effective in slowing the rate of breast cancer cell reproduction was originally

derived from the Pacific yew tree. Quinine is another famous example of a tree bark medicine. And there are many more

Synthesizing medicinal molecules (making drugs) is a terrific idea. First off, it standardizes potency. You always know exactly what you are getting, or at least that is the goal. Plants are less reliable in this regard. Also, synthesizing drugs may well save rare plants from being over-harvested and protect wild, remote habitat from human incursion.

A plant that is "thrivey" (more colorful, fast growing and healthy), may be more potent than one that is not. Extracts made from the top third of a plant are often much more potent than those made from the bottom third. Sometimes herbal concentrates appear to be more effective than their syn-



When Natural Products are More Effective than Synthetic Ones

The inner bark of the white willow was used for pain relief lona before aspirin Image: Pixaby.com.

thetic counterparts. And often, eating fresh vibrant foods do much more for a body than taking vitamin pills. Since molecules are molecules whatever their source, this makes no sense from the outset. What gives? Is this a placebo effect?

The answer lies in the concept of bundles. Nature operates in a bundle and so do you. Here's how it works:

Vitamin C is essential for human health. Taking synthetic ascorbic acid (vitamin C) has some health benefits. In nature and in oranges, Vitamin C is always found associated with bioflavonoids, the stuff that makes vegetables so colorful and good for you. The thing is, your body evolved to utilize vitamin C in conjunction with its neighbors, the bioflavonoids. Ingesting pure synthetic vitamin C, even in mega doses is typically much less effective at optimizing health than eating

fresh, ripe organic fruit every day. When drug companies patent a medicine, they patent both its uses and the process of manufacturing it. Their aim is to create a single pure medicinal molecule they can own. But nature works differently. Take a look at wormwood (artemesia vulgaris). Wormwood contains a molecule called artemisinin, which is used around the world as a safe and effective malaria treatment and, recently, as a potent cancer treatment. But

taking an ounce of wormwood tincture divided among four doses a day for three months is colloquially reported to be much more

effective than the synthetic analog pills. What is going on here?

It turns out that synthetic artemisinin is only one molecule in the artemisinin bundle. It may be the Big Brother of the family, demonstrating FDA proven tumor-imploding properties; but it has a whole bunch of sisters and brothers and cousins eager to pitch in and

help with the process. One form of artemisinin attacks existing capillaries feeding the tumor, and causes them to wither, thus starving the tumor. Another changes the surface of the tumor itself, rendering it more difficult for new capillaries to

provides a good start-

ing place to make the

changes we all need to

make, if we are going

to truly address global

warming and all the other challenges the

Earth and its inhabit-

attach to it. Which would you rather have? A knight in shining armor to fight for you? Or that knight and her buddies and cousins and uncles fighting on your side too?

Vitamin E (the alpha or main tocopherol) has proven to have protective value for your heart and arteries. But vitamin E is never found alone. It is found with other tocopherols and with its cousins the tocotrienols. Once again, getting the entire bundle in wholesome unrefined food is far more useful for maintaining your optimum health than taking a single synthetic molecule.

This is the Soapman, reminding you that "nature operates in a bundle." And so should vou.

Larry Plesent is a writer, philosopher, part-time farmer and soap maker living and working in the Green Mountains of Vermont. Learn more at www.vermontsoap.com.



Wormwood shoots. Image: Wikimedia.org.

## More Late-Breaking News

#### Cont'd from p.2

Extreme weather worsened by climate change and the health impacts of burning fossil fuels have cost the U.S. economy at least \$240 billion per year over the past ten years, according to a report Universal Ecological Fund. The report does not factor in this year's record breaking hurricanes, scores of wildfires in Western states, and losses to our wheat crops due to drought, which are estimated to cost over \$300 billion in total.

The US DOE has offered conditional loan guarantees worth \$3.7 billion to help save efforts to build two nuclear reactors in Georgia. This brings the total federal backing for the project, which is behind schedule as well as over-budget, to \$12 billion. This comes from a department whose leadership has called for elimination for subsidies for renewable energy.

A new report from the International Energy Agency said solar energy was the fastestgrowing source of electric power in the world last year. It spoke of the "birth of a new era" for the renewable energy sector. Last year, solar energy grew at a pace faster than wind power, natural gas, or coal.

The Institute for Energy Economics and Financial Analysis released a report documenting the disruption of the electricity markets by renewables, which it says is increasingly obvious. It says the price of electric power from renewable resources is a key driver of this change, and it gives eleven case studies revealing the trend.

On the anniversary of the death of St. Francis of Assisi, forty Catholic institutions announced that they were divesting themselves of ownership in the fossil fuel industry and its ancillaries. The total value of the divestments was not disclosed, but it is thought to be in the neighborhood of \$5.5 trillion.

## The Way Home to Love - A GUIDE TO PEACE IN TURBULENT TIMES

By Maresha Ducharme, Balboa Pres, August 1, 2017, 138 pages, \$13 Book Review by George Plumb

We are certainly living in turbulent times with global warming, extreme political divisiveness, mass killings, and tremendous suffering going on around the world for a variety of reasons. How we personally deal with all the conflict that is going on around us is a very challenging question. Maresha Ducharme fully recognizes the impacts of climate change, and she and her husband do all that they can to reduce their carbon footprint including living off the grid at the Snow Dragon Sanctuary in Meredith, N.H. She founded the sanctuary in 2000 and continues to be the resident teacher there.

In her recently published book, Ducharme combines and expands on the teachings from several spiritual traditions including Christianity, Buddhism, and others into practices that will transform our personal lives. She states, "The practice of meditation, prayer, and self-reflection can bring us into direct communication with the soul and allow us to feel the sweetness of life and tread the path of love." She stresses working towards a higher level of consciousness. She says that we should take the blame off of others and take responsibility for our own emotions. We should respond to situations and not react to them

Her main emphasis is on choosing love. To be kind and compassionate to yourself and to others should be our ultimate life purpose. We should see and feel everything but hold nothing. "We take what is heavy—fear, anger, and self-pity—and transform it into self-awareness and finally into love." She says that the best way to choose love is through the breath. One of my favorite quotes from the book is

that, "In the morning, instead of saying to my husband, 'Have a nice day Honey', I say, 'Remember to breathe"

Although a book of only 138 pages, it is not an easy read. It is the kind of book that needs to be read repeatedly in order to fully understand and appreciate what she is saying and then put it into practice. Ducharme stresses that, "The breath is the entry point to a higher level of consciousness.

In these difficult times, personal transformation for the benefit of ourselves and others is extremely important. This book



com. To learn more about the sanctuary, go to www. snowdragonsanctuary.com. The author is

also the co-owner and account manager for Snow Dragon Solar LLC. (See ad on page 12.)

George Plumb is a long-time environmental activist, an Unitarian Universalist and member of the Vermont Chapter of the Buddhist Peace Fellowship, and organizer of the groundbreaking report, "What is an Optimal/ Sustainable Population for Vermont." He also voluntarily delivers the Green Energy Times in central Vermont by driving his all-electric 2014 Nissan Leaf.

## Elmore Roots' Permaculture Know-How **PLANTING, GATHERING AND STORING NUTS** Squirrel's Guide to Homegrown Sustenance in the North

#### **Bv** David Fried

Inspired by The Man Who Planted Trees, a book by John Giono and Bill Mackentley (my mentor), I planted black walnuts, Korean pine nuts, hazelberts and shagbark hickories on our hill in northern Vermont. They grew and started making nuts in five to twelve years. The hazelberts were the quickest, and the shagbarks the slowest, but they are very grand.

If I were a squirrel burying (planting) nuts, I would plant them the same time they fall. They have been doing this a long time, so I follow their example and plant mine right away, too.

They forget where they plant them. I mark them with stakes in prepared beds and record the name

of the parent tree on a map and label each bed. I also cover the nuts with hardware cloth, with extra on all sides, from a roll, so those who would 'have at them" have less of a chance. Just like when the squirrels plant, a lot of ours come up, and they are most noticeable at the end of summer. I leave the hardware cloth barrier on the first year but make sure to take it off by gently sliding it over their tops when the leaves have fallen in November, or April before they grow new ones! When they are two or three years old, I dig them up and plant them all around the place.

Hazelberts are planted about six feet apart, pine nuts about 20, shagbarks and black walnuts about 30 feet apart. This gives them room to grow, so they will not be too far apart for pollination, or so the squirrel will not have too hard a time leaping from tree to tree.

Always keep the seedlings marked with a colorful flag and a cedar post or



Squirrel painting by Gabriel Tempesta www.gabrieltempesta.com

large stick. This gives the mower a better reputation and your tree a better chance of making it to the nut stage.

Always plant at least three of the same species. If one dies for some reason, down the road of time, you still have two maturing trees ready to pollinate each other, and then you get the nuts.

Here are our harvesting secrets. Know that the squirrels are waiting all year for this moment. For you, it is a hobby — for them it is survival. You must notice when the first few heavy or filled ones are fall-ing and get crackin! Pluck the hazelbert clusters off the large bush and store them in breathable containers and spread them out to dry in the husks, indoors and in a squirrel-proof building or wire enclosure. They are ready to harvest when they begin to turn from light tan to medium tan. They will continue to ripen indoors, but if you wait until they are good and dark brown on the bush, the squirrel will get them first.

The squirrel begins knocking off the whole nut pine cones, and they all fall heavy to the earth. He will sit and start pulling out the large nuts and sit cracking them on a shelf or air conditioner. This is your cue to check under the tree and gather all the rest of the cones. Store these inside and crack them to eat as you want them, or plant some outside, in partial shade, to start a new pine nut grove.

We use a "nut wizard" to roll along the ground

rolling up the green and fragrant black walnuts (without bending over to pick up each one which is much easier on the back) which we then open, watching them fall into a bucket. You need to stomp on the green husk on pavement or gravel, and you are left with the hard black interior. After a bucket is filled with nuts in the shell, I fill this with water and whack

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FOOD CO-OF



it around with a two-by-four to help clean them and get some of that black juice off. (Wear gloves, as they stain your hands for weeks, which is why they make a great natural dye.) Now spread them to dry in a squirrel-free zone of a home or workshop. They "cure" and are ready to eat in two or three months and keep for two or three years in the shell. You can use a hammer and a rock or a vise, but we use a special black walnut cracker to gently open each shell and get to the tasty nutmeats inside. They are best stored within their shells at room temperature. Once cracked and open, keep the ones you don't eat in the fridge.

Someone visiting our farm nursery once said, after her tour, "If I was a squirrel, l'd live here!"

Growing nuts in the north asks for a combination of patience, skill, timing and enjoying aerial acrobatics. Nut trees are big producers of high quality protein we can grow here in the north, and there is plenty to go around for all.

David Fried of is the owner of Elmore Roots, a fruit and nut tree nursery in Elmore, Vermont, where you can also pick up a "nut wizard" and a black walnut cracker.



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## **Killington Resort's Exemplary Sustainable Practices**

#### By Roger Lohr

Ski areas in the U.S. continue to implement innovative energy conservation measures and environmental practices to reduce energy consumption and the effects of climate change. Killington Resort in Vermont strives and continues to exceed customer expectations as a steward in the battle against climate change.

## **RENEWABLE-SOURCED ELECTRICITY**

Recently, Killington announced its intention to install solar arrays at Pico Mountain with 56 kilowatts (kW DC) of solar panels on the Pico Base Lodge and Administration building, to be financed and constructed by the Green Lantern Group. In addition, tracker solar panels that move to maintain the optimum angle with the sun will be located at six sites around the resort with three trackers at each site. Power from these systems will be sent back to the electric company (net metering), with netmetering credits generated by the solar panels applied to reduce Pico Mountain's electricity expenditures.

The Cow Power program is a unique form of producing energy whereby about a dozen Vermont farmers use cow manure at their farms in an anaerobic digester system to generate electricity to sell to Green Mountain Power, and Killington purchases 1,125,000 kWh annually of this



Climate change makes snowmaking imperative. Courtesy photos: Killington .



energy to power the K-1 Gondola and the Peak Lodge.

In 2007, the resort converted 12 walk-in coolers to Freeaire Refrigeration, which uses outside air to refrigerate the coolers instead of using high energy consuming compressors. Smart.

### RECYCLING

Killington has been recycling for years and now recycles 100 tons of waste annually. It uses 50,000 pounds of 100% recycled certified paper products annually. Killington trail maps and guest guides have been printed on paper certified by the Forest Stewardship Council.

An innovative design to use recycled waste water systems in the restroom facilities is employed at the six Killington base lodges saving up to 35,000 gallons of fresh water each day during peak days. Since 1987, when the water conservation system was installed, about 62 million gallons of fresh water have been conserved!

## TRANSPORTATION

On transportation, Killington participates in the Marble Valley Regional Transportation District. Current resort-related ridership on "The Bus" exceeds 375,000 one way trips annually including 75,000 commuter and employee related trips. In 2014, two ChargePoint stations for electric cars were installed at the Killington Grand Resort Hotel with dedicated spaces open to all guests. There are also plans to have two Tesla Destination Charging stations (at the Snowshed and Skyeship areas) installed prior to the 2017-18 ski season.

## SNOWMAKING

Killington purchased 400 new energyefficient snow guns as a part of Efficiency Vermont's Great Snow Gun Roundup in 2014, an investment of snow guns valued at over \$2 million, which required that for every five energy-efficient snow guns purchased, four less efficient snow guns be scrapped. Killington retired 317 snow guns in a variety of styles and added 396 new guns to its fleet.

Killington added 150 new tower bases for these more efficient snow guns and mounting guns on towers allows for more "hang time" in snowmaking, adding to efficiency and output while reducing noise for skiers and providing a more authentic snowfall experience. Dave Lacombe, snow surfaces manager for Killington Resort commented, "Modern, energy-efficient snow guns require up to 85% less energy to operate than older snow gun models, and the new snow guns represent the most advanced, energy-efficient technology available."

One standard diesel-powered air compressor used for snowmaking produces 1600 cubic feet of air per minute (CFM). Older snow guns use 600 CFM, while new energy-efficient guns use 8-26 CFM, allowing for far more snow guns to be powered by a single compressor. To further improve sustainability, all Killington diesel compressors have Tier 4 engines that use cleaner burning fuel and have increased energy efficiency overall.

Killington's projected direct savings for the season associated with the new snow guns totaled 1,453,000 kilowatt-hours of electricity, 84,000 gallons of diesel fuel, 3,452,000 pounds of carbon emissions and roughly \$470,000...and that's a return on investment in about a year and a half.

## **ECO-ACTIVE PRACTICES IMPACT**

Killington Resort is one of the ski areas leading the way to reduce energy consumption and many more ski areas and other industries can employ the commitment to such practices as exemplified at Killington.

Roger Lohr is the founder and editor of XCSkiResorts.com and a prolific national writer on cross country skiing. He lives in Lebanon, NH.

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## **Nanogrids:** Whole-Building Cont'd from p.31

Com a from p.51

#### Battery Energy Storage and Energy Management Software

Battery energy storage is another technology that is seeing significant cost reductions and is expected to play a larger role on the grid of the future. At the building level, storage can provide a number of services, including load shifting of solar PV generation to better match the variable demand profile, participation in demand management and/or response programs, back-up power, and much more. When paired with sophisticated software, multiple battery services can be stacked to combine revenue streams and improve the economic outlook of the system [5]. Therefore, battery systems and energy management software are essential to ensuring optimal performance of the nanogrid, acting as the central command hub of the building's energy resources. By firming and shifting the PV output to match variable demand, and providing additional capacity for storing energy, a battery system can help the PV system reduce demand and keep a CHP plant operating at full utilization.

#### Conclusions

The REV initiative's Value of Distributed Energy Resources (VDER) program is intended to be the next step beyond simple net metering, providing market-based incentives for deploying DERs that are beneficial to both consumers and utilities. The program is currently accepting proposed market structure plans from utilities and comments from the public, and the final rulings are expected to be made relatively soon, ideally leading to significant growth in DER development across the state. The results of this initiative could have an impact on the deployment of DERs across the country, particularly in areas like the northeast where grid resiliency will become more and more important as the effects of climate change are felt.

Building nanogrids, comprising multiple DERs including PV, CHP, and storage, are exactly the type of systems that New York is hoping to encourage through the VDER program. Understanding both the policy and technological implications of the interactions between these various resources is essential for achieving optimal performance. When sized and configured properly based on the whole building's energy needs, the nanogrid can perform at a better efficiency and provide more value than its components would independently.

Steven Winter Associates, Inc. provides energy, sustainability and accessibility consulting as well as certification, research and development and compliance services. Learn more at http://www.swinter.com/.

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# Happy Trash-Free Holidays!

### Cont'd from p.1

crossed the threshold into Nana and Grampa's ranch home, my brother, sister and I would sprint to the fireplace and tear at our stockings, furiously scattering toys, candy, and knick-knacks across the floor until we got to the one thing we were really looking forward to, the ONE THING we looked forward to the most, buried down in the toe of the stocking.

Each of us got our very own can of ripe black olives.

We loved black olives. But the thing I remember most, the thing that stayed with me through all these years was the anticipation! We looked forward to that can of olives as much as anything, and it's still one of my

fondest memories of the holidays with my family. It was an experience far more valuable than the two dollars Nana spent on a can of oily fruit.

According to the EPA, Americans generate a disproportionate amount of household waste between Thanksgiving and New Year's. We don't need to give in to the consumer culture that sells us more things, cheap



Here is what 365 disposable coffee cups look like compared with a single durable coffee mug. Photo: Rhonda Mace, CSWD School Outreach Coordinator.

things, things individually wrapped for convenience. Here are three ideas to help make the holidays less wasteful—and more meaningful, instead.

Give an experience. Studies have shown over and over that people get more happiness from experiences than things. We look forward to the experience, enjoy it while it's happening, and think back fondly on it after it's over. Whether you splurge on a performance at the theatre, a nice dinner (at a restaurant that composts, of course!), or lessons for a favorite activity, this is one gift that appeals to young and old alike. Include a brochure or color printout from the business's website to give the recipient a visual impression of the event. They make great stocking stuffers! Just like black olives.

Give the gift of less trash. If you want to give someone a thing, why not choose something that will do some good? A cookbook for leftovers (better yet, a cooking class for leftovers). A reusable coffee mug. A food dehydrator. Battery recharger. Cloth napkins. A stainless steel food scrap pail. A compost bin. Reusable produce bags. Black olives! (Okay, that's

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a stretch.) Give your friends and loved ones something that says you care about them and the environment we live in.

Buy less trash. I know, this seems like an obvious one. But really, most of the trash that we produce at home is packaging material



Buy items in packaging that's recyclable (like black olives!). Buy in bulk, with your own containers. Bring reusable bags. Buy durable items; they often require less packaging, because they're less fragile.

Another way to avoid trash is often to buy local. Shipping items across the country requires a lot of packaging – some of which may be recyclable, but much of which is just going to wind up in the landfill. (Not to mention that whole carbon emissions thing...) If you can buy a similar item that's made locally, chances are it requires a lot less packaging to get to you.

Here's to you finding your own black olives – a waste-free gift that somebody will remember forever.

Jonny Finity grew up celebrating holidays in the Blue Ridge Mountains of southwest Virginia and found his way up to Vermont after almost a decade abroad in Kenya, South Korea, and Malaysia. He is the Marketing and Communications Manager for Chittenden Solid Waste District (CSWD).





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