Issue 52 • October - December 2018 – HARVEST, HOLIDAYS & HIKING – FREE!

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Only the Heat You Lose

Greg Whitchurch

You know how after your furnace has gotten the house all warm and cozy, a little while later it comes on again - and then again? What happens to our heat? Does it wear out, or just fade away?

No. It escapes! Your precious heated air leaks out through holes and cracks, through wall sockets, around windows and doors. It's sucked in and then blown outside by your dryer and anything that burns fossil fuels. Those appliances use your breathable air for combustion and then force the poisonous exhaust outside - sucking cold air back inside. (If you cook with gas, then those toxic fumes just circulate around your house until they're able to escape with other heated air.)

In addition, in a conventionally built home, heat that is touching your walls is conducted outside through thermal bridging. A typical home has its sheetrock or paneling nailed to the studs, which are good conductors of heat; they transfer it directly to the sheathing nailed to their other side, where the heat disappears. Many doors and windows and their frames are conductors of heat as well.

Finally, heat radiates through windows. South-facing windows might allow more warmth in than they let out while the sun shines on them, but other windows and the nighttime rob us.

Watching this 90 second video will enhance the rest of this article: http://bit.do/PH90.

Zooming through the -40F degree wind chill in a helmet and snowmobile suit can be comfy cozy. But if we instead dressed ourselves in the manner of "the modern home," it would be more like going snowmobiling with holey jeans, a jacket, sneakers, work gloves, and a pair of goggles. But, the building code and many builders don't seem to see the parallels. Remember, the building code simply describes the worst home you can legally build.

Most heat loss in modern homes is through air leakage - inadequate insulation usually comes in second; thermal bridging, third. The air leakage is like a very small window left open year 'round, but when leaks are spread both low and high, the "chimney effect" amplifies air movement - popular windows and doors are often not much better than older versions. To address these issues properly requires a highly insulated envelope (walls, roof, and foundation); triple-paned windows created for south vs. north exposures; and taped membranes to air seal and protect against moisture problems.

Proper attention to home design makes our homes more resilient, longer lasting, more healthful for the occupants, cheaper to own and operate, safer, and more valuable as an investment, to say nothing of being far less polluting. And the home itself doesn't have to cost more.

WARNING: Side effects will include: no drafts, ladybugs, mice, cluster flies, or cold windows and cold rooms; fewer allergic reactions, very much lower heating and cooling costs,

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Greening the Harvest Feast

Jessie Haas

theodysseyonline.com

"Historically, we've tackled the biggest challenge—that of meaning, and the question of how to live a life—through the concept of 'practice' in the form of a religion, cultural tradition or disciplines like yoga or martial arts. Given the stark facts, this approach might be the most useful. Practice has value independent of outcome; it's a way of life, not a job with a clear payoff. A joyful habit. The right way to live."

---"Stopping Climate Change is Hopeless. Let's Do It." Auden Schendler, Andrew P. Jones, New York Times, 10/6/18.

It's the time of year when we celebrate the harvest with a great big feast. In gratitude to the living earth who feeds us, let's make that feast not a burden to our parent planet, but a blessing.

So, local organic, grass-fed everything? That's only a start. Unfortunately, a large part of food's carbon footprint is on consumers. It's not just transcontinental trucking. It's us, driving from farm to farmer's market to supermarket to the corner store for the essential thing we forgot. It's inefficient home appliances and habits of food preparation.

Kind of a downer, right? But we can make the harvest meal a time to re-examine and improve our practice.

So local, yes. Home-grown is best. When my parents were younger, Thanksgiving included home-raised turkey, potatoes, squash, pickled vegetables, blueberries, apples, celery—a serious bounty.

Most people don't grow that much food, but if you grew and preserved something this year, put it on the table. Pesto? Jam? Homemade pickles, sauerkraut, and horseradish? Why not? You're proud of it, and thankful to have it. Change up the traditional feast to include a taste of your own bounty.

Wild turkeys are everywhere these days, strolling through the woods and across suburban lawns. I don't hunt, but when I see a turkey I feel hungry. If you're a hunter, go get one. It doesn't get more free-range!

Pasture-raised turkeys are getting easier to find, and their grazing contributes to soil carbon

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THE TIME TO ACT IS NOW!

George Harvey

The Johnson Bayou Branch Library in Cameron Parish, Louisiana is built for high storm water. Image: FEMA.

Scientists commissioned by the United Nation's Intergovernmental Panel on Climate Change (IPCC) have produced their report, "Global Warming of 1.5°C"(bit.ly/IPCC-report-2018). Put as simply as possible, the report says we can keep global warming to 1.5°C, but we have to act decisively, and we have to act now. If we do this, climate change will get worse for a while, but it will be livable. If we fail to act, we can expect an average increase of 3°C, and that would be catastrophic.

Perhaps we should look at just one tiny example at what the figures imply. Keeping climate change to 1.5°C does not mean we can save Miami. An article in The Guardian, "Rising ocean waters from global warming could cost trillions of dollars," makes this clear (bit.ly/rising-ocean-waters). Miami has a special problem, which is that the entire region is based on sandstone, and it is porous enough that water flows right through it. This means that even a sea-wall will not help.

The problem of rising seas is not just Miami's. Cameron Parish, Louisiana, which had the highest percentage of pro-Trump voters of any county in the United States, comes to mind. The conservative, Republican government of Louisiana has told the people of Cameron Parish that they will all have to evacuate their homes permanently within fifty years, and depending on where they live, this

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Apple Time! Sustainable Orchards In Our Region

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GREEN ENERGY TIMES (G.E.T.)

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Our mission is to create Energy Awareness, Understanding and Independence – Socially Responsible Living.

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Green Energy Times would like to thank everyone who has submitted articles or helped in any way to make this all a reality. We want to also thank our advertisers & ask that you support them. Say that you saw them in Green Energy Times. Now let's all G.E.T. moving ahead towards a dean, renewable future – one where our children & grandchildren will be able to breathe & grow, live & love on this beautiful planet where we live.

Thank you for reading G.E.T. Please send your comments & suggestions to: info@greenenergytimes.org

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Lebanon Residents Tell City Council, "No Pipeline!"

People rally on the steps of Lebanon City Hall with the message, "No pipeline". Photo: Stuart Blood.

On the night of October 17th, 2018, more than 50 people, including a group of Lebanon High School students, rallied on the steps of Lebanon City Hall to send city government the message, "No Pipeline Here!" Most then walked inside to deliver over 1,100 signatures, all from Lebanon residents and students calling on the City Council to take every legal and regulatory action at its disposal to prevent a natural gas storage facility, regasification plant, and pipeline from proceeding.

Lebanon High School junior Celia Barnett, who led the rally and later addressed the City Council, said, "Until I learned about the petition I was unaware of the gas pipeline that was planned for my community. I was shocked to find out about this dirty and dangerous pipeline. Installing this pipeline will make it much more difficult to move towards renewable energies in the future. I ended up immediately wanting to make a difference."

As Celia concluded her remarks, a classmate presented a petition signed by 115 Lebanon High

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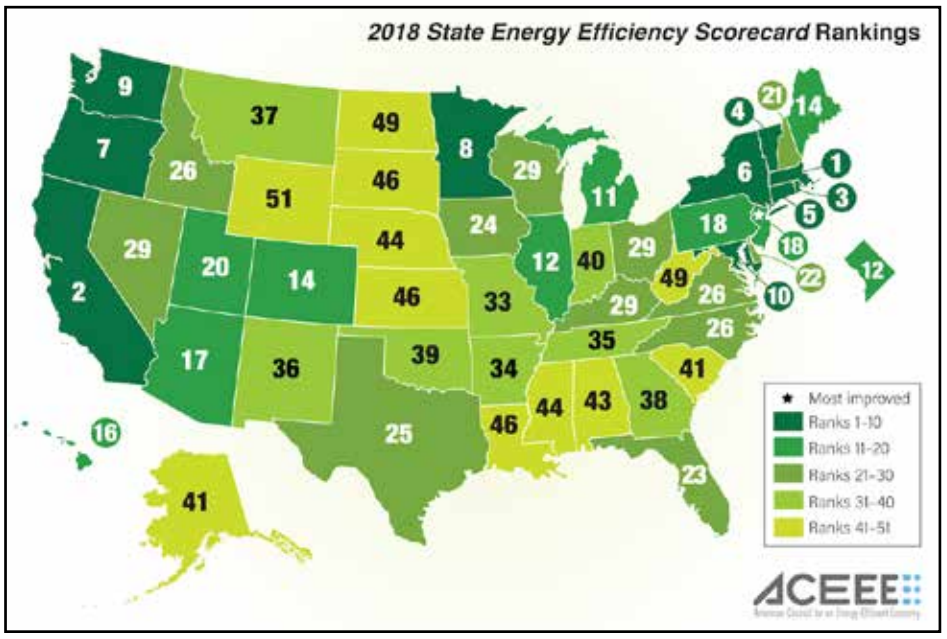
ACEEE 2018 STATE ENERGY SCORECARD

States up efficiency investments and power savings; push net-zero buildings and electric vehicles; NJ, CT, CO, SD improve most; MA and CA lead.

As the U.S. government loosens environmental rules, states are investing more in energy efficiency and delivering increased power savings, according to the 2018 State Energy Efficiency Scorecard. This 12th annual report from the American Council for an Energy-Efficient Economy (ACEEE), released today, identifies the leaders (Massachusetts and California), the most-improved states, notably New Jersey, the states that lost ground such as Iowa, and those lagging behind, including North Dakota, West Virginia, and Wyoming.

The scorecard offers mostly good news about energy efficiency — the nation's third-largest electricity resource. In response to federal efforts to freeze U.S. vehicle and appliance standards, quite a few states worked to retain their own standards and to promote electric vehicles as well as zero-energy buildings. While some, like Iowa and Connecticut, saw legislative attacks within their states, others — including Virginia, New York, New Jersey, Colorado, and Arkansas — unveiled plans to boost investments in efficiency and clean energy, often driven by concerns about climate change. The scorecard, which ranks states based on 32 metrics in six areas, has these key findings:

- New Jersey improved the most, moving up five ranks to No. 18. The Garden State set new annual energy savings targets and took steps to rejoin the Regional Greenhouse Gas Initiative, a multistate cap and trade emissions compact. Missouri, Connecticut, Colorado, and South Dakota showed marked improvement. Other improved states include Nevada and North Carolina.
- Massachusetts continued to rank #1 overall. It launched a plan to set new three-year energy savings targets and approved utility spending for grid-scale modernization. A close second is California, which led efficiency efforts in three areas: buildings, transportation, and appliances. These leaders are followed by Rhode Island, Vermont, Connecticut, New York, Oregon, Minnesota, Washington, and Maryland.



- Iowa fell the most, moving down five spots to No. 24. This drop was due mostly to a bill signed earlier this year (SF2311) that imposes a restrictive cap on efficiency programs and allows customers to opt out of paying for some of them. Sixteen other states also fell in the rankings.

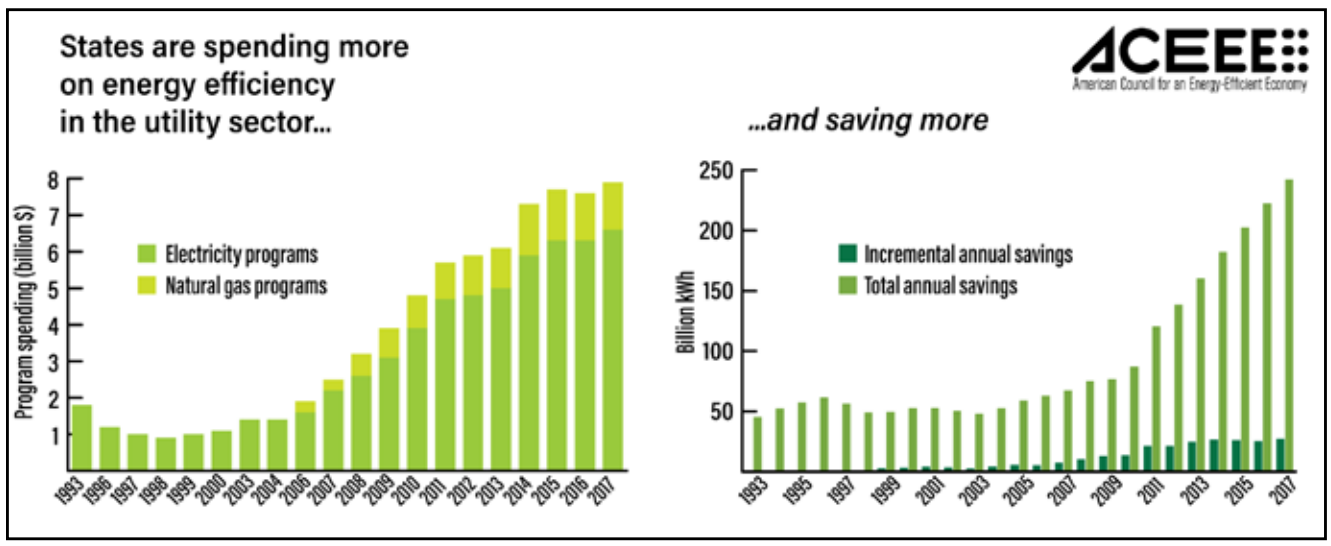
States increased investments in energy efficiency in the utility sector. They spent nearly $8.0 billion last year, up from $7.6 billion in 2016. The result was a 7.3% increase in electricity savings (nearly 26.5 million megawatt-hours) — enough to power about 2.5 million US homes per year.

- States ramped up efforts to promote zero-emission vehicles (ZEV), mostly electric, as the federal government sought to freeze fuel economy standards for cars and SUVs. California joined with eight other states in rolling out an updated ZEV plan, which incentivizes consumers to buy ZEVs. Missouri moved to incentivize the rollout of more EV charging stations, and Oregon to require new buildings be ready to charge EVs.
- More states pushed for zero-energy construction (buildings that produce as much power as they use) largely through tougher building codes. California calls for all new homes and commercial buildings to be net zero-energy by 2020 and 2030, respectively. Vermont, Rhode Island, Oregon, Washington, the District of Columbia and Massachusetts have incorporated net zero-energy construction into long-range plans.

Other key findings:

- States ramped up efforts to create the utility of the future. Ohio, Rhode Island, New York, California, and Minnesota have major plans in place. They're looking to modernize grid infrastructure, leverage data, and deploy more distributed energy resources.
- California and Vermont led in setting appliance standards. California, which has standards for 100-plus products, set new standards for computers, computer monitors, and portable electric spas in 2017. This year Vermont adopted new standards for 16 products.
- States focused on innovative financing solutions. Six states (California, New York, Connecticut, Hawaii, Nevada, and Rhode Island) have set up green banks, and Washington, DC, passed legislation this year to do the same.

The scorecard assesses state policies and programs in six areas: utilities, buildings, transportation, state government, heat and power (combined), and appliance standards. It highlights best practices for promoting energy efficiency, typically the lowest-cost way to meet customers' energy needs. Such efficiency improves air and water quality, strengthens grid resilience, promotes equity, and improves health and comfort. To download the report, visit bit.ly/ACEEE-state-scorecard. ♻



ACEEE
American Council for an Energy-Efficient Economy

THE TIME TO ACT IS NOW! *Cont'd from p.1*

could be much sooner. Some have already been forced to leave their homes because of rising seas. Coastal parishes (counties) have brought suit against oil companies, according to an article in Climate Liability News,(bit.ly/parish-climate-suit).

I should point out that sea level rise is measured by a number of scientific tools. NASA uses lasers, and the changes it measures are believed to be accurate to within less than a quarter of an inch. All of the waters of the Earth have been measured. The problem is not just that the land is subsiding, as some people like to claim.

The problem of climate change goes far beyond sea level rise, however. It will change every place on earth. Weather changes will bring alterations to our environment, dictating changes in agriculture, threatening our road and electric transmission infrastructure, pushing invasive species into new areas, rendering species extinct. That is the type of damage we can expect if we limit climate change to 1.5°C.

If things go past 1.5°C, things get far, far worse.

According to the IPCC report, however, stopping global warming at 1.5°C is still within our power. The cost of doing this is considerably less than the damage caused by allowing things to get worse.

Analysis published in the BBC News article, "Final call to save the world from 'climate catastrophe,'" says that addressing climate change will require investments of about 2.5% of the gross world product for the next twenty years (bit.ly/BBC-final-call). That is about $2.4 trillion per year.

That cost needs to be taken in context, however. We might compare it with the cost of World War II. My rough calculation is that World War II took up over 6% of the gross world product while it was going on. But wars are destructive, even to the winners. By contrast, addressing climate change will not deduct 2.5% from our incomes; it will shift the expenditures from the fossil fuel industries and their affiliates to clean technologies. The figure is well within our abilities.

Let me put that another way. While the Koch brothers and the big stockholders of ExxonMobil and Chevron might object, and while Donald Trump might try to tell you that he knows for a fact that I have an IQ of 65, addressing climate change is almost certainly the biggest business opportunity ever to be presented to human beings. It will produce jobs and income on a scale we have never seen.

Another aspect of this also should be mentioned. The side benefits of addressing climate change almost unquestionably include reducing air pollution, reducing water pollution, and reducing water use. Arguably, it will also reduce our bills for heat, transportation, and all products that need to be transported.

The not-for-profit organization Health and Environment Alliance estimated the health costs of our use of fossil fuels at $2.76 trillion per year, according to an article at triplepundit.com (bit.ly/fossil-health-costs). A quick calculation shows that if this is true, we can cover the cost of aggressive action on climate change with the money we save on health care alone.

We have a choice. By stopping climate change, we can have lots of jobs, be healthier, have more money, and live more comfortable lives. Or, through inaction, we can preserve the profits of big investors in fossil fuels and suffer the consequences. ♻

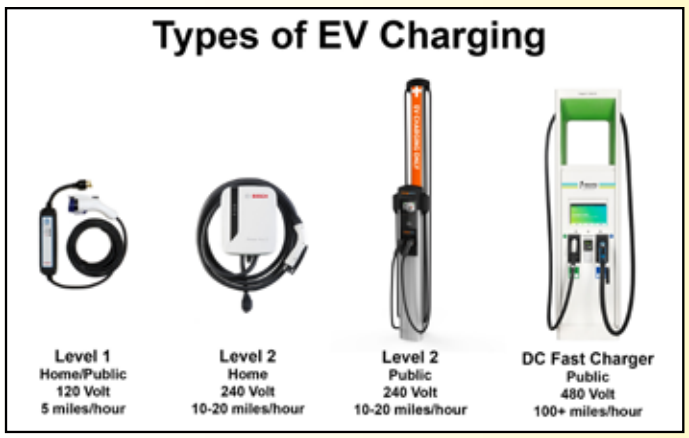
Charging Up Electric Cars WITH NEW GRANT OPPORTUNITIES

David Roberts

Driving a plug-in electric vehicle (EV) is getting easier with the arrival of new longer range and more affordable options, including some with all-wheel drive. Plug-in hybrids, such as the Mitsubishi Outlander PHEV, can run 20-plus miles on the battery and then switch seamlessly to running on gasoline for longer trips. There are also all-electric options like the Tesla Model 3 dual-motor version with all-wheel drive that provide over 300 miles of electric range and a national network of charging for longer trips.

Many potential EV buyers are curious about how these vehicles charge. There are a few different possibilities depending on the vehicle but all of them can plug into a standard 120-volt home outlet to start. Many EV drivers compare the convenience of plugging in at home with the way they might plug in their mobile phone overnight – they just plug-in when they get home, and it's ready to go in the morning.

TYPES OF EV CHARGING



Level 1 Charging (120 Volts)

Level 1 charging uses the same 120-volt power found in standard household outlets and can be performed using equipment that comes standard with the vehicle. It will provide about five miles of range per hour of charging so is typically used at home overnight or at workplaces with long dwell times.

Level 2 Charging (240 Volts)

Level 2 charging uses 240-volt power which enables faster charging of an EV battery system. Providing this type of charging usually requires installation of an Electric Vehicle Supply Equipment (EVSE) unit and electrical wiring capable of handling higher voltage power. The vehicle and charging equipment communicate to ensure neither the EVSE nor the vehicle charging systems are overloaded.

Most plug-in hybrids will charge at 3kW power, which provides about 10 miles of range per hour of charging, while all-electric vehicles often charge around 7 kW which will give 20 miles of range per hour of charging.

DC Fast Charging (480 Volts)

DC Fast Charging (DCFC) provides compatible vehicles with an 80% charge in 30-45 minutes. This is a great convenience if you're on a longer trip and don't want to hang out for hours on Level 1 or Level 2 charging equipment.

Not every EV has DCFC capability. It is generally available on all-electric vehicles, because plug-in hybrids can run on gasoline when needed. Some all-electric models offer DCFC as standard equipment, but it is optional on several models, so you'll want to be sure to include this as a requirement when you are shopping if you think you will ever need it.

Automakers currently have three different options for DC fast charging plugs, the CHAdeMO, SAE Combined Charging System (CCS), and Tesla Supercharger standards.

Drive Electric Vermont

CHAdeMO is used by Nissan, Kia and Mitsubishi EVs. The SAE CCS plug is included in vehicles that the U.S. and Europe manufacturers, including Chevrolet, Ford, BMW and Volkswagen. Tesla's Supercharger equipment is only compatible with Tesla vehicles, although they offer an adapter which allows Tesla owners to use CHAdeMO equipment.

WHERE TO CHARGE

Most EV owners charge at home overnight. This is a great convenience to have a "full tank" every time they leave home in the morning. Charging at work is also a boon to EV owners and studies have shown that having access to charging at work greatly increases the likelihood of owning an EV.

A growing network of public charging is making it easier to travel farther on electricity, with funds from VW's Electrify America subsidiary, electric utilities and others helping fill in gaps and build more redundancy. Apps and websites like PlugShare.com are a great way to see what's available in owners' home areas or to help plan a long-distance trip in an EV.

Tesla has invested in building out an international network of "Supercharger" DCFC which are only available to Tesla owners. Their in-vehicle navigation system can provide routing instructions for cross-country travel on Superchargers, down to how many minutes you will need to stop at each location along the way. Tesla is currently the best option for convenient long-distance travel in an all-electric vehicle.

The best time to install EV charging is when it can be bundled as part of a larger development project involving electrical work near where vehicles park. Any new homes or buildings should consider building capacity in their electric service and conduit to parking areas to streamline future charging installs. In some areas this is even required by the building code.

EV CHARGING GRANT FUNDING OPPORTUNITIES

Many states are putting a portion of the funds from their VW "Dieselgate" settlements toward building out EV charging. Maine recently launched a program to support DC fast charging along high traffic corridors.

Vermont has a current grant opportunity for Level 2 and DCFC installations with $2.4 million in funding available to support:

- Public charging on municipally-owned property (10% cost share required)
- Public charging on private property (20% cost share required)
- Charging for workplace employees or residents of multi-unit dwellings (40% cost share required)

The first round of applications is due on November 30th, with a second round anticipated in April 2019. More details available at: *http://bit.ly/VT-EV-Grants.*

New Hampshire's VW-settlement spending plan includes funding for EV charging installations and other states are also working on programs to put these funds to good use. You can check with your state's VW "designated beneficiary"

Cont'd on p.5

Colby-Sawyer College Installs Electric Vehicle Charging Station

Rebecca Tham and Jen White

As part of the Colby-Sawyer College's most recent campus improvements and commitment to sustainability, an electrical vehicle (EV) charging station was installed this fall at the college in New London, New Hampshire.

The free EV station works with all plug-in vehicles and is located in parking lot D, adjacent to Colby-Sawyer's wind turbine and Sue's Sugar Shack. Estimated charging times can be found at clippercreek.com/charging-times-chart.

A Level 2 EV charging station, Colby-Sawyer College, parking lot D. Courtesy photo.

A generous donation from New London Energy Committee members and EV enthusiasts Jamie Hess and Lisa Kendrick Hess '81 helped fund the Level 2 Clipper Creek HCS-40R 7.7 kW model. Professor of Natural and Environmental Sciences Ben Steele, Ph.D., who commutes to campus in his EV, was also instrumental in bringing the charging station to campus.

Jennifer White, Director of Sustainability and Innovation, met with the college's Facilities Department to identify possible locations and collaborated with Dr. Steele, Jamie Hess and Lisa Hess to determine an appropriate and affordable model that would be accessible to a range of vehicle types.

During a nine month feasibility study, Colby-Sawyer will evaluate user frequency to determine if a future permit or fee system may be necessary. The college will also consider installing more stations on campus based on study results.

EV charging stations are growing in popularity with several universities across New England hosting stations, including the University of New Hampshire, University of Vermont and University of Massachusetts at Amherst. According to the International Energy Agency, the number of EVs around the world numbered 3.1 million in 2017, up 54 percent from the previous year. Projections suggest that number will reach 125 million by 2030. Drivers can find charging stations on the U.S. Department of Energy website at http://bit.ly/DOE-EV-stations.

Colby-Sawyer has purchased 100 percent renewable energy since 2010 and aims to be a carbon-neutral campus by 2015. The college hopes that making this small contribution to the region's electric vehicle infrastructure will allow drivers to continue to reduce their own carbon footprint and will encourage more sustainable ridership in years to come.

Rebecca Tham is a Communications Assistant for the Office of Sustainability. She manages social media and writes for Colby-Sawyer's Sustainable Learning Initiative at Franklin Falls.

Jennifer White is the Director of Sustainability and Innovation and she coordinates Colby-Sawyer's Sustainable Learning Initiative at Franklin Falls. ♻

New EV Grant Opportunities – Cont'd from p.4

agency to learn more on the status of grant programs in states that haven't yet announced their funding programs.

Many electric utilities are also offering support for EV charging, so be sure to check in with your provider on any programs they might be offering. Utilities may have funding available that can be used as cost share toward a state grant funded by the VW settlement.

Charging infrastructure is improving in many areas, but challenges remain with building out a network that will support the millions of EVs needed in our region to meet climate and energy goals. If you have a good location for EV charging, consider asking the business owner whether they might consider offering EV charging in the future – hearing from customers is a great way to boost interest in these funding opportunities!.

David Roberts is the Drive Electric Vermont coordinator. He has driven an all-electric Nissan LEAF for the past six years and says, "If you have to drive, drive electric." http://www.driveelectricvt.com ♻

Nashua, NH's Newest Buses Will Be Hybrids

Green Energy Times staff

Nashua, New Hampshire, is getting two new diesel-electric buses to be paid for through a $1.1 million low or no Emission grant from the U.S. Department of Transportation. The buses are being manufactured by BAE at its plant in Endicott, New York.

BAE Systems launched its hybrid propulsion system about fifteen years ago. According to BAE vice president Steve Trichka, the company has quadrupled in size in the last four years and will sell its 10,000th bus this year.

BAE's new vehicles are great improvements over its earlier models. In the current design, the diesel engine is only used to charge the battery, which means that where there is sufficient charging infrastructure, the buses can operate in pure electric mode. The buses have regenerative breaking, electric air compressors, and electric power steering. They also provide a lot of comfort for the passengers, including wheel-chair access and air conditioning.

Trichka said BAE is very interested in moving into the all-electric market. A problem standing in the way of that is that the infrastructure to charge buses is just not in place, except in places where government or utilities have been aggressively pursuing their installation. By supplying the buses with diesel engines, the batteries can be smaller and reliance on electric charging stations greatly reduced, so the buses can be operated in most communities.

Nashua has been moving away from a purely diesel bus fleet since last year, when it started replacing its older buses with new ones powered by compressed natural gas. A total of eight such buses were purchased.

Its new buses will provide the Nashua Transit Authority with the experience it needs to make a transition away from polluting vehicles. The Authority has a goal of reducing its emissions from vehicles 25% by 2025. ♻

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**

MID-STATE REGIONAL RIDE RESOURCE DIRECTORY - Services elknap-Merrimack Counties, excluding Hooksett and the towns of Deering, Hillsborough and Windsor of Hillsborough County. 603.225.3295 x1201. **midstatercc.org**

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/**

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 **greyhound.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**

DRIVE ELECTRIC NEW HAMPSHIRE

Randy Bryan, Drive Electric NH

Three converted Prius plug-in hybrids charging at San Francisco City Hall public recharging station. Image: Wikimedia Commons/Felix Kramer(CalCars).

GREETINGS AND ANNOUNCEMENT

First, I would like to wish a very happy and safe holiday season to everyone. Holiday season can generate distracted and difficult driving, no matter what car you are in. Be happy and drive safely for other drivers' and your family's sake.

Second, I want to express how pleased I am with the growing state of New Hampshire's Drive Electric event's push. In 2017, there were four to six electric vehicle (EV) events during the whole year (four were during National Drive Electric Week or NDEW). This year, there were six NDEW events around the state and another six to eight events at other times. That's over 100% growth. A huge WELL DONE! to all the event organizers around the state.

WILL AN END OF TAX CREDITS HURT EV SALES?

In 2009, the U.S. implemented a Federal Tax Credit (FTC) for plug-in electric vehicles (PEVs) to encourage manufacturers to make them and to make them more affordable and competitive versus combustion cars.

The formula adopted granted FTCs according to battery size, as that would help to offset higher early-market battery and vehicle cost. To simplify, the formula provided a $7500 FTC for EVs, and $2500-3500 for PHVs. The formula also included a sunset clause where, after a threshold of 200,000 PEVs sold in the U.S. per manufacturer, their FTC would start to decline to zero. The full FTC remains available for two quarters including the one in which the threshold was achieved. The tax credit then drops to half for two more quarters, then drops to one-fourth for two more quarters, then to zero. This schedule was agreed to by the government and automakers as a good transition from market testing to volume (profitable) production.

Because Tesla reached that threshold in July, and other manufacturers are getting closer, it is a good time to reflect on how the manufacturers and market will handle this change. Loss of the FTC will usher in a significant change to how EVs are made, priced, sold and perceived. The FTC went right to the manufacturer in the sales price, then the customer filed for a tax credit with his/her taxes. My guess is that different manufacturers will handle it differently, according to their U.S. and world market view.

Tesla 's FTCs remain at full through the end of this year, then drop to half, then to a quarter in 2019. Tesla is unique in the U.S. market as a comparatively small start-up EV-only car company. Loss of the FTC will hit them the hardest, affecting their core product line. As a result, Tesla has stated they will become profitable by the end of 2018 and will fund new product developments (and price discounts) thereafter. The generator of this profit is and will-be volume manufacture and sales of their EVs and batteries. To their credit, they have shed most of the expensive cobalt from their batteries and built out their charging network. Look for them to press for ever higher manufacturing volumes in 2019, so their profitability can sustain the company. I do believe they will start price decreases in 2019 as their FTC declines.

General Motors will probably be next to cross the 200,000 threshold, probably in the fourth quarter 2018. But its circumstance is markedly different. Their EVs (Chevy Volt and Bolt) are just a tiny fraction of the company's sales. The great bulk of its revenues and profits comes from sales of combustion-based cars, SUVs and trucks. GM has made EVs in low volumes to keep a toe in the game and prefer to delay volume manufacture until its cost of batteries allows profitable EVs. As such, I predict GM will discount its prices as its FTC fades, to stay in the game until 2022-2025.

Next up to the FTC threshold in the first quarter of 2019 is probably Nissan and its Leaf EV. Nissan has been trying to make a volume market for EVs, but not as successfully as Tesla. The recuperation of their combustion-based car, SUV, and truck product lines sustained the company. Nissan has been resorting to price discounts to sustain sales volume. Loss of the FTC will test its boardroom metal more than GM, but I believe they will and can handle the FTC loss with discounts until 2022-2025.

The other manufacturers will produce in small volumes (taking losses) to keep their toe in the game, too. All seem to be waiting for 2022-2025 when the industry cost of batteries will support profitable volume manufacture (still with FTC). For what it is worth, all this delaying of EV production makes it likely Tesla will remain unchallenged until 2022.

Has the FTC worked? Yes, definitely. Early PEV production costs were well above combustion vehicles due chiefly to battery cost and low volume production. The manufacturers swallowed some of the cost and the federal government assumed a share via the FTC. Most early EV sales were made practical by the FTC incentive. As the FTCs are lost, manufacturers will decrease their prices to stay competitive. Going forward, I suspect a sunset date for the FTC may be considered so as not to reward the industry laggards.

Randy Bryan is one of the co-founders of Drive Electric NH. Randy's company, ConVerdant Vehicles*, has converted vehicles to plug-in hybrids and sold inverters that turn a Prius into an emergency generator.* ♻

World's First Zero-Emissions Hydrogen Trains Enter Service

By Lorraine Chow, EcoWatch. Reposted with permission from EcoWatch.

The Coradia iLint, the world's first hydrogen fuel cell train. Image: Wikimedia Commons/Plutowiki

The world's first hydrogen fuel cell train entered commercial service in the German state of Lower Saxony on September 17, 2018.

The Coradia iLint, developed by French railway manufacturer Alstom, features fuel cells that convert hydrogen and oxygen into electricity, emitting nothing but steam and water. The low-noise train can reach up to 87 miles per hour and accommodate up to 300 passengers.

Two such models entered service, replacing some of the noisy, diesel-fueled trains that had been in use. Alstom has plans to deliver another fourteen Coradia iLints to Lower Saxony by 2021, according to a company press release. The state government has invested €81 million (about $94.7 million) for the technology.

Roughly 120 diesel trains in the existing fleet will reach the end of their lifetime within the next 30 years, meaning the new trains could be a sustainable and practical replacement going forward, a transport official noted.

"The emission-free drive technology of the Coradia iLint provides a climate-friendly alternative to conventional diesel trains, particularly on non-electrified lines," Bernd Althusmann, Lower Saxony's Minister of Economy and Transport, said in the release. "In successfully proving the operability of the fuel cell technology in daily service, we will set the course for rail transport to be largely operated climate-friendly and emission-free in the future."

Passengers will be able to take the new, bright blue trains on a 62 mile line running in the region of Cuxhaven, Bremerhaven, Bremervörde and Buxtehude on a fixed timetable.

The two Coradia iLints are fueled at a mobile hydrogen filling station. Hydrogen gets pumped into the train via a 40-foot-high steel container next to the tracks at Bremervörde station. At a full tank, the train can run a full day with up to 621 miles of range, which is similar to diesel trains. Excess energy is stored with onboard lithium batteries.

"This is a revolution for Alstom and for the future of mobility. The world's first hydrogen fuel cell train is entering passenger service and is ready for serial production," Henri Poupart-Lafarge, chairman and CEO of Alstom, said in the release. "The Coradia iLint heralds a new era in emission-free rail transport. It is an innovation that results from French-German teamwork and exemplifies successful cross-border cooperation."

Alstom said that Britain, the Netherlands, Denmark, Norway, Italy and Canada are also looking into the technology, Agence France-Presse reported. France also wants hydrogen trains to be on its rails by 2022.

"Sure, buying a hydrogen train is somewhat more expensive than a diesel train, but it is cheaper to run," Stefan Schrank, the project's manager at Alstom, told AFP. ♻

"No Pipeline!"

Cont'd from p.2

Lebanon High School junior, Celia Barnett, addresses the Lebanon City Council.

School students to the council. Next, Chuck Manns, read out the petition, signed by 1059 Lebanon residents who called on the City Council to "take every legal and regulatory action at its disposal to deny the natural gas depot/pipeline". Mr. Manns, a resident of the Trues Brook neighborhood, which is closest to the proposed site of the storage tanks then addressed safety concerns related to trucking liquefied natural gas (LNG) to the proposed site on a congested main artery through West Lebanon.

Several other Lebanon residents and the chair of the Hartford, VT Selectboard made powerful statements to the City Council. Dr. Eric Bronstein, a family physician and resident of Lebanon, addressed the public health impacts of gas extracted by fracking then noted that gas worsens climate change. "A lot could go wrong with this pipeline, and likely would go wrong, based on this industry's track record. But this issue is way bigger than our backyard," said Dr. Bronstein. "We need to do better than just asking ourselves what could go wrong. We need to ask ourselves what can we do right for the safety of our neighborhoods, our families, our streets, our businesses, our state, and this planet we care about."

Sarah Riley, a member of Sustainable Lebanon, the grassroots volunteer group that organized the petition drive and rally, pointed out "troubling indications" about the safety track record of Liberty Utilities, the company that proposes to build the gas project in Lebanon. She drew attention to a report prepared for Liberty by consulting engineers in August 2015, and noted that specific safety concerns remain unstudied by the company more than three years later. She also noted that Liberty had kept that "fatal flaw analysis" shielded from public view until spring of 2018 when the Public Utilities Commission finally required release of the document following a citizen request under New Hampshire's right-to-know law. Ms. Riley pointed out that the PUC's Safety Division, in assessing Liberty a $20,000 fine in a gas project in Keene, cited the company's "not appropriately following the most minimal of federal safety regulations, Liberty's inability to properly follow its own written procedures and maintaining documentation of the steps being completed per the applicable procedures..." Liberty was fined $54,000 in 2016 and 2017 for failing to monitor leaks in its existing pipelines.

Phil Bush, another member of Sustainable Lebanon, presented a request that the City Council set up a task force dedicated to finding ways that the city of Lebanon can prevent the pipeline from being built. According to Mr. Bush's statement, the task force should include citizen participation from the start and consider opportunities for the City Council to prevent pipeline construction, such as developing an amendment to the City's zoning ordinance, opposing the special exemption from the zoning board that the pipeline requires, and supporting local businesses in rejecting the pipeline proposal. Sustainable Lebanon suggests that the City also explore ways that it can partner with other municipalities, such as Keene and towns along the Granite Bridge route, to oppose the pipeline, and join cities across the state in passing legislation to stop construction of new fossil fuel infrastructure.

Dr. Eric Bronstein, a family physician at Alice Peck Day Hospital and a resident of Lebanon's True's Brook neighborhood, addresses the city council. Photos: Stuart Blood.

Last March, Liberty Utilities secured a gas distribution franchise from the PUC, which provides it a license to build an LNG storage depot and regasification facility and to construct a pipeline through Lebanon and Hanover streets, despite objection from thousands of residents and both municipalities. Liberty would need local zoning permits before it can start construction.

Lebanon City Councilor Clifton Below told the PUC at a hearing In September, 2017 that the city does not support expanding natural gas. He testified "to make clear to the Commission that our current Master Plan, which is the official policy of the City adopted by both the Planning Board and the City Council, does not support the expanded use of natural gas. It's not consistent with our goals to move more quickly to reduce our carbon footprint as a city and to develop renewable energy."

Phil Bush said that catastrophic climate events have convinced Sustainable Lebanon that we have to move quickly to curtail the warming caused by burning fossil fuels. And many agree: a poll of NH residents in October 2016 showed that 67% favor renewable energy to 24% favoring natural gas.

"Many people think natural gas is green, but it's not good for the environment," according to Sustainable Lebanon's Jon Chaffee. "It is a fossil fuel, and it causes even more global warming than the other fossil fuels now used for heating in Lebanon, because gas leaks up into the atmosphere where it has a greenhouse effect 80 times that of CO2".

Chaffee, who recently organized a forum for Lebanon business leaders on renewable energy alternatives, also said, "The pipeline can be stopped if there are no customers. If local businesses are sensitive to public opinion and hear how strongly the public wants to see Lebanon move away from fossil fuels, we are hoping they will refuse to contract for pipeline gas." Liberty is required by the PUC to obtain customer commitments for 50% of the revenue needed to support the pipeline before it can start construction.

"We hope our City Council will respect public opinion and our Master Plan principles and take further action to stop this pipeline," says Sarah Riley of Sustainable Lebanon. She adds, "To that end, I think the best first action the Council can take will be to set up the pipeline Task Force as we have urged them to do." ♻

THETFORD STRAFFORD COMMUNITY SOLAR

First Multi-Use Community Solar in the State Goes Live

George Harvey

Thetford Strafford Community Solar array. September 11, 2018. Photos courtesy of Nancy Rae Mallery.

The Thetford Strafford Community Solar (TSCS) farm, in Thetford, Vermont, is now operational. Unlike the state's earlier community solar installations, the TSCS farm has a mix of types of members. It was formed as a partnership of residents of Thetford, Strafford, and Norwich, a commercial farm, and the town of Thetford itself. Its mixed membership make it a mixed-use community solar farm, the first of its kind in the state.

The solar array has 185 kilowatts of photovoltaic panels. Together, they should produce about 230,000 kilowatt-hours of electricity each year. The electricity is to be sold to Green Mountain Power (GMP) under a net-metering contract. GMP gets the renewable energy credits associated with the energy and retires them.

Net-metering also benefits the owners of the system's 187 shares, who invested $2,782 for each share, by reducing their electric bills. About 85% of the electricity their shares generate is credited to their GMP meter under net-metering to GMP. The remaining 15% of the electricity from the solar farm is credited to the Town of Thetford's meters under a 25-year credit purchase agreement the town has entered into with TSCS, allowing the town to buy power at a discounted utility rate and providing a slight downward pressure on the tax burden to benefit all residents.

While most, or possibly all, of the owners bought shares in TSCS to help reduce the world's carbon emissions, most may also have invested to save money. At least one customer bought two shares specifically to be able to cover the increased power consumption of new heat pumps. Dori Wolfe's company, Wolfe Energy, already renewably powered, will be heated by getting electricity from its two shares.

Building the TSCS system engaged a number of subcontractors in Vermont and New Hampshire. Foremost among them was Norwich Technologies, which built the TSCS array. There will also always be some maintenance to keep the array in top working order, plus the cost of insurance and taxes are the reasons why 15% of the power produced is sold to the Town of Thetford.

The organization is not the only thing novel about the installation. It does not have a fence to keep animals out. This is because the land is home to deer migration. There is technology making the fences unnecessary; one way to do this is to put a fabric coating on wires that makes the array code-compliant in lieu of a fence. The absence of fences means that wildlife living patterns are not disrupted.

The TSCS array was put up during a somewhat slow time for solar construction in Vermont. In-state production of renewable electricity has increased from 12% in 2010 to 20% today. That might sound like progress, but it is nowhere near as fast as what we need to get 90% of our energy from renewable sources by 2050. To do that, we will have to replace nearly all of the fossil fuels we use to power our vehicles, heat our homes, and provide for the needs of industry, and they will have to be replaced by electric power. We have two choices for where the increased power for that comes from: local renewable sources and out-of-state renewable sources. Out-of-state sources imply a flow of money out of Vermont, and they also imply increases in the state's transmission lines.

The TSCS array provides an example of how a renewable energy system can benefit all of the people of a community. Because it is easily replicable, it may provide some guidance to the benefit of all people everywhere, as we deal with climate change. ♻

Dori Wolfe speaks at the ribbon-cutting ceremony.

Solar Is a Family Affair

For Integrity Energy of East Bethel, Vermont

Evan Lawrence

Solar power is a family affair not just for Integrity Energy LLP of East Bethel, VT, but also for some of Integrity's customers. The small solar design and installation company has completed solar energy projects for two homes, owned by a father and son, and their business, EyeCare for You, in Bethel, VT. This is an exciting three-part family affair installed by a family-owned and operated solar company.

Amos Post founded Integrity Energy in 2011. He entered the solar industry with groSolar and spent nine years there at positions that included lead installer, project manager, and service manager. Post left the company in 2011 when groSolar stopped doing residential projects.

Post met carpenter John Mattern at their church and got Mattern a job at groSolar in 2008. When Post started Integrity, he hired Mattern as a subcontractor. Mattern joined Post as co-owner in 2013. Mattern's brother David came on part-time in 2014, doing installation and IT design. Post's younger brother Greg also works on installations.

Mattern and Paul Lambert built the sugarhouse at Silloway Maple Farm in 2014, and Mattern and Post designed and installed the PV system for the building. Marilyn Lambert is engaged to Mattern and helps cover the Integrity Energy office.

To date, Integrity has installed more than 1,000kW of photovoltaics on houses and small businesses in Vermont and New Hampshire, with more than 150 projects. Its portfolio includes roof, ground, and pole mounts, both on and off-grid. Integrity's goals are a high level of workmanship, polite efficiency, and an ability to deliver good-quality installations at a reasonable price. Post has a PV installation professional certification from NABCEP, the industry's highest recognition.

Top photo from top to bottom: John Mattern, Greg Post and Amos Post, as the east roof installation was completed; below is the west-facing roof installation at EyeCare for You in Bethel, VT. Photos: N.R. Mallery

Jerry Barcelow, OD, owns EyeCare for You and practices there with his children, optometrists Dean and Rebecca Barcelow, continuing the family affair for the whole three-year project. Dean Barcelow became interested in solar power several years ago as part of his desire to become more energy-efficient. Integrity put a 14.08kW system on his roof in 2016. Combined with LED lights and cold-climate heat pumps, the PV system has saved him 32,209 pounds of carbon emissions. He also drives a hybrid vehicle.

Jerry Barcelow "went solar" in 2017 with a 5.5kW residential system. The system has reduced his household emissions by 7,300 pounds of carbon, according to Post's calculations. The electricity for both homes is 100% solar-powered.

From there it was an easy decision to convert the office, the practice's home since 1998, to solar. The building's ridgepole runs north-south, so Integrity placed the panels on the east and west-facing roof slopes. The 27kW system was completed in October. It is projected to generate a little more than 100% of the office's electricity needs and to offset about 41,000 pounds per year of CO2 emissions.

The EyeCare for You building was one of Integrity's larger projects to date. The panels are Canadian Solar with Iron Ridge racking and EcoFasten attachments. For this job, Integrity chose Solar Edge inverters. The brand has an optimizer that makes the design easy and straightforward, Post said. Integrity also uses SMA inverters for ground mounts, depending on the situation.

Along with gardening, the Barcelows are beekeepers. Hives behind the office on Route 107 produce honey from nearby stands of wildflowers, which the doctors sell to their patients.

For a small company, Integrity has a wide range of experiences. Although the company can do all three major types of installations, Post said he prefers rooftops "because they're simpler, there's no need to excavate, and the space is already available."

One of Integrity Energy's early installations. 'Grandpa's Garage' was completed in June 2011 for Gabriel Gagne in Swanton, VT. Courtesy photo.

Solar energy has grown since Post started in the business. "There are definitely more people considering solar and open to the idea of solar today," he said. "It is more accepted. Before, it was really expensive or was for super-green, tree-hugger kind of folks. Solar used to be political, but now people on both sides are open to the idea."

This past year saw Integrity's biggest increase in installations, Post said. Changes in state incentives haven't hurt the company, because most of its jobs are smaller in nature. The EyeCare for You office was Integrity's first job for a medical practice. Because Route 107 is well-traveled, "the exposure for solar on EyeCare for You is very good," Post said.

For more information about Integrity Energy, visit ienergyvt.com, call (802) 763-7023, or email info@ienergyvt.com.

Evan Lawrence is a free-lance writer in Cambridge, NY, specializing in sustainability, environmental, and health topics. ♻

Brattleboro Landfill Solar System Commissioned

George Harvey

16,000 solar panels adorn the former Brattleboro Landfill after a strong collaboration of local companies.

On October 11, 2018, the solar array at the landfill in Brattleboro, Vermont, was formally commissioned. Officials from a number of interested organizations were on hand, along with those of the Windham Solid Waste Management District, which manages the landfill. The solar array had been generating power since June 30.

The Brattleboro landfill solar project has been under development for five years, and has suffered a series of setbacks along the way. The developers were persistent, however, and eventually brought the long work to fruition.

The array was originally envisioned as a special project under the net-metering system in Vermont. Net-metered projects had a maximum size of two megawatts (MW), but the Brattleboro landfill was explicitly given a five MW maximum size in a clause in the net-metering law, Act 99, in 2014.

Solar arrays on landfills have a common special requirement, which is that the integrity of the landfill cap has to be preserved. The cap is put in place when the landfill is decommissioned to trap methane gas from escaping into the atmosphere. This gas is often used to drive engines to generate electricity, if there is enough of it, or it is flared to prevent it from being released into the atmosphere.

Since the cap has to be preserved, it is necessary that the solar panels rest on special ballasts, usually made of concrete, which can sit on top of the ground. The array has over 3,000 ballasts supporting about 16,000 solar panels. Anything that can affect the cap has to be done with due consideration. Digging for underground conduits has to be done carefully by experienced operators.

The towns of Brattleboro, Wilmington, Readsboro, Vernon, Wardsboro, Dummerston, Halifax, and Newfane are all system stakeholders. Schools in Brattleboro, Vernon, Putney, and Marlboro are also beneficiaries, as are Landmark College and the Brattleboro Retreat. The savings for these municipalities and organizations are expected to start at $375,000 per year, increasing slightly over the 25-year term of the array's operation. The Windham Solid Waste District is also to receive payments for a lease.

A company in Burlington, Vermont, Encore Renewable Energy, partnered with Sky Solar to develop and fund the project. Sky Solar, a world-wide company with headquarters in Hong Kong, did important parts of the engineering. We were told that Gran Solar, another worldwide company, supplied a number of solar installers through an affiliated company in North Carolina.

Much of the work on the array required local talent that was familiar with local conditions, electric codes, worker safety regulations, and the special requirements of landfill solar systems. Integrated Solar, of Brattleboro, Vermont, Southern Vermont Solar, of Westminster, Vermont, and Renewable Edge, in Tarrytown, New York, were responsible for electrical wiring, but much of the management of local organizations and personnel was done by Integrated Solar. This work went beyond simple management, however, to include keeping an eye on safety, quality control, and code issues. For example, the final push to finish the array was done in severely hot conditions, and it became important for the safety of workers that they be kept hydrated sufficiently. Integrated Solar's Katrina Wilson said, "When that happened, we handed out a lot of water and Popsicles."

The ground work, protecting the landfill cap, digging for subsoil conduits, and preparing and installing a concrete transformer pad, was all done by local contractors. Dynamic Organics, of Putney, Vermont, worked with Southern Vermont Solar to provide guidance on issues relating to ballasts and the landfill cap. The actual digging was done by Evans Construction, of East Dummerston, Vermont.

Andy Cay, the owner of Integrated Solar, as he was managing shares of the electrical wiring, was responsible for bringing into the job a number of other organizations, including friendly competitor Southern Vermont Solar, and Dompier Electric, of Brattleboro.

Victoria Roberts, from Southern Vermont Solar commented on the extent of local involvement, saying, "The strong collaboration of the local companies working together with the larger companies from out of state and country was key to overcoming the challenges to build the project. The globalized system of bidding came with added hurdles to an already complicated project. Pulling this off is an extraordinary accomplishment, but if Vermont is serious about being 90% renewable by 2050, we will need to be bold and participate in more of these complex collaborations." ♻

Many thanks to our sponsor:

Cable trays protect the integrity of the capped landfill where burying conduit and conductors was not an option.

Wiring of the combiner boxes. Photos courtesy Integrated Solar Associates.

Bradford, NH Soccer Field Named after Granite State Solar

Granite State Solar Field JPG: (L-R) Teri Gauntt, Granite State Solar CFO, Andy Spiegal, Granite State Solar Installation Consultant, Erik Shifflett, Granite State Solar co- owner, Ed Shaughnessy, Bradford-Newbury Sutton Youth Soccer Executive Board President and Alan Gauntt, Granite State Solar co-owner.

On Saturday, October 20, the Board of Directors of the Bradford-Newbury Sutton Youth Sports (BNSYS) dedicated a soccer field in Bow, New Hampshire in honor of Granite State Solar (GSS). The soccer field located at Warren Brook Park is now known as the Granite State Solar Field and was dedicated to GSS after the donation and installation of a 4.2 kW DC roof-mounted solar array.

"Granite State Solar has stepped in and really helped out this community and its youth athletes," said Edward Shaughnessy BNSYS President. "This solar array installation will help us offset the cost of our electric bill especially when the park and fields are not in use. We will be able to store energy year round saving us more money and allowing us to put every dollar possible back into our athletes and the fields they play on."

"At Granite State Solar we believe in giving back to our communities and what better way than with the installation of a 4.2kW solar array," said Erik Shifflett, co-owner of Granite State Solar. " This system will not only save the community money but they will be able to conserve energy and reduce the town's carbon footprint."

Granite State Solar installed the 12-panel solar array system on the roof of the athletic field's snack shack building.

Celebrating its 10th year, Granite State Solar (GSS) located in Bow, New Hampshire designs, sells and installs photovoltaic energy systems. They are known for their customized energy solutions for residences, businesses and municipalities throughout New Hampshire. Granite State Solar provides state-of-the-art products with innovative system designs and eco-friendly solutions that conserve energy and save money. All systems are designed, installed and maintained by a full-time staff certified technicians, electricians, and engineers. Visit www.granitestatesolar.com or call 603.369.4318. ♻

Dancing with the Sun at MoCo Arts – Keene, NH

Jessie Haas

MoCo Arts, a nonprofit family-based arts education organization in Keene, NH, had solar planned for phase two of its brand new facility, somewhere off in the future. But thanks to a grant through The New Hampshire Charitable Foundation, phase two was completed four weeks after the new building opened.

The two story building, featuring a black box theater that seats 200 and three full-sized studios, was designed by architect and MoCo parent, Katie Cassidy Sutherland, and has energy efficiency in its DNA. At 17,000 square feet, it was designed to have energy costs similar to MoCo's previous 7,700 square foot building.

Sutherland, working with H3 Hardy Collaboration Architecture, a New York City theater architect firm, designed the building for LED lighting inside and out. Many lights have timers, daylight sensors, and motion detectors, so the lights are never on when they are not needed.

Moco Art's lobby has a Kalwall translucent wall system providing diffuse daylighting using lightweight structural sandwich panels which are energy-efficient.

Heating, cooling, and ventilation is through an air distribution system that is gas-fired and electrically cooled. It is controlled with a web-based energy management system. There are seven zones giving MoCo the ability to heat or cool each area based on usage and solar exposure.

The building envelope plays an important role in helping MoCo meet its energy efficiency goals. It exceeds energy code by 50% by employing: a continuous air barrier system; over the air barrier is 4 inches of continuous insulation at the exterior wall and 8 inches at the roof, 2 inches of continuous insulation below the slab, and enough rigid insulation that the dew point occurs outside the building, eliminating condensation within the structure.

The building is oriented to maximize sun exposure for passive heating, daylighting, and the new solar photovoltaic system. Another aspect of daylighting is the Kalwall translucent wall system in the lobby and one studio. Kalwall makes highly insulating, diffuse light-transmitting walls which allow light to come in while blocking solar heat. This allows natural daylighting without increasing the need for air conditioning.

"It's amazing," said executive director Reagan Messer. "The staff and families all pinch ourselves every day."

Messer particularly likes the Kalwall systems. Kalwall, a Manchester, NH company, provides its trademarked "museum quality daylighting" with lightweight structural sandwich panels. The company claims its panels are 400% more energy-efficient than double-paned insulated glass. The Kalwall system provides diffuse daylighting in the MoCo lobby. In Messer's office, two walls are windows, and he rarely has to turn on a light.

The intention was always to have solar on the roof to meet 100% of electricity needs. But that was aspirational, with MoCo focusing on raising $5 million for its new home. Then a few months ago, The New Hampshire Charitable Foundation contacted MoCo and said they had a donor who was interested. Working through a donor-advised fund, the Foundation facilitated a $138,000 grant to install one hundred thirty-seven 360 watt modules, manufactured in Canada by Heliene. Total array size is 49.32kW DC. The array is expected to produce between 56,000-58,000kWh annually. Solar Source, a division of The Melanson Company Inc., designed and installed the system. A small portion of the grant is set aside for maintenance.

The system went live on September 28th and will meet 70% of MoCo's needs, short of the original goal of 100%. The installation was limited by roof size. Still, the array significantly reduces overhead and allows MoCo to focus on its mission. The nonprofit already provides $70,000 a year in tuition aid. Trimming the electric bill will allow that to continue. "The generosity is allowing us to breathe easy for many years to come," says Messer.

Other energy-conscious features include structural concrete floors for thermal mass, which reduce heating needs, recycled and regionally produced building materials, low impact development techniques to reduce storm water runoff, plumbing systems designed to conserve water, and not least, site selection in downtown Keene, which make MoCo accessible by public transportation, walking, and biking.

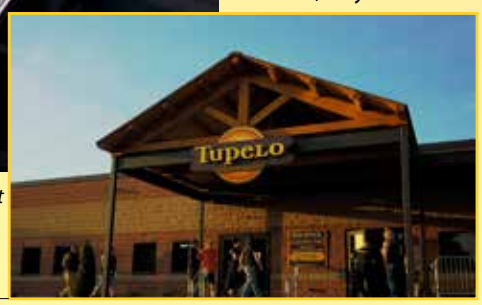
Links available with the posting of this article on the G.E.T. website. ♻

The 49.32kW rooftop solar array at MoCo Arts consists of 137 panels and will offset 70% of their energy needs. Courtesy photos.

Solar Power Sings Powerfully at Tupelo Music Hall

How Derry's Net-Zero Task Force Helped Tupelo Music Hall Become the First Solar-Powered Performance Venue in NH

By Chris Gillespie



The 313 solar panels (100-kilowatt) rooftop solar array installed by ReVision Energy at Tupelo will yield enough energy to power the entire concert hall; right: Tupelo Music Hall moved to its new state-of-the-art home on A Street in Derry, NH in 2017.
© Photo courtesy of Jerry Lofaro.

Tupelo Music Hall's journey to making history as the first solar-powered concert hall in the state started not unlike the careers of many famous musicians: with an invitation for collaboration. The hall is in Derry, NH.

"We started the Net-Zero Task Force focusing on municipal buildings and schools, but another one of our goals was to find out who else in the community would be interested in investing in solar," said Town Councilor and Vice Chairman of Derry's Net-Zero Task Force Joshua Bourdon. "We were looking for local businesses that were popular and extremely busy."

Approaching Tupelo Music Hall, according to Bourdon, was an obvious choice. The award-winning multi-genre performing arts space moved to a renovated facility in Derry in early 2017 after thirteen years of building statewide acclaim in a repurposed nineteenth century farmhouse in the neighboring town of Londonderry.

"Tupelo is such a draw to town. They're a face of the community," said Bourdon of the venue that hosts over 200 nationally-recognized music and comedy acts per year. "A few years ago, when they relocated from Londonderry, they could have gone anywhere, and they chose Derry."

Scott Hayward, Tupelo Music Hall's owner, was receptive to what Bourdon and the Net-Zero Task Force had to say. At the time, Hayward and his team had already found success using exclusively LED lights in the facility, installing energy-efficient appliances and using biodegradable packing materials for the venue's food and beverages.

"When we built the new venue, we wanted it to be as energy-efficient as possible and find ways to reduce our carbon footprint," said Hayward, adding that going solar was a goal, but that the timing needed to be right, as the new facility still needed some renovations done on its roof.

"From a purely financial perspective, solar panels are great because you just have to pay them off once and then you're done," said Hayward. "The sunshine is already there – why not utilize it?"

The project became infused with an extra sense of urgency when the Trump administration announced the tariffs on solar cell imports. Bourdon and his team "explained what was possible" to Hayward in terms of solar energy and took care of all of the initial legwork. Hayward says that Bourdon and his team, "streamlined the process and helped him understand what he was looking for" and even put him in touch with a list of companies specializing in solar panel installation.

"Derry is a business-friendly community. My team will do as much as possible to help you get settled in and thrive in our town, absolutely free of charge," said Bourdon. "Any advice or help we can provide to local business owners, we will."

Using the town-provided list, Hayward eventually decided that ReVision Energy was the ideal partner for his project.

"ReVision has been fantastic," said Hayward. "They have provided us with everything we've needed to know and have been very thorough and super attentive throughout this whole process."

Once the 313 rooftop solar panels go live this October, they will yield roughly 115,000 kilowatt-hours a year, providing enough energy to power the entire facility.

"Go big, or go home," said Hayward when talking about the

Cont'd on p.15

Whole Village Energy Makeover

Brings Everyone to the Table in Plymouth, NH

A one-of-a-kind partnership is saving thousands in energy costs and putting food on the table – literally – at a Plymouth area homeless shelter.

Extensive upgrades of the energy infrastructure at Whole Village Family Resource Center and the neighboring Bridge House shelter is projected to save up to $25,000 annually in propane and electricity costs, some of which has already been repurposed to start a nightly family-style meal for Bridge House residents and staff.

A new 33kW solar PV array is the centerpiece of energy efficiency improvements at the Whole Village Family Resource Center. Photo: NHEC.

"It's done wonders for the cohesiveness of the group," said Susan Amburg, Director of the Whole Village Family Resource Center. "You have a different relationship after you've sat across the table from someone."

It's the culmination of a two-and-a-half year project that involved nearly as many partners as the number of solar panels installed on the roof of the two buildings. Local and state organizations, from the Granite United Way and NH Charitable Foundation to New Hampshire Electric Cooperative (NHEC) and Plymouth Area Renewable Energy Initiative (PAREI), joined forces to identify energy-saving opportunities and create a detailed project schedule. The result has been an overall 80% reduction in annual electricity consumption.

Sandra Jones, Director of PAREI and de facto project manager, said the Whole Village project was guided by a simple mantra: "Reduce Before You Produce." Initial efforts focused on improving the energy efficiency of the buildings by retrofitting indoor and outdoor lighting with LED fixtures and timers, installing a new central air conditioning unit, reducing standby power loss, adjusting HVAC controls, and educating building occupants on behavioral changes that make more efficient use of energy.

With an efficient building shell and energy systems in place, construction was completed in May 2018 on a new 33 kilowatt (kW) solar photovoltaic (PV) array capable of producing enough power for eight typical homes. The new array on the roof of the Whole Village building joins a 25 kW solar PV array at the Bridge House which was one of the project's first undertakings. At Whole Village the combination of the occupant's energy conservation, the new energy efficiency upgrades and two month old solar PV array, have resulted in an annual electricity consumption drop from 122,610 kilowatt-hours (kWh) to 47,537kWH in July of 2018.

"And once the solar PV is on line for a year we expect to see their electric load at Whole Village drop to 22,200kWH annually. That's an 82% drop", said Sandra Jones. "The directors of both Whole Village and Bridge House came to PAREI asking for ways to reduce their energy and their costs. We made it happen one meeting, one step and one building at a time."

The majority of funding for the project came from the generosity of local and statewide businesses who purchased $321,875 in NH tax credits provided by the New Hampshire Community Development Finance Authority (CDFA).

Businesses that donate to local projects that have received a CDFA business tax credit grant can get at least 75% of that contribution back in the form of a state business tax credit. A roster of local and statewide businesses stepped up to purchase the tax credits and donate to the project.

Also taking a lead role in the project was NHEC, which provided technical advice and incentives totaling more than $20,000.

"The amount of staff time the Co-op dedicated to this project was so appreciated," Amburg said. ♻

$40 Million Announced to Support Solar-Powered Storage Projects in NYS

Projects Advance Progress of New York's Ambitious Target to Have 1,500 Megawatts of Energy Storage by 2025

On October 10, 2018, Governor Andrew M. Cuomo announced that $40 million will be made available to support solar projects that integrate energy storage, accelerating progress toward New York's energy storage target of 1,500-megawatts by 2025. These projects will build toward Governor Cuomo's mandate that 50 percent of the state's electricity come from renewable sources by 2030 to combat climate change and build a cleaner, more resilient and affordable energy system.

"As we continue our aggressive pursuit of clean, renewable technologies, funding for projects like this will ensure New York remains at the forefront of the global fight against climate change," Governor Cuomo said. "The strategic pairing of energy storage and solar technologies moves us closer to building a clean energy economy that protects critical natural resources and benefits all New Yorkers."

Today's announcement was made at the Alliance for Clean Energy - New York (ACE-NY) annual conference in Albany. This funding represents a continued commitment by the state to ensure the rapid growth of the evolving solar industry energy is paired with innovative storage technology that will significantly reduce emissions and provide additional benefits to the electric grid. As New York adds more renewable energy to the grid, storage will play an increasingly important role in improving the efficiency and reliability of the grid for all New Yorkers.

To help jumpstart New York's energy storage efforts, the NY-Sun program will make $40 million available in early November for the development of solar-plus-storage projects. This funding will accelerate the deployment of at least 50 megawatts of energy storage paired with solar, and reduce barriers to deployment of this clean energy technology associated with customer acquisition, siting, and interconnection.

These funds will be the first storage incentive funds made available since the release of the New York State Energy Storage Roadmap in June. By offering a new incentive for solar-plus-storage projects for the commercial and industrial sectors, including so-called community solar gardens, the storage component will ensure that renewable energy is shifted to times of highest customer usage, such as afternoon hours on summer days. Solar-plus-storage helps reduce consumer energy bills and improves the value of renewable energy to the grid. In addition, paired solar and storage systems can deliver lower costs to consumers by taking advantage of expiring federal tax credits, combining the permitting and interconnection processes, and utilizing less space by co-locating on the same sites.

To ensure that communities are informed about the benefits of co-locating storage with solar systems and prepared to review the zoning and local tax implications of these projects, NYSERDA will be performing outreach to communities where projects are proposed and will be providing technical resources, including adding an energy storage chapter to the solar guidebook (http://bit.ly/SolarGuidebook) for communities.

In his 2018 State of the State address, Governor

Cont'd on p.15

Maine Solar Solutions – Keeping the Power On

George Harvey

A 6.6kW pole mount tracker solar array installed by Maine Solar Solutions. Courtesy Photo.

Maine Solar Solutions (MSS) is just outside the town of Freeport, in the southern part of Maine and not far north of Portland. Sam Zuckerman, the owner of MSS, provided us with some insight on how to design and install grid-tied photovoltaic (PV) systems with battery backup.

Like many other solar installers, MSS can design and install a grid-tied solar system or an off-grid system. MSS can also install heat pumps, such as those made by Mitsubishi or Fujitsu. Most installers seem not to be interested in designing and installing grid-tied systems that have battery backup, but Zuckerman says while there are not large numbers of these installations, he has a fair amount of experience with them.

The approach MSS uses for system design begins with understanding, and this is particularly important for grid-tied systems with battery backup. MSS makes a point of understanding the particular needs of the customer. Based on what they find, the MSS team can provide the customer with a complete understanding of available options.

Many customers for grid-tied solar systems are surprised that household systems will not provide power during a grid outage unless special attention has been put on providing electric power in that situation. There is such a thing as an inverter that provides a little power without a battery system, but even if such an inverter is chosen, it usually cannot supply power that is constant enough to do much more than charge cell phones or laptop computers. To provide for most living situations, a battery backup system is needed.

The costs of grid-tied battery backup systems are not trivial, so it is really important that they be designed carefully. For a customer who is grid tied, the least expensive alternative to batteries may be some sort of generator. A generator is a stop-gap solution and has serious drawbacks, including making sure there is enough fuel, but if the grid is sufficiently reliable, and whatever outages that do come are short, a generator might do.

For situations where the outages might last, and energy security is important, batteries should be considered. Their design needs to be wisely undertaken, however, to avoid unnecessary expense. Both systems that are too large and those that are too small can prove costly in their own ways. A well designed system is sized carefully, taking into account the owner's own critical load, the minimum requirement to provide for that owner's energy security.

Two neighbors, living side by side can have very different critical loads. For example, one house might be heated by wood and have its water gravity-fed from a spring. If the grid fails to supply power, the critical load may only be what is needed to run the refrigerator and a few lights. Its battery system can be quite small and function well.

Another house may have a large number of people living in it, a refrigerator and a freezer, a deep well drawing a lot of electricity to supply water, and a heating system that needs electric power to run. For such a house, both the battery system and the PVs that charge it have to be sufficient to meet those needs.

Design does not stop with identifying the parameters. The components need to be chosen so they are compatible with each other. Zuckerman used the example of LG lithium-ion batteries and SolarEdge inverters to explain this. They are designed in a way that makes putting them together in a system particularly easy.

Given the rapid decline in battery costs and the rise of smart grids, grid-tied systems with battery backup are becoming more common in parts of the world. We could easily see that happening here in the Northeast.

The Maine Solar Solutions website is mainesolarsolutions.com. ♻

$40 Mil For Solar Storage

Cont'd from p.14

Cuomo announced a 1,500 megawatt energy storage target by 2025 to put New York on a path toward a larger 2030 target to be announced in late 2018. In June, NYSERDA and the Department of Public Service, in conjunction with stakeholders, developed the New York State Energy Storage Roadmap to identify the most promising policies, regulations, and initiatives needed to realize the Governor's ambitious 2025 energy storage target. The NY Green Bank also has available an RFI to solicit interest from project developers on how it can address financing gaps and support energy storage projects. NY Green Bank seeks to invest at least $200 million in storage related-investments, which will help drive down costs for the strategic deployment of energy storage at scale.

NY-Sun is Governor Cuomo's $1 billion investment to build a self-sustaining solar market and solar industry in New York State. The program has already completed 85,327 solar projects with a total capacity of 1,203.2 MW and an expected annual production of 1,395GWh - the equivalent to powering nearly 200,000 homes or taking nearly 160,000 cars off the road. With over 4,437 in the pipeline, NY-Sun is supporting the tremendous growth in the solar sector and has positioned New York as third nationally for residential and non-residential solar installations year-to-date. ♻

Tupelo Music Hall

Cont'd from p.13

scale of the installation. "We are stewards of the world. What do we want to leave our kids—a junkyard? The more fossil fuels we burn, that's what we're creating. Solar energy now is way ahead of where it was only a few years ago, and we should embrace it."

The ribbon-cutting ceremony for Tupelo Music Hall's rooftop array took place on October 16th—yet another exciting event in a month that Hayward describes as "our biggest month of the year for shows and events," with performances by The Wailers, George Winston, Livingston Taylor and Billy F. Gibbons from ZZ Top.

Although the music from these shows can't be heard from Town Hall, the excitement has certainly carried. Said Bourdon, "We are thrilled that the owner of an extremely popular local business is leading by example and putting his money where his mouth is when it comes to clean energy."

For more information on Tupelo Music Hall and tickets for upcoming shows, visit www.tupelomusichall.com.

For more information on the Derry Net-Zero Task Force, visit www.derrynh.org/net-zero-task-force.

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

FEDERAL

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.

- Residential Renewable Energy Tax Credit: http://bit.ly/energy-gov-R-E-tax-credit
- Electric Vehicles - Tax credit for qualified plug-in electric drive vehicles including passenger vehicles and light trucks. For vehicles acquired after December 31, 2009, the credit starts at $2,500 and goes up to $7,500 based on the battery specs.

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

REGIONAL

NEW ENGLAND GRASSROOTS ENVIRONMENTAL FUND

MODEST GRANTS ARE AVAILABLE FOR COMMUNITY-BASED ENVIRONMENTAL WORK IN CT,MA,RI,NH,VT,ME

- Must be volunteer driven or have up to 2 full time paid staff or equiv.
- have an annual budget up to $100,000
- "Seed" grants of $250-$1,000 and "Grow" grants of $1,000-$3,500
- 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.

Advanced Wood Heating

- Advanced wood pellet heating systems -- $6,000 per pellet boiler/furnace. CEDF and EVT each provide a $3,000 incentive. Details at www.rerc-vt.org or call (877) 888-7372.
- Starting July 1st retails sales of "Advanced Wood Boilers" are exempt from Vermont's 6% sales tax. http://tax.vt.gov/exemptions,
- **Details at www.RERC-vt.org or call (877)888-7372**

Windham County

- For residential low- and moderate-income residents there is a pellet stove program. Contact the Windham and Windsor Housing Trust for more information: Tara Brown at 802-246-2119
- For wood heating (pellet or chip boilers/ furnaces) in municipal buildings, schools, and non-profits contact the Windham Regional Commission: Marion Major at 802-257-4547 ext. 109 or windhamregional.org/energy/wwh

In Rutland County (and towns in neighboring counties that boarder Rutland Co.) contact Melanie Paskevich mpaskevich@nwwvt.org at NeighborWorks of Western Vermont, (802) 797-8610.

Pellet Sap Evaporators:

Incentives are available for new, high-efficiency wood pellet- or chip-fired evaporators utilized as primary evaporators completely replacing oil or cord wood-fired units. $200/sq-ft of evaporator pan. Info at RERC-vt.org

Other Utilites Heating Offers

- Members of Washington Electric Co-op (WEC) can get a $1,000 rebate on approved pellet boilers/furnaces. This can be added to the CEDF and EVT incentives for a total of $7,000. Call WEC for details: 802-223-5245.
- Members of the Vermont Electric Co-op can get a $150 credit on the purchase of an approved pellet stove: www.vec/energy-programs.

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®)

- Special pricing on LEDs at Vermont retailers for as low as $.95.

Home Efficiency Improvements

- Improvements: air sealing, insulation and heating system upgrades - up to $2,500 in incentives by using a participating* contractor

Appliances (must be ENERGY STAR)

- Dehumidifiers $25 - $40 mail-in rebate
- Clothes Washers - $40 - $75 rebate
- Refrigerators - $40 - $75 rebate
- Clothes Dryers - $50 to $400 rebate

Heating/Cooling

Efficiency VT (EVT) has a new custom incentive for commercial/institutional installations of pellet heating systems. Contact EVT for details: (888) 921-5990.

- EVT also has a flat-rate incentive of $3,000 for pellet boilers. This can be combined with CEDF's $3,000 incentive for a total of $6,000.

Residential New Construction

- Enroll to receive a home energy rating, expert technical assistance, and incentives – Efficiency Vermont Certified™ projects receive up to $3,000 cash back
- Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives

Other Opportunities To Save

- Advanced Power Strips – special pricing starting at $6.95*
- Pool Pumps – up to $600 rebate on select ENERGY STAR models
- Commercial Refrigeration Evaporator Fan Motors - $60-$100 each w/ point of purchase discount
- Heat Saver Loan – low-interest loans of up to $35,000 for home weatherization and heating improvements
- For commercial refrigeration, lighting, or HVAC rebates, apply online for a 20% bonus at rebates.efficiencyvermont.com

*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

NH PUC: Get up-to-date information at http://bit.ly/puc-nh-RE-rebates

Commercial Solar Rebate Program

– waitlist; closed to new applicants

This Program has been modified by Commission Order to consolidate the two eligible project categories:

Category 1 was previously for solar electric and thermal systems rated less than or equal to 100 kW (AC) or thermal equivalent and Category 2 was previously for solar electric systems greater than 100 kW (AC) but less than or equal to 500 kW (AC). Incentives are limited to 25% of the total project cost or $50,000 if less than the AC incentive payment otherwise calculated, whichever is less. The Program is available to non-residential structures with a commercial electric meter located in New Hampshire. Incentive levels for PV systems are as follows:

- $0.40/watt (lower of AC and DC) for new solar electric facilities (Step 1 application received on or after March 19, 2018); and
- Expansions to existing solar systems are not eligible.
- Incentive levels for solar thermal systems are as follows:
- $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.

Contact CISolarRebate@puc.nh.gov or at (603) 271-2431.

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

PACE

The state also has passed PACE (property-assessed 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 and Wind Rebate Program

- Waitlist only until funding available; no new applications being added to waitlist Check for updates at http://bit.ly/NHResidentalRebate

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

– waitlist and closed to new applicants.

- 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

- waitlist and closed to new applicants.
- 40% of installed system up to $10k
- Must meet thermal efficiency and particulate emissions standards

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 (property-assessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes
- Visit https://www.nh.gov/osi/energy for more information.

NH Electric Cooperative Incentives for Electric Vehicles and Electric Car Charging Stations

- NHEC offers a $1,000 incentive on a Battery Electric Vehicles (BEV), $600 on a Plug-In Hybrid Electric Vehicles (PHEV), and $300 on Electric Motorcycles.

NHEC offers incentives for Level 2 Electric Vehicle Charging Stations.

- For Commercial and Municipal Members up to $2,500
- For Residential Members up to $300 using Time-of-Use (Off Peak) rates
- Pre-approval is required.
- Visit: https://www.nhec.com/

NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the Home Heating Index (BTUs of heating fuel / conditioned square feet / heating degree

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.

NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the 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, eligible homes get a $450 value comprensive energy audit for $100 (rebated if improvements installed), and 50% instant rebate for eligible weatherization improvements up to a $4,000.

• Visit www.NHSaves.com/HPWES for more information and an online Home Heating Index calculator

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 $4,000 based on the HERS score.

• Visit www.NHSaves.com/newhome for more details.

NHSaves Residential ENERGY STAR ® certified Products Program

• Mail-in/online rebates are available toward the purchase of the following ENERGY STAR® certified products: Clothes Washers, Clothes Dryers, Room Air Conditioners, Room Air Purifiers, Refrigerators, Dehumidifiers, and Pool Pumps. For current rebate information and forms go to www.NHSaves.com/appliances.

• Refrigerator/freezer recycling is available – unit must be in working condition (10 – 30 cubic feet in size), program includes free pickup and $30 rebate. For program requirements and scheduling information go to www.NHSaves.com/recycle.

• 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). Infor: NHSaves.com/lighting.

• Rebates are available to residential electric customers of the four NHSaves utilities.

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.

PAREI

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

• NH Solar Shares: www.nhsolarshares.org

• www.nhsaves.com

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-yr 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.

Mass. Solar loan 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 http://www.masssolarloan.com/.

DEPT OF ENERGY RESOURCES

• The Massachusetts DOER is in the process of designing a new solar incentive program. The latest information can be found at http://bit.ly/SMART-Solar-Incentives-Program.

• Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Resources (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 SRECs.

• Next solar incentive information can be found at http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/development-of-the-next-solar-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 community-based 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 qualify 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

Heating Programs

• 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.

• Woodstove Program Info: http://bit.ly/mass-cec-woodstoves

• Heat Loan info: http://bit.ly/mass-save-heat-loan

• Insulation Incentives: http://bit.ly/mass-saves-home-insulation

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/

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NYSERDA

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.

EV Incentive from National Grid

National Grid, in partnership with BMW, is bringing eligible customers an incentive on a BMW i3 or BMW i3s EV. Form is at https://www.NG-BMWi3.

• Energy Rebates: https://NG-energy-rebates

National Grid: Heat Pumps

Total incentive amount not to exceed $1,100 for ASHP or $1,500 for GSHP (installations per project). Installation of the high efficiency measures must be completed between 4/1/2018-12/31/2018. *Mini-split heat pump units that only provide cooling are not eligible: http://bit.ly/Heat-pumps.

Home Energy Waste

Getting a home energy assessment can help you take control of your energy costs, 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 infor on the status of block and current incentive levels by sector and region. Block status is updated as applications are submitted, so check for current status. http://bit.ly/MW-block

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/Commercial-and-Industrial

Community Solar

• http://bit.ly/NY-sun-Community

Commercial/Industrial PV Installer

• http://ny-sun.ny.gov/For-Local-Government/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://bit.ly/NYSUN-power-estim

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://on.ny.gov/2Rd14zL

• Charge Ready NY: $4,000/installed Level 2 electric vehicle (EV) charging stations for public, workplace, and multi-unit dwelling stations. http://bit.ly/ChargeReadyNY.

Utility sponsored incentives & tips:

http://bit.ly/utility_sponsored_incentives

MASSACHUSETTS SMART PROGRAM FOR SOLAR INCENTIVES

George Harvey

Massachusetts is in the final stages of implementing a new set of solar incentives, the Solar Massachusetts Renewable Target, or SMART. Presentations are going on in Lenox and Amherst, as Green Energy Times is wrapping up its editorial work on the October issue. Until the new program is running, homeowners are still eligible for the SREC II program. The transition date has been set for November 26, 2018, according to an article at GreenTech Media (bit.ly/GTM-SMART).

The program is explained, though in language that is somewhat difficult to understand, by the Massachusetts Department of Energy Resources at a state government website (bit.ly/MA-SMART).

The SMART program will allow owners of solar systems to be paid fixed amounts for the energy produced, on a per-kilowatt-hour basis. The actual incentive portion of the payment is the amount over the net-metered price of the electricity that is needed to reach the fixed amount. This means that the owner of the system is guaranteed a price of at least the incentive amount of the electricity.

The incentives vary according to the size of the system, and they vary from one electric utility to another. A special incentive is given to owners of small photovoltaic systems if they have low incomes. Also, there are differing terms for the incentives.

Another aspect of the SMART program that has an effect on the incentives is the type of installation of the solar system. For example, there is an additional amount given if the system is in the form of a solar canopy, is on a landfill, or has energy storage included.

Solar installers and their customers have been somewhat baffled by the SMART program's details. While the solar part of the program has verged on clarity, the storage part has been nearly impossible incomprehensible. The reason for this appears to be that the program, which will be rolled out on November 26th, is not fully designed.

We talked with Claire Chang and John Ward, the owners of the Solar Store of Greenfield, to see what their understanding of the program is. Ward told us that they were frustrated by the fact that nearly every question they asked at public meetings was given the same answer, "We don't know."

Chang amplified that message. While agreeing that the state's vision on the storage portion of a solar-plus-storage was obscure, she said the state also lacks vision on the solar component, saying "Given the lack of legislative initiative and gubernatorial leadership to raise net-metering caps, solar has been curtailed in Massachusetts over the last two years, and when the floodgates are lifted on November 26th, blocks 1 and 2 are likely to be filled nearly immediately. Since the compensation is reduced with each block, solar development will be put under pressure."

Chang also had a message about the political nature of the problem, pointing specifically at the governor. She said, "Just because he's not crazy does not mean he's not a Republican." ♻

Rate range per kWh	Term	Type of system
33¢ to 39¢	10 years	25 kW or less (low income)
29¢ to 34¢	10 years	25 kW or less
21¢ to 26¢	20 years	25 kW to 250 kW
18¢ to 21¢	20 years	250 kW to 500 kW
16¢ to 19¢	20 years	500 kW to 1,000 kW
14¢ to 17¢	20 years	1,000 kW to 5,000 kW

The SMART program has what is termed a "block" structure, which has an effect on the incentive amount. The first block has a 200-MW threshold, and when that amount of capacity is reached, the incentive amount will be reduced by 4%.

Huge Batteries Store Energy for Holyoke Gas and Electric

Green Energy Times staff

The new battery system that stores energy made from the solar at Holyoke Gas and Electric. Courtesy photo.

The article, "From Dirty Coal to Solar Power," (bit.ly/coal-to-solar) which appeared in the December 2016 issue of Green Energy Times, described what was to become the largest solar array in Massachusetts. The 5.76-megawatt photovoltaic array at the retired coal-burning Mount Tom power plant now supplies power to Holyoke Gas and Electric (HG&E). The output from its 17,208 solar panels is sufficient for nearly a thousand homes in the area.

The former Mount Tom coal-burning plant now supplies power from solar photovoltaics. Wikimedia Commons.

Last year, the decision was made to add more to the site. Six GridSynergy batteries, each the size of a shipping container, were added to the solar system by Engie Storage, which will operate the system under a 20-year contract with HG&E. The cost of the electric energy is low enough that savings can be passed to retail customers in the form of lower electric rates.

Solar power is especially valuable, because it is produced at what is usually a peak demand time. It has the problem of disappearing at sundown, when normal peak demand is not quite over. The batteries are rated at three megawatts and store six megawatt-hours of electric power. Their energy can shift the solar array's output to match demand.

Holyoke Mayor Alex Morse said his city has "a vision of being one of the first carbon-neutral communities in the state." He added that the new battery system will help move Holyoke toward that goal. ♻

Wind Power Does Not Cause Global Warming

And two Harvard researchers did not suggest it does.

George Harvey

Image:Flickr (nate2b)

Two Harvard researchers published an article on wind power that drew rapid reactions from the press. A widespread interpretation of the articles by media was that they had shown that wind turbines somehow cause climate change. That is not what the articles say. It is not what they imply.

"Climate Impacts of Wind Power," by Dr. David Keith and Dr. Lee Miller, is a scientific paper, and it was not written for casual reading. It is easy to get wrong impressions from it, and unfortunately, there are writers for popular publications who do that. Some of them, I suspect, may do that knowing that they are misrepresenting the facts.

The authors of the paper explicitly contrast reversible changes in local climate that wind turbines can cause by mixing up the lowest region of the atmosphere with the cumulative and persistent effect of burning fossil fuels. In fact, this contrast is the first of the caveats they mention at the conclusion of their article, which says, "Fundamentally different mechanisms cause warmer temperatures from climate change compared with wind power."

I am not suggesting that the authors should be let off the hook just because their writing has been misinterpreted. Their science has been criticized, and I think for good reason. For one thing, their model looked at a set of conditions that are not even remotely like anything that is likely to happen. In it, they consider the local climatic effect on the continental United States if the country got 100% of its electricity from wind turbines packed into the Midwest. I have not seen any author take the position that we get all of our energy from wind power.

They surely had their reasons to do the model as they did. They must have wanted to make a case that was as clearly stated and comprehensible as possible. Getting 40% or so of our electricity from wind power, along with a similar amount of solar, a large amount of hydropower, and other renewable sources would not have been merely hard to model. It would have been very difficult to comprehend the results. But I think they could have been clearer about their reasons for choosing the model they did.

They conclude that the surface of the United States would be 0.24° C warmer, on average, if we operated according to the model they used for their study. I believe, however, that this is not sufficiently contrasted with whatever the alternatives are. What would the effect be if we continue with the current generating mix? Certainly that would be more than 0.24° C. What would it be if we used the proportions suggested by Dr. Mark Z. Jacobson? The results would be very different. And what would be the result of distributing the wind power throughout the country? The authors actually did say that would be different, but they do not quantify how.

One of the caveats in the paper is, "Our comparison metric ignores many possible benefits and drawbacks of the climate impacts caused by wind power deployment." The items listed do not include the benefits to human health of reduction in fossil fuel pollutants in the atmosphere. Nor does it include economic benefits arising from reducing the effects of pollution on agriculture. Nor does it include the reduction in costs for electricity, with power purchase agreements from wind power currently averaging only two cents per kilowatt-hour, the least expensive source of power we have.

I believe this paper was not intended to move us to abandon wind power as we move to renewable energy, a purpose for which some people are certainly trying to use it. It is intended to alert scientists to the fact that we have good reasons to give careful consideration to the energy mix that we use in the future. It does not exclude wind power from that mix.

There is one thing that some news reports seem to have missed. It is the first sentence of the conclusion section. It reads, "Wind beats fossil fuels under any reasonable measure of long-term environmental impacts per unit of energy generated." ♻

Sustainable Apple Orchards

George Harvey

Apples at Scott Farm Orchard. Courtesy Kelly Carlin.

As we all know, "An apple a day keeps the doctor away." And though that proverb apparently did not come from Benjamin Franklin, as I had thought, it has been shown by medical researchers that apples have significant health benefits. Of course, many of us would eat apples even if they were not good for us. We eat many things just because they taste good, and apples are delicious.

The Northeast is especially blessed with orchards, but Vermont stands out among the region's states in that respect. This is not just a matter of the million bushels of apples the state produces each year. Apples are important to Vermont's culture. The state's official fruit is the apple. Its official pie is apple pie. And the single thing that is said to distinguish Vermonters from all other people, to the point that some believe they should have exclusive claim to the name, "Yankee," is that real Vermonters eat apple pie for breakfast.

Here, we are celebrating the harvest. But we are not just celebrating Earth's products; we celebrate the people who grow them, the things they believe, and the things they do.

YATES FAMILY ORCHARD

Yates Family Orchard. Courtesy Jessika Yates.

Maybe we should start with Jessika Yates, who runs Yates Family Orchard in Monkton, Vermont, with her husband, Steve Yates. They bought the orchard ten years ago and have been building the business since then. That might not be a very long time to be an orchardist, but it gave Jessika a view of the business that is unique and deserves to be repeated, because it reflects on the entire industry, and perhaps on the entire state. "I am extremely grateful to the dedicated and knowledgeable people who have been willing to help us get our business started," she said. Perhaps Vermont's orchardists can provide an example of decent concern for the rest of the world.

The Yates Family Orchard operates on the pick-your-own model, so those of us without our own fruit trees can have harvests of our own. It has 23 varieties of apples, along with pears and plums that can be picked by visitors during the season lasting from early in September to the end of October.

The orchard's other fruits include peaches and cherries, which are harvested during the summer, and it has raspberries. The fruit is grown using an integrated pest management system (IPM), to avoid the toxic chemicals, including even some that are allowed for organic farming. IPM manages pests by combining biological, cultural, physical, and chemical tools so as to minimize economic, health and environmental risks.

The orchard has a farm stand, where visitors can get home-made pies, crisps, and other treats, along with cider (not hard) and locally grown organic produce. The farm stand is also open in September and October.

Remarkably, Yates Family Orchard is operating as a net-zero user of electricity. On buying the orchard in 2008, Steve Yates, who works for Peck Solar in addition to being the cider maker and orchard engineer, installed a 2.66-kilowatt (kW) pole-mounted solar system. This was expanded with 2.5kW of new panels in 2011. In 2016, a battery system was added. Jessika said their home is also equipped with a solar water heating system, and she wants to install a heat pump next.

SCOTT FARM ORCHARD

Apple picking at Scott Farm Orchard. Courtesy Kelly Carlin.

Scott Farm Orchard, in Dummerston, Vermont, was settled as a farm by Rufus Scott in 1791. The orchard itself dates from 1911. In 1995, owner Fred Holbrook gifted it to the Landmark Trust USA, a non-profit organization focusing on preservation of historic sites. Scott Farm Orchard is a Certified B Corporation so it could run as a for-profit business, but still follow Landmark Trust's mission for public benefit. The orchard sits on 571 acres and has many dozen varieties of fruit.

Scott Farm Orchard has a farm market, which operates for nine weeks, opening on Labor Day and running to the day before Thanksgiving. Its website says, "Scott Farm cultivates over 125 ecologically-grown apple varieties, to include one of the largest collection of heirloom apples in the country. As they ripen different varieties are offered in the Farm Market along with aromatic quince, peaches, plums, pears, apricots, medlars, berries, cut flowers, and pumpkins."

Scott Farm has an event location, for weddings receptions, banquets, and celebrations. It runs workshops on growing trees and cooking with fruit. And it sells trees and other perennials for planting in the spring.

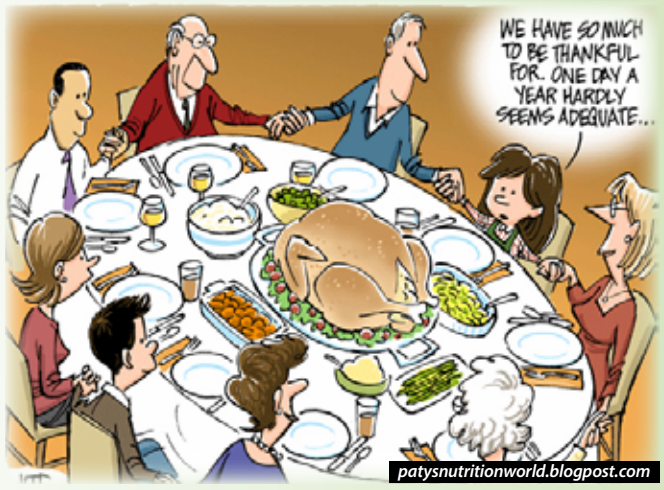
We asked orchardist Zeke Goodband about Scott Farm's growing methods, and specifically whether it was growing apples organically. He said he believes the chemicals used for organic farming are too harsh for the environment and the orchard ecosystem. Instead, Scott Farm, like Yates Family Orchard, uses IPM. A variety of systems can be employed for this, including traps, pheromones, and other systems that are non-toxic to human beings and nearly all species found in the wild. Such a system leads to a natural diversity that can stay in balance. Goodband's statement of the overall philosophy used at Scott Farm was, "In my opinion, growing apples organically is a marketing decision and not an ecological decision." And, he said, "It is better to risk the crop than the customers' safety or the employees' health."

I asked Goodband what had inspired him. He told me it was words of Martin Luther King, Jr., who said "When evil men plot, good men must plan. When evil men burn and bomb, good men must build and bind. When evil men shout ugly words of hatred, good men must commit themselves to the glories of love." ♻

GREENING THE HARVEST

Cont'd from p.1

sequestration. The price will be higher than a supermarket turkey, so resolve to get your money's worth. Use or share every bit of the meat, freeze leftovers, and make a nutritious broth from the carcass.



patysnutritionworld.blogpost.com

Plan your shopping to minimize driving. Build some shopping into other trips. Drive your electric or hybrid vehicle. Go with a friend who also needs to shop, cutting the impacts of each of you in half.

What about bags? The plastic grocery bag we've all learned to hate actually has a low carbon footprint, compared to cotton tote bags. You need to use a cotton tote 327 times to achieve the same per-use carbon ratio, according to Noah Dillon, (The Atlantic, 9/2/16). (Each paper bag needs to be re-used 7 times.)

So if you have cotton tote bags, use them forever. If you don't, don't buy them. You can make handsome, colorful totes from pet food, birdseed, or grain bags, using instructions that are easy to find on-line. If you do end up using supermarket plastic bags, reuse them a few times, then recycle them. Most supermarkets have a place to do so. Plastic bags may be a decent carbon bargain, but they're still a petroleum product bad for wildlife, and in the environment basically forever, so minimize their use.

Prep several dishes ahead, and cook them all

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Dartmouth Takes Solar to the Mountain

Nature's Power Hits Moosilauke!

N.R. Mallery, publisher of G.E.T

There is a new sight to see on Moosilauke Mountain.The Class of 1978 Bunkhouse of the Moosilauke Ravine Lodge, in Woodstock, NH is now powered by nature. The orientation and pitch of the newly renovated roof was ideal to allow Norwich Solar Technologies to design and install the 14.2kW DC rooftop solar array to maximize efficiency.

The 395W crystalline silicon modules with DC/AC string inverters are anticipated to generate 17,000kWh of electricity per year. The system is expected to be fully operational by October 31, 2018.

The system is financed through a Power Purchase Agreement (PPA), meaning the system will be owned by a third-party equity funder. All associated tax credits and depreciation will belong to the equity funder. No upfront cost or capital expenditure was required from Dartmouth. The system is interconnected to the existing utility grid with net-metered credits to Dartmouth's electric account for the electricity made from the solar. The Power Purchase Agreement includes a buy-out option at years 7, 15, and 25. During those years, Dartmouth will have the option, but not the obligation, to purchase the system at the fair market value, as determined by an independent 3rd party appraiser.

The environmental benefits include offsetting 700,000 lbs. of CO_2, 8,000 trees planted, or 730,000 miles not driven. (Estimates are based on a 50,000 lbs. carbon offset/ 579 trees planted and 52,000 miles driven per kW over the life of the system.)

Fall is a great time to hike this 4,802-foot mountain! Be prepared for the snow on the peak already. ♻

Mad River, VT and Climate Change

Mad River, Vermont: stage.saltandwind.com

A recent study published in Science Direct (sciencedirect.com) focused on the effects of climate change on the Mad River in Vermont. The study found that watershed discharge and sediment yield are expected to increase with warming temperatures, and that peak flows and sediment loads will intensify and become more variable. The study also cited high levels of phosphorus related to agricultural runoff.

Highlights of the study included:

- Watershed discharge and sediment yield are expected to increase with climate change.
- Peak flows and sediment loads are expected to increase and become more variable.
- General Circulation Models (GCMs) are not suitable for assessing the impacts of extreme precipitation and flow.

More at http://bit.ly/MadRvrVT-Climate.

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UNH Biomass Boiler Project Is Underway

Jim Van Valkenburgh

Rendering of the completed Northwest Biomass Heating Plant at UNH in Durham, NH. Image: Weller & Michal Architects, Inc.

After a long summer of construction, Froling Energy is now finishing up the University of New Hampshire's (UNH) first large-scale biomass boiler system. The new Northwest Heating Plant will provide heat and hot water to four buildings and ten greenhouses in the Thompson School neighborhood. The new plant is located on the Durham campus, on the back side of Putnam Hall.

For decades, UNH's central Combined Heat and Power Plant provided heat to these buildings and most of the campus, but the long pipe run out to the Thompson School area was failing. Instead of spending money on replacing the old buried pipes, the UNH Facilities Department decided to make this an opportunity to

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create and test a biomass-fired district heating system fueled by one of New Hampshire's most important renewable fuels, wood.

A key part of the project is the creation of a small area district heating system that will provide heat to Putnam Hall, Barton Hall, Cole Hall, the Veterinary Diagnostic Lab and the ten MacFarlane Greenhouses. By the time snow flies this winter, the new wood chip boiler will be the main source of heat for these buildings, sending it out through newly buried insulated steel pipes. Two new liquid propane gas boilers will act as a back-up source of heat and provide additional heat needed during extremely cold weather.

The biomass boiler is a 2.45 million BTU-per-hour output Viessmann Vitoflex 300-UF which employs gasification technology, oxygen-sensor-based combustion controls and a multi-cyclone in the stack, making it incredibly clean burning. The intended fuel, screened semi-dry wood chips, called PDCs, are a key element in making the Vitoflex 300 one of the most automatic, reliable and efficient wood chip-fired boiler systems available. PDCs are screened wood chips with 25% to 30% moisture content, made from sustainably harvested trees sourced locally from forests in southwest New Hampshire and central Massachusetts. Locally sourced means fuel dollars stay in our region which is important for the New England economy.

The UNH Facilities Department calculates that the new district will consume 750 tons of PDCs. This is the equivalent of over 70,000 gallons of No. 2 fuel oil (or over 91,000 therms of natural gas). PDCs are delivered a bit like oil: from a truck that pumps it through a hose and into a tank. But with PDCs a blower truck blows them through a five inch diameter hose into the silo. The simplicity of this delivery method significantly reduces the project's cost. A vertical storage silo is being built inside the boiler house that is able to hold 45 tons of PDCs—that's the same heat value of about 4300 gallons of fuel oil. PDCs are locally sourced and nearly carbon neutral with a very low cost of about $5.65 per million BTUs.

At this writing, in mid-September, the boiler building and silo are complete, all of the long pipe runs are in place, and the boilers, tanks and pumps are all installed. The next steps are to complete control wiring and begin the system commissioning process. The plant is expected to be fully operational by November.

Froling Energy is acting as the general contractor on this project.
The project engineering

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Time for Real Change

Dr. Alan K. Betts

Elections are coming up, and if we don't vote for real change this November, many environmental disasters lie ahead. The U.S. is sinking deeper into a sticky web of lies from which truth, honesty and democracy may not escape. At the national level, this is clear but, even in New England, we are moving politely backwards, as conservative memes get reframed more elegantly but are unquestioned.

I have lived in Vermont as an independent climate scientist for forty years and have watched many Republican and Democratic governors come and go. I have sat on climate-change panels and written climate-change adaptation reports for the state. I have watched a few important steps in the right direction, such as the founding of Efficiency Vermont and some steady solar development. But I have heard many speeches making promises without follow through and seen Vermont slip away from its renewable energy targets and refuse to implement a fossil carbon tax to fund the needed transition.

People and politicians will not discuss the basic truth, that climate change is simply incompatible with 'business as usual.' Refusing to pay for the transition away from fossil fuels means disaster ahead both for humanity and much of life on Earth. This month's special report from the Intergovernmental Panel on Climate Change says disaster is only two decades away. But rather than accept this and start serious planning, we shrink back into the familiar collective delusion: the gospel of economic growth based on a consumer society that is a major contributor to the threat we face.

So let us start here with this delusion. We want to have it all now, as we always have, without thought for the future consequences. Everything we want should be grandfathered in. Our children, equipped with fantastic technology and artificial intelligence, can solve all the problems and deal with any disasters that we are creating for them. The future is not our responsibility, because so much is unknown; while in the thrall of advertising, our current needs are so much clearer.

We revere the global market economy that has created great wealth for some. We admire the successful and pity the desperate poor, both around us and overseas. Someday, the market will lift all boats. Ironically, this has a grain of truth,

Image: www.proyecto40.com

rising sea-level and storm surges will flood the coasts, lift the boats and dash them on the shore.

Industrial growth led us to abandon our responsibility for the future of the Earth. Short-term profits matter more, as people are encouraged to be short-sighted and self-centered. We listen to the oil companies when they say it is unfair to tax fossil carbon, because we want cheap oil. We listen to the conservative fantasy of reducing taxes and deregulation and let the market take care of everything including climate change. All so the rich can get richer and poor poorer, while we all exploit the Earth.

The refrains go on and on. We have never had to pay for the long-term costs of our waste streams. Those scientists must be exaggerating – it can't be as bad as they say. Anyway, it is the future where so much is unknown – they cannot prove it will happen and perhaps they are wrong. A sea of wishful thinking to protect the status quo of 'business as usual' and grease all the wheels that keep it going. The dreams we need to avoid taking collective responsibility that would drive real change.

Since elections are coming, ask politicians where they stand on key issues and don't accept platitudes. Do they support the development of local markets where our communities have some control: local food, local power and local industries that can provide us with some security through the transition? Or do they just accept the immorality of 'business as usual' in the amoral global market? How deeply have they considered how our delusions will ruin the Earth and the lives of our children and grandchildren?

Yes, it will take real efforts by our communities and a bunch of creative thoughtful politicians, but time is not on our side, as the oceans warm and rise, and the Arctic melts.

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

The Best Three Years in Climate History: Believe It or Not, It's True

By Carl Pope

Yes, the world fell far behind in controlling emissions and there's much to be done. But there's progress and hope.

How is climate progress faring? Hurricanes from Asia to the Carolinas, fires in California and Spain, floods in southern India and heat waves in Europe are sobering reminders of how much is at stake and how far we have to go. But how fast are we moving?

We're awash in conflicting assessments. It's the third anniversary[1] of the U.S.-China agreement that laid the groundwork for the historic Paris climate accords. Last week saw the Global Climate Action Summit, a San Francisco gathering of bottom-up climate leaders, and this week we had the more nation-state-flavored One Planet Summit convened by French President Emmanuel Macron and Michael Bloomberg in New York.

IT'S TIME FOR A REPORT CARD

Our grade depends on when you begin. In the U.S.-China Joint Statement1 three years ago, the world's two largest carbon emitters pledged themselves "to a successful climate agreement in Paris" and to "mid-century strategies for the transition to low-carbon economies [and] the below 2 degree [Celsius] global temperature goal." At Paris, the U.S. and China joined other nations to offer short-term emission reductions commitments. How are we doing since that pledge?

America's Pledge, a catalyzing and analyzing platform (I am its vice chair), last week released "Fulfilling America's Pledge[2]," the first comprehensive report on the U.S. potential for meeting its Paris goal of reducing 2025 emissions by 24 to 26 percent from current levels. The report concluded that existing commitments will get us two-thirds of the way; increased momentum by companies, cities and states would leave the U.S. just short of meeting its goal by 2025.

Strikingly, this progress is possible even though the current administration in Washington has totally abandoned multilateral climate diplomacy. The report also found that continued bottom-up climate leadership would put the U.S. on a trajectory of deep "decarbonization" by 2050 – even without federal leadership between now and 2020.

So, the United States is basically on track, if accelerated engagement by the real economy continues. What about China, the world's largest emitter? Here the news is even better. China has pledged that its emissions would peak by 2030. One study has concluded that this peak may already have occurred, more than a decade early[3] – although other observers think that the real peak is still some years ahead. China clearly met its 2020 goal[4] for cutting carbon intensity in 2017, three years ahead of schedule. It achieved its reforestation goal five years early. It's on track to meet its Paris renewable energy pledge.

The No. 3 key climate player is India. From 2020 to 2040, 27% of global energy growth will be created by that one country (About 19% will come from China.). India is overall solidly on track to meet its Paris pledges[5]. Indeed, it's likely to exceed them by far, given that India has met its renewable target 12 years ahead of schedule.

So three years into the Paris agreement, the three key players are either on track or moving faster than promised. So why is so much recent coverage of climate progress much less positive? Why did Brad Plumer of the New York Times dismiss bottom-up climate progress[6] in the U.S., writing that the "groundswell hasn't been nearly enough to counteract the effects of the Trump administration's retreat on climate policy"? Why does a Rhodium group analysis[7] cited by Plumer report that the U.S. will only make half its goal – no more than it is has already done? Why was Yale professor Angel Hsu "shocked to find that the numbers were so low[8]" when she looked for measures of progress?

Three misperceptions skew the conversation. The most important of these is the time factor. The three years since Paris have shown remarkable progress, but the world has not, and could not have, made up for the last 18 years – the period between Kyoto to Paris – during which the 'who-is-going-to-pay-the-bill?' conversation drowned out the new reality that for most countries a transition away from fossil fuels will be a huge economic bonus, not a sacrifice.

The second distortion is a focus on yesterday's key climate players, the world's most affluent Western nations, which, the U.S. aside, are indeed falling behind on their pledges[9]. They need to catch up. More importantly, they need to give up their stranglehold on the flow of finances that emerging markets need to leapfrog fossil fuel technology. But their response – or their failure to respond to date – to the climate finance challenge is far more consequential than the exact year in which the last diesel car is sold in Italy.

Finally, it is indeed far easier to measure the past than the future. Both the Rhodium report and the Yale study look only at where we are, our current position, not how much faster we are moving than three years ago, i.e., our momentum. Conventional economic models used to forecast emissions are heavily biased in favor of yesterday's economics and today's policy. They are almost useless when it comes to projecting tomorrow's technology and political environment. Rhodium's end of June report, for example, focuses on "current policy," but since that date, dozens of important changes in state and local policy continue to tilt the U.S. emission trajectory steadily downwards. Yale's analysis looked only at explicit, formal climate commitments – ignoring the fact that most decarbonization happens simply because wind and solar are cheaper than fossil fuels.

Behind these biases is a common flaw – the concept that climate progress is still about shared sacrifice. One analysis captured this precisely,

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CLIMATE MIGRATION: A GLIMPSE OF OUR PROBABLE FUTURE

Barbara Whitchurch

Image: wwww.progressive-charlestown.com

The phenomenon known as "climate migration" refers to the forced movement of living things to escape the life-threatening impacts of climate change.

Increasing temperature swings, droughts, tidal flooding, storm systems and wildfires are all causes of this evolving problem. But other shifts are also developing: rising sea levels and temperatures, and the degradation of the polar ice cap. Animals of all types are dying. Those who survive have to move, as their food migrates away, and their habitat changes. This is true of people as well.

Climate migration has already been occurring around the globe for years, where rising sea levels and the disappearance of arable land has forced migration into cities and towns, stressing the social and economic fabric of previously peaceful regions. A World Bank Report (http://bit.do/worldbank1) issued in March, 2018 projects that in three of the most vulnerable regions — sub-Saharan Africa, South Asia and Latin America — 143 million people could be displaced by these impacts by 2050. In West Africa, the almost total disappearance of Lake Chad because of desertification has empowered terrorists and forced more than four million people (http://bit.do/chad1) into camps. The report projects that without effective climate action, around 2.8% of the population of these three regions could be forced to move within their own countries to escape the near-term impacts of climate change. They will migrate from areas with lower water and crop availability, and from areas affected by rising sea level and storm surges. This migration will accelerate over time.

... we need to reduce our GHG (greenhouse gas) emissions by 45% before 2030 and reach net-zero emissions by 2075 in order to have a chance to avoid catastrophic climate change.

But the grim predictions of this report have been eclipsed by the much grimmer predictions of a more recent one. On October 6, 2018, the International Panel on Climate Change (IPCC) released a special report (http://bit.do/ipcc1) in support of a global response to keep global warming to less than 1.5ºC above pre-industrial levels. Widely reported in mass media, the *Summary for Policymakers* provides a clear warning: *we need to reduce our GHG (greenhouse gas) emissions by 45% before 2030 and reach net-zero emissions by 2075 in order to have a chance to avoid catastrophic climate change.*

Predictable or inevitable?

Climate migration in the United States is one of the effects of climate change that is now predictable. Recent research (http://bit.do/sleepwalking1) has focused on the entire Gulf region, in particular the South Florida coast, and most notably, the city of Miami, where the Army Corps of Engineers and other scientists have predicted sea level rises of twelve inches by 2030. An eighteen inches rise would threaten the existence of that city (http://bit.do/miamigone). This would result in millions of people losing their homes and their livelihood.

What will happen when millions of Americans are displaced due to rising sea levels? Some will go inland, and some will move to states perceived as "safer," with higher elevations, no coastline, and a viable economic infrastructure such as interior New England. Climate scientists have projected a general migration from southern and western states to the Northeast.

"We have a small window now, before the effects of climate change deepen, to prepare the ground for this new reality. Steps cities take to cope with the upward trend of arrivals from rural areas, and to improve opportunities for education, training and jobs, will pay long-term dividends."

- Kristalina Georgieva

What types of economic and social disruptions can we anticipate? We already know from organizations such as the Vermont Refugee Resettlement Program, that an increase in population means an increased need for public transportation, housing, employment, retraining, medical care, social services, schools, food and water. Burlington has been a microcosm of immigration and its consequences for the past 20 years.

Vermont will also continue to experience a phenomenon known as "climate gentrification," in which richer people can afford to move to safer ground, while poorer people will have to stay where they are or be forcibly evacuated. So far, the first wave of climate refugees consists of affluent folks from the Coast or the South, people who have the means to purchase property in Vermont or who already have a second home here.

What are the best ways to prepare?

According to an article in *The Montpelier Bridge* (http://bit.do/vt-climate-refugees), some plans are already in the works. Brian Shupe of the Vermont Natural Resources Council states, "Historically, when we have had an influx of new residents and development pressure, Vermont has responded with things like Act 250." Anticipating another influx is one reason the state has formed a commission to re-examine Act 250 (Vermont's land use law) and issue a report by the end of the year. Vermont Senator Chris Pearson, vice-chair of the Act 250 Commission, recommends protecting agricultural land to provide more food, protecting forest blocks and wildlife corridors, and improving decision-making around the location of housing. Steve Crowley, Energy Chair of the Sierra Club's Vermont chapter, in examining climate migration, states that climate-related changes to food security pose serious challenges. Crowley advocates building more densely-packed housing in the future and "preserving all the agricultural land that we can."

According to Kristalina Georgieva, World Bank CEO, "We have a small window now, before the effects of climate change deepen, to prepare the ground for this new reality. Steps cities take to cope with the upward trend of arrivals from rural areas, and to improve opportunities for education, training and jobs, will pay long-term dividends."

If you live in a small town with a general store, a church or two, and a Grange Hall, you and your descendants will witness a major change in the character of your town. Although this may come about more slowly than the changes in urban or semi-urban areas, it's something to prepare for -- now. Educate yourself, cut back on your CO2, and prepare to make room.

Barbara Whitchurch is a freelance writer and editor. She lives in Middlesex, VT and owns a Passive House and a Nissan Leaf. ♻

<< Cont'd from p.24

lamenting: "Here's what subnational and non-state actors can't do: Make others take action." That's true. Behind it lies the notion that someone can. But history from Kyoto to Paris has demonstrated that if climate solutions are resisted by the real economy, neither the global community nor national governments will force them to comply.

"Fulfilling America's Pledge[2]" marks the first comprehensive effort to measure the future – inadequately, and only for the United States. But it shows not only that deep decarbonization is possible, and profitable, but identifies the pathways, actors and timetables that can get us there. The last three years, have been the best in a century for the future of the climate – President Trump notwithstanding. We need to double down on what is working.

A veteran leader in the environmental movement, Carl Pope is the former executive director and chairman of the Sierra Club. He has published three books and is now the principal advisor at Inside Straight Strategies. He continues to serve as a board member or adviser for a long list of environmental organizations.

Footnotes:

1. https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change
2. https://www.americaspledgeonclimate.com/fulfilling-americas-pledge/
3. http://www.chinadaily.com.cn/a/201808/23/WS5b7d8c03a310add14f387373.html
4. http://www.chinadaily.com.cn/a/201809/17/WS5b9fb6aea31033b4f4656847.html
5. https://climateactiontracker.org/countries/india/
6. https://www.nytimes.com/2018/09/11/climate/california-climate-summit.html
7. https://rhg.com/research/taking-stock-2018/
8. https://www.economist.com/international/2018/09/15/california-leads-subnational-efforts-to-curb-climate-change
9. https://www.nytimes.com/interactive/2017/11/06/climate/world-emissions-goals-far-off-course.html ♻

CERTIFIED B CORPORATIONS LEAD THE WAY

BUILDING A SUSTAINABLE, RESPONSIBLE TWENTY-FIRST CENTURY ECONOMY

How Your Company Can Join the Movement of Using Business as a Force for Good

Chris Gillespie

In order to transition to a more sustainable society, it is imperative for our economy to evolve. Even the best-intentioned of government regulations cannot force this change to occur, as real, meaningful change must start from the bottom and work its way upwards. In this case, individual businesses and business owners wield the ability to move our overall economy in a more sustainable direction. With this ability, no doubt, comes responsibility.

Fortunately, there are many businesses that are taking their social responsibility seriously by becoming Certified B Corporations through an initiative powered by the nonprofit B Lab. With 2,655 companies spanning 150 industries and 60 countries, Certified B Corporations define themselves on their website as "businesses that meet the highest standard of verified social and environmental performance, public transparency and legal accountability to balance profit and purpose [in order to] accelerate a global culture shift to redefine success in business and build a more inclusive and sustainable economy."

While conventional business philosophy may prioritize profit above all else, B Corporations recognize that profits and growth are only a "means to a greater end." B Corporations view success not simply as making the most money possible, but being able to yield a "positive impact for their employees, communities and the environment."

To create this positive impact and to establish a global economy that uses business as a force for good, B Corporations follow the tenets stated in "The B Corp Declaration of Interdependence": "We as leaders of this emerging economy believe that we must be the change we seek in the world; that all business ought to be conducted as if people and place mattered; that, through their products, practices, and profits, business should aspire to do no harm and benefit all; to do so requires that we act with the understanding that we are dependent upon another and thus responsible for each other and future generations."

Becoming a B Corporation requires more, though, than just taking an oath. A key step of earning a B Corporation certification is passing the B Impact Assessment, which "evaluates how a company's operations and business model impact its workers, community, environment and customers." The B Impact Assessment takes into account every aspect of a business, from its supply chain and input materials, to its charitable giving and employee benefits.

B Corporation certification is certainly an honor, however, it is more than just a stamp of approval—it is a commitment. In addition to transparency and accountability standards, B Corporations must incorporate the B Corporation values into their company's legal structure.

To a business owner, this may seem like a lot of effort and commitment for something that, on the surface level, may not seem to boost business performance, however, there are many tangible benefits of the B Corporation certification. B Corporations join a network of likeminded companies who share the same values and goals, attract top-notch talent and have their brand instantly associated with industry leadership, social responsibility and exceptional business practices.

Although B Corporations hail from around the world, New England is home to quite a few, including Ben & Jerry's, Stonyfield Farm, Cabot Creamery, King Arthur Flour as well as energy companies ReVision Energy, Green Energy Options, and Green Mountain Power. In fact, Green Mountain Power was the subject of a report by the Institute for Local Self-Reliance (ilsr.org) which found that, since getting B Corporation certified, Green Mountain Power has seen growth in net income and has started outpacing other, non-certified investor-owned utility companies.

Companies of all sizes can be considered for a B Corporation certification, from start-ups to public companies and related entities. To learn more about Certified B Corporations and how your company can become involved in leading and shaping tomorrow's economy, visit www.bcorporation.net.

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

Pablo Fleischmann and Valerie Piedmont, owners of Green Energy Options, a solar company located in Keene, NH is a B Corp. Courtesy photo.

ReVision Energy, an employee-owned solar company, is one of the B Corp certified energy companies in New England. Courtesy photo.

Historic Home in Deerfield, MA Gets to Net-Zero

George Harvey

New houses with net-zero energy use are getting to be increasingly common. On the other hand, New England is full of old houses that really should be preserved for their historic value. We rarely see a house that fits into both groups. There is a reason for that. A "deep energy retrofit" to bring a house to net-zero energy use while preserving historic value is not easy.

It may be hard to believe this house, dating to before 1740, is a net-zero energy user. Photos courtesy of Kent Hicks Construction.

Kent Hicks, owner of Kent Hicks Construction in West Chesterfield, Massachusetts has made a study of the problem of deep energy retrofits in historic buildings. This is quite literally true, as he had one employee spend six months just researching insulation to find out what has the best results, with the least environmental impact, for given situations.

Hicks' company recently completed a job that shows what is possible when the deep energy retrofit is combined with building restoration. The work may have produced the oldest electrified house with net-zero energy usage in the United States.

The house, whose owners wish to remain anonymous, is in a historic neighborhood of Deerfield, Massachusetts. It is not really known when it was built, but there were alterations made to it sometime in the 1730s, so perhaps it was built in the late 1720s.

The original plan was to start with an energy retrofit on an apartment in the barn on the property, which had been built during the 19th century. Then the owners could live in that while the work on the house was being done. As work on the barn progressed, however, it became clear that the condition of the barn was not good enough to make that task practical. Since it was clear that old lumber would have to be found for parts of the house restoration, it was decided to deconstruct the barn, putting its timbers aside.

Catherine Truman Architects, which was working on the project, managed to find a barn that was nearly the same size and shape. That barn was also deconstructed, with its timbers brought to Deerfield to build a replacement barn. When that was in place, it was set up to use net-zero energy and the owners moved in.

The barn roof had a 12-kilowatt photovoltaic system installed, to supply all needed energy for both buildings. Since both buildings would be highly efficient, the solar system could provide heat as well as lighting and power for appliances.

Deerfield House interior. Photos courtesy of Kent Hicks Construction

We might mention that the present barn sits on a concrete slab and has a polished concrete floor. The long-lasting quality of this material can make it environmentally attractive to use, despite its high embodied energy. An article on this appeared in the October, 2017 issue of Green Energy Times (bit.ly/GET-concrete-house).

Once the owners were comfortably set in the new quarters, work could begin on the old house. The three-century-old building's problems were very much in evidence. Many of its timbers were in direct contact with the soil. Nevertheless, Hicks could easily see that while significant parts of the wood were rotten on one side, the other side was often both sound and capable of being rendered beautiful for re-use. And these could be polished to have the patinas of aged wood, cut from forests unlike nearly any we have left today.

The building was taken down to the frame. New wiring and plumbing was installed. As the walls were rebuilt, they were covered on the outside by a layer of insulation consisting of polyisocyanurate, with foil on both sides, and this was covered by reused siding. The envelope had to be sealed as well as possible at the windows and doors, and care has to be taken that any intruding moisture ducted back outdoors, which entailed use of an inner layer of polyisocyanurate insulation. Hicks explained the importance of this, "As long as we can keep the shell dry, we are golden."

Inside, there is additional insulation of cellulose. Hicks said this has an environmental impact that is about as low as you can get. The final measurement is R-40 for the walls and R-60 for the roof.

Windows were replaced with new ones that were not as efficient as some that are available today. This was to preserve their appearance. If they had the same number of lites in each, they appeared too deep, when compared to the original glazing.

The ventilation system Hicks chose for this project

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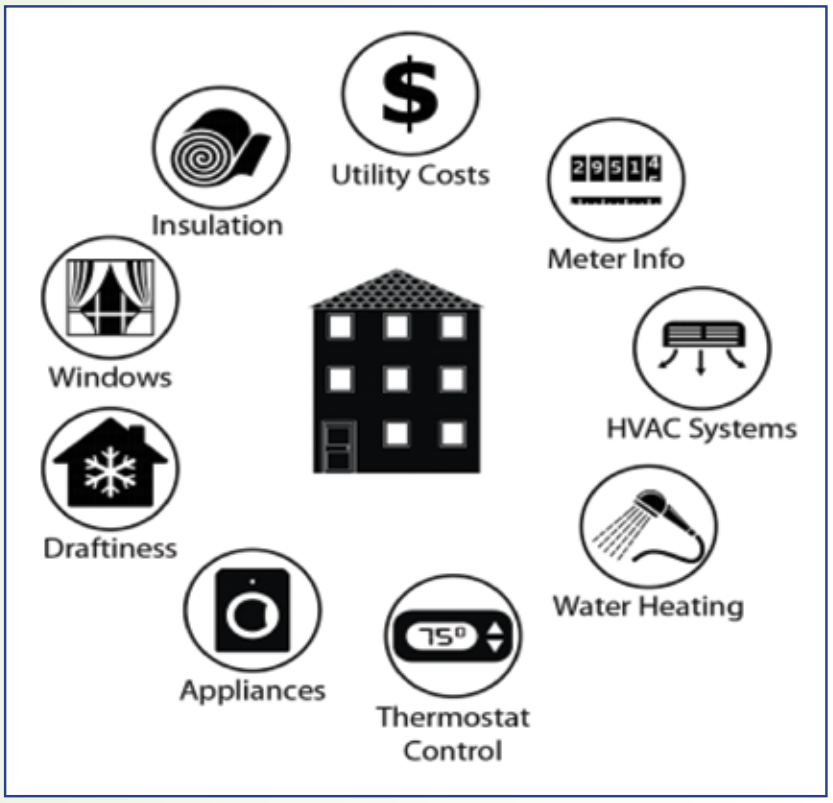
ENERGY EFFICIENCY FOR RENTERS

Evan Lawrence



Homeowners have a high degree of control over their home's energy efficiency. Whether the house is new or old, they can choose heating and ventilation systems, insulation strategies, water heaters, appliances, and lighting. If the site, structure, local zoning, and budget allow, solar panels or geothermal system are renewable energy options.

For renters, the options are very limited, since the landlord usually controls the structure, heat and hot water sources, and provides large appliances. Once the lease is signed, renters who want to conserve energy may not be able to do much beyond replacing inefficient light bulbs and practicing energy-saving habits.

Energy efficiency for renters starts with asking questions at the first visit to a potential rental. It's not just a question of being green--the unit's energy efficiency can have a big impact on the occupant's budget. A cheap rent is no bargain if the space has outdated or poorly designed energy systems and no insulation. When utilities are figured in, a higher rent in an energy-efficient building may be a better deal, and certainly be more comfortable.

In a conference call for the U.S. Department of Energy's Better Buildings program this past July, Samantha Caputo of Northeast Energy Efficiency Partnerships (NEEP) discussed the questions renters should ask when looking at an apartment or house. NEEP is one of six U.S regional energy efficiency partnerships within the Better Buildings program, with a mission to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industries, and communities.

The kind of energy that runs the heating system should be an energy-conscious renter's first question, Caputo said. The Department of Energy, based on Massachusetts' statistics, estimates that heating oil and propane are about three times more expensive than electricity and natural gas. Even if heat is included in the rent, the choice of fuel will have a direct impact on tenants' cost of living.

Other questions are: Are the units on individual electric meters or does one meter serve the whole building? Which utilities does the unit have: natural gas, oil, water, electric, Internet, cable TV, telephone? Are any of them included in the rent?

Is the thermostat programmable? Is it in the unit, so that tenants can control their own heat, or in the hallway? How old is the heating system? Where is it? How old is the water heater? What kind of system is it? Where is it? Which appliances come with the apartment, how old are they, and are they Energy Star certified? Appliances may include a stove, dishwasher, refrigerator, clothes washer, and dryer.

Is the building or unit air sealed and insulated? Can the prospective tenant feel drafts? Are there gaps around windows and doors to the outside or unheated hallways? If there's a fireplace, how's the damper? Check the windows to see if they're single, double, or triple-paned. Do they have storm windows and screens?

The unit should have smoke and carbon monoxide detectors (required by code in many places) and a fire extinguisher. How many light fixtures are there and what kinds of bulbs are in them: incandescent, fluorescent, compact fluorescent, or LED? What sort of natural light does the unit receive? How will that affect heating and cooling?

Publisher's note: Prospective tenants can ask if the landlord plans to make energy-efficiency improvements. When enough people insist on energy efficiency in rentals, landlords who are serious about attracting tenants will listen. Landlords who invest in energy efficiency cannot only improve their occupancy rate but also save significantly on the cost of running the building. NEEP has resources for landlords, too.)

According to Caputo, the three takeaways are:

1. Transparency about the energy costs of a unit is essential for renters, who have little ability to make changes to their living spaces without the landlord's permission. A checklist helps identify areas that need improvement or problems that disqualify the rental from consideration.

2. Tenants can't control what they pay in rent, but a checklist can help them determine if the energy costs of a unit will be high and whether the unit will be comfortable to live in.

3. For real estate professionals, an energy checklist is an easy way to show the importance of energy efficiency and start conversations about it.

The checklist is available on-line at http://bit.ly/RentersEnergyEffChecklist. Scroll to slides 23 through 26.

NEEP is completing the Home Energy Labeling Information Exchange (HELIX), a first-of-its kind effort to automate the transfer of home energy data to multiple listing services in the real estate industry. NEEP is sponsoring a HELIX summit on December 7, 2018 at the Providence Biltmore, Providence, RI. There will be a reception for networking and a tour of National Grid's Energy Innovation Hub the day prior. For more information, visit https://neep.org/events/2018-helix-summit.

Evan Lawrence is a free-lance writer in Cambridge, NY, specializing in sustainability, environmental, and health topics. ♻

Historic Home in Deerfield

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is from Zehnder, a German company. He told us, "The ventilation system is inexpensive insurance that your family is breathing fresh air." Simple vents in the bathroom and kitchen are good enough for neither heating nor health.

Because the house is a restoration, as well as a retrofit, the project was not fitted with the usual mini-splits. The Mitsubishi heat pumps were instead fitted to a ducted system to avoid having clearly visible heating units inside the house.

In the end, the grid-tied PV system is enough to cover the energy needs of both the barn and the house. Performance is expected to be very like that of newer net-zero buildings. When I asked about a backup for the heat, Hicks told me there was none, adding, "We built a passive house a couple years ago, and at 10 below, the heat was shut off for two days as an experiment. The temperature went down two degrees."

Hicks believes this house is probably the oldest in the country that uses net-zero energy. Nevertheless, it remains true to its historic presence. "Buildings are really important to the fabric of the community," Hicks said. "This is what we do well. If you look at the Deerfield house you would probably not realize it was net-zero." ♻

Heat You Lose *Cont'd from p.1*

no poisonous explosive fuels or exhausts; smaller net-zero and backup power system options.

How might one move from past practice to the future? Well, actually the future has been here for a while. Advances in science and engineering have allowed designers to analyze local climate, land formations and trees, seasonal positioning of the sun. This gives the designer heretofore unimaginable opportunities for optimizing design choices. With the latest insulations, membranes, and HVAC systems, those choices lead to an affordable comfortable home. Thousands of institutional, residential, and commercial buildings throughout the world have also been built to these standards.

There are continuing education courses for builders and architects to bring them up-to-date on the latest materials and practices in their fields. If you hire someone without proper certifications, you risk a poor outcome for your renovation or new build. Utilizing new materials in the wrong way can be worse than just doing things the wasteful, expensive, old-fashioned way.

Few of us would choose to go back to tube TVs and ice boxes. Just so, anyone who's lived in a Passive House home is never likely to settle for less. There are financial incentives and free expert advice to help build responsibly. (Efficiency VT: http://bit.do/evt-res, Capstone: http://bit.do/capstoneweather, and Passive House Institute: http://bit.do/phius can help. For folks outside Vermont, see pages 16-17 in this issue.)

If your builder says, "A building has to breathe;" or s/he just wants to staple up a membrane as an air or moisture barrier;

A Habitat for Humanity Passive House in Vermont. Image: Chris Miksic, CPHC, Montpelier Construction.

PASSIVE HOUSE PLAN WITH GROUND SOURCE HEAT PUMP

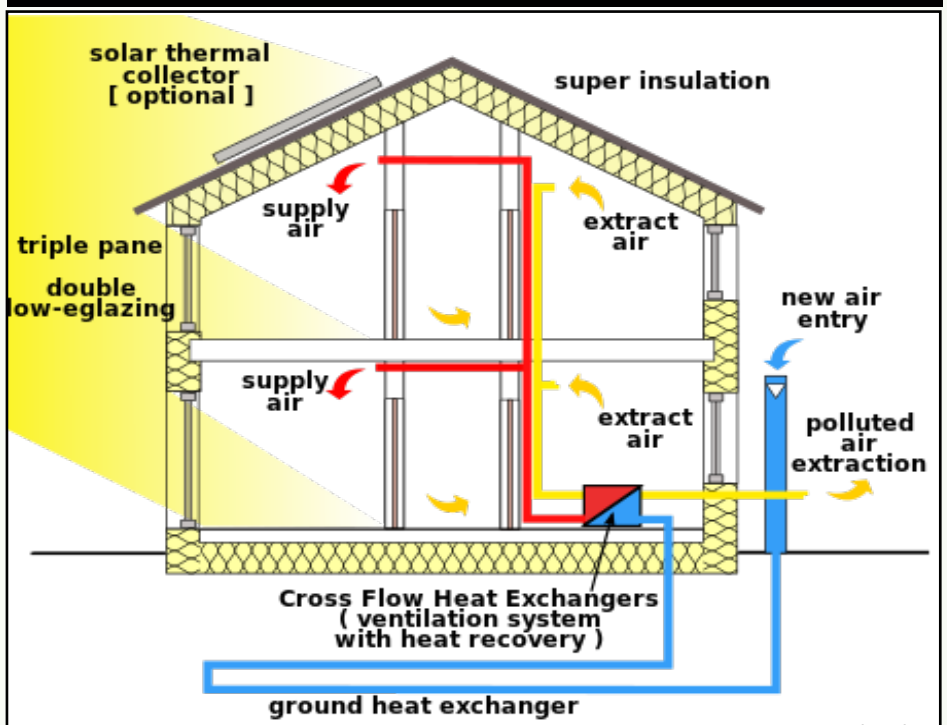

Image: Wikipedia.

or they advise you to avoid specifying a blower door number; or they say you'll need a furnace or boiler; then you need to look further. Many professionals have proven they can build to an above-code certification like Passive House, LEED, or Efficiency Vermont's High Performance Home program. All of these require independent testing, so you get guaranteed results rather than broken promises.

Someone who claims they've been building "high efficiency" or "high performance" homes is like a car salesperson telling you their car is "economical" and "safe" without giving you the EPA figures or the NHTSA ratings. A nice website with beautiful pictures and glowing references doesn't guarantee up-to-date practitioners or efficiency. Check out their certifications. See if they're listed with Efficiency VT. Ask about certified projects. Some builders scare clients away from current design and building standards by saying they cost too much -- this is false, and they're indirectly admitting they aren't up to snuff.

My parents live in a Passive House. Their TV, cooking appliances, bodies, and refrigerator give off enough heat to keep them cozy so far this fall. Their thermostat is set to 70, but the heat hasn't come on yet. When the sun is out on even the very coldest winter days, they need no help from their 500W air source heat pump. Their total energy bill for a whole year is less than $500. (It's an all-electric home - see link in bio.)

So, the answer to "How much heat do you need for your house?" is: Only as much as you let get away. IF you're willing to do your homework, you can find experts who will guarantee far more than just another beautiful home.

For decades the Whitchurches have heated their house, water, and food with cordwood and now have solar PV and hot water. Greg is a board member of Vermont Passive House and owns a net-zero Passive House addition in Middlesex, Vermont. http://bit.do/vgbnphc (802)223-2416. ♻

UNH Biomass *Cont'd from p.23*

Northwest Biomass Heating Plant under construction. Image: Weller & Michal Architects, Inc.

firm is Wilson Engineering of Medville, PA. The architectural firm is Weller & Michal Architects, Inc. of Harrisville, NH.

Froling is the supplier of the PDC dry wood chips and boiler-service company during the coming winter. For the last nine years, Froling Energy has been focused on the installation of commercial biomass boiler systems in schools, manufacturing plants, municipal buildings and homes throughout New England. They also deliver PDCs to a growing list of customers, and the screened semi-dry wood chip fuel made at their plant in Peterborough, New Hampshire.

Jim Van Valkenburgh is VP Sales & Marketing for Froling Energy. He can be reached at 603-924-1001 x2. For more information on Froling Energy go to www.FrolingEnergy.com.

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The International Energy Agency's Energy Efficiency 2018 Report

The American Council for an Energy-Efficient Economy (ACEEE)

RE: the release of the Energy Efficiency 2018 report from the International Energy Agency (IEA).

The report underscores efficiency's critical role in meeting greenhouse gas reduction commitments under the Paris Agreement and highlights the disappointing news that efficiency investments have slightly decreased in the United States and China.

Energy efficiency remains a vastly untapped resource despite being a proven strategy for meeting growing energy demand worldwide and a key driver of economic, social, and environmental progress. The report's finding that global energy demand rose by nearly 2% in 2017 indicates a need for a significant increase in efficiency policies and programs in both emerging and established economies.

This is especially relevant in light of the alarming findings from the most recent Intergovernmental Panel on Climate Change report, released in early October, which states that global greenhouse gas emissions must drop by 45% by 2030 from 2010 levels for the world to meet its Paris Agreement commitments.

We endorse the IEA's support for key efficiency policies, including stronger fuel economy standards for cars and trucks, appliance standards, and deep building retrofits. As governments consider ways to significantly cut their energy use while also growing their economies, they can turn to the ACEEE International Energy Efficiency Scorecard, which provides policymakers and anyone interested in energy efficiency with a roadmap of policy options and best practices in the buildings, transportation, and industrial sectors that will help optimize efficiency investments and maximize reductions in energy consumption.

To read the press statement online, visit: http://bit.ly/ACEEE-press-statement.

To read the report, visit: http://bit.ly/ACEEE-2018-report.

The American Council for an Energy-Efficient Economy acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors. ♻

ACEEE
American Council for an Energy-Efficient Economy

Back-up Battery Storage Program May Help When Disaster Strikes

Home Battery Storage Can Reduce Energy Costs Through GMP's "BYOD" Program

Green Mountain Power (GMP) has announced a new program to partner with customers to reduce costs during times of high energy use. During peak times such as cold winter nights, GMP will share access with customers' home or business battery storage systems, rather than purchasing expensive surplus power. In return, GMP will issue credits to customers based on the amount of energy transferred from the customer's battery to the grid. The "Bring Your Own Device" (BYOD) program using batteries provides value to the people or private companies who sell and install the batteries, the customers who sign up, and all customers GMP serves.

Mary Powell, GMP CEO said "Battery storage is a meaningful part of that energy future." She explained. "We call the new program 'Bring Your Own Device' (BYOD) because customers can now purchase any compatible batteries through any source and still receive credits on their bills. Of course, more importantly, they're helping to keep costs down for all energy users."

As part of the program, customers will allow GMP access to their battery systems through internet connections. In order to receive bill credits, customers will allow GMP to discharge their batteries back onto the grid to drive down costs. GMP will make every effort to re-charge battery storage when adverse weather events are on the horizon so that customers can count on that back-up.

More info at: http://bit.ly/GMP-BYOD. ♻

La Cité Écologique

George Harvey

Garden at La Cité Écologíque, an intentional community in Colebrook, New Hampshire.

Whether we know it or not, nearly all of us are familiar with the idea of intentional communities. The colonies that became the United States were started with them. The first settlers in Plymouth and Jamestown set up intentional communities, though the intentions were different. They have existed all through history.

One rather new kind of intentional community is an ecovillage (bit.ly/wikipedia-ecovillage). Ecovillages are intended to be sustainable. Their design takes social, cultural, economic, and ecological sustainability into account. Some of these, such as the Findhorn Ecovillage in Scotland, are well known. There is no single organization uniting all of them, but looser organizations do exist. The Global Ecovillage Network (bit.ly/global-ecovillage-network) is just one such organization; it has about 10,000 ecovillages affiliated with it.

A really good example of an ecovillage is La Cité Écologíque of New Hampshire (CENH). It was founded in 2003 as an offshoot of another ecovillage, also called La Cité Écologíque, which was founded in 1984 in Ham-Nord, Québec. Like possibly all ecovillages these two have strong interest in organic gardening, community living, and sustainable economic development. They both also have an especially strong interests in educating children.

One of the members of the Québec community had the idea for starting a business involving stained glass objects. As a result, Kheops International (KI) was founded in 1991. At first, it seemed to those interested that Florida would be a good place to develop this business, but the distance from Québec argued in favor of a new ecovillage in New England, from which KI could do business. As a result, CENH was founded in Colebrook.

The New Hampshire ecovillage produces fruit and vegetables, which are sold in the area. It is beginning to develop sugar bushes with the maple trees on its 315 acres of land, most of which is forested, and there are already about a thousand trees tapped. CENH has its own solar array and biomass furnace. But there are other businesses associated with the ecovillage, in addition to KI and sustainable agriculture.

We spoke with Leonie Brien, the Coordinator and Director of Programs at CENH's Learning Center, and her husband, Pierre Forest, an electrical engineer. Both had long experience with living in ecovillages before their New Hampshire community was set up.

The focus on education is very important. Children have been home schooled, when there were not many of them at the community, with expertise drawn from the adults. When enough children were present, the community had its own an accredited private school.

CENH is not a standoffish unwelcoming community. In her position directing the programs at the community, Leonie Brien works to make sure that people can learn about sustainability, permaculture, and the other aspects of life in ecovillages. CENH offers a number of programs to interested people. These range from workshops and school field trips to multi-week sessions and internships.

Remarkably CENH has about forty residents behind all this work. I would have to say they are forty very creative, very productive residents. But they cannot do the work by themselves. One important aspect of CENH is the economic benefit it brings to its community. Ten of CENH's residents are employed in its businesses, but so are about forty other people of the area, making it an important source of jobs.

CENH has a delightful web site, http://citeecologiquenh.org/. For anyone who might be interested, go there,hover your cursor over "About Us," and you will notice a page called "How to become a member." ♻

How Much Land Do We Need for Solar?

According to a study from MIT, *The Future of Solar Energy*, the United States is expected to be able to power its demand for electricity in 2050 from 33,000 square kilometers of land (http://bit.ly/MIT-solar-future). That may seem like a lot of land, but it should be considered in comparison with other areas. We have about 20,000 square kilometers of rooftop, for example, not enough to power our country. On the other hand, we have 10,000 square kilometers of land devoted to golf courses, so it is three times that amount.

It happens that the amount of land we have devoted to coal mines is 34,000 square kilometers. Coal mines are often eyesores, but they could be largely converted to solar power. Doing so would hardly make them worse.

Spring at La Cité Écologíque. All photographs courtesy of La Cité Ecologique.

Learning Intensive Develops Professional Skills

Jennifer White and Stacey Doll

Hands-on learning and transformational experiences are cornerstones of a Colby-Sawyer education, and through the Sustainable Learning Initiative (SLI) at Franklin, more than 280 students have partnered with stakeholders to revitalize the New Hampshire community. Students' latest foray into Franklin's efforts is a four-credit May Intensive that enables students to engage with professionals, improve communication and presentation skills, work on time management, and conduct real-time accelerated research in a setting that replicates a job environment.

Acadia LeBlanc '19, left, and Stephanie Malicki '18, right, engage with community stakeholders to gather feedback and support for Franklin's green infrastructure. Image: Michael Seamans

This May, graphic design major Erin Chute '20 and sustainability majors Stephanie Malicki '18 and Acadia LeBlanc '19 worked with adjunct faculty member Stacey Doll to develop recommendations for the green infrastructure in the "infield" of the bridge-to-bridge downtown area. Green infrastructure can include green roofs, bioswales, rain gardens, constructed wetlands and green streets. The students' design process focused on permaculture, the development of agricultural ecosystems intended to be sustainable and self-sufficient.

"I enjoy permaculture design because it incorporates creativity, sustainability, the environment and more," Malicki said. "With it, we're proactive and trying to make a difference --and helping others learn what we learn."

The design plan began with the students identifying and engaging with stakeholders to understand their needs and visions, then developing project goals. They also analyzed and assessed the project site and participants and drew a base map to provide background detail of the location's existing boundaries and infrastructure.

"The most valuable lesson I learned from this class is that there are always other sides to an argument," Chute said. "It's important to meet with stakeholders and hear them all."

Based on research and field work, the students redesigned a downtown parking lot with a bike and pedestrian greenway to capture storm water and create shade; perennial plants and a bioswale for storm-water management; safer access points and traffic patterns for pedestrians, cyclists and cars; a storm-water filtration pond to capture runoff before it enters the Winnipesaukee River; and solar lighting, benches and artwork.

The trio presented their final design and findings to gather feedback and bolster support for permaculture design in the downtown site. Stakeholders included the city of Franklin, CATCH Neighborhood Housing, Chose Franklin, the Tax Increment Financing Advisory Board, FBIDC,

PermaCityLife and Chinburg Properties. They had some questions but supported the design; one participant proclaimed the project a "net gain" for the city.

"Many people are aware of sustainability but do not have a complete understanding of how it relates to them and their projects," LeBlanc said. "After educating the stakeholders about what we've been studying, they understood how important sustainability is to the community."

The students' last tasks were to prepare a letter of intent for a Transportation Alternatives Program grant that the city will submit. They'll also complete a final report that includes their research, design recommendations, sources and an implementation strategy.

"Most college classes work on case studies or hypothetical situations. This class works on actual projects," LeBlanc said. "It helped me gain experience in the workforce while helping me to learn about my area of study and other topics along the way."

Jennifer White '90 is director of Sustainability and Innovation. She holds an A.A. from Colby-Sawyer, a B.A. from Colorado College and an M.A. from Naropa University.

Adjunct faculty member Stacey Doll holds a B.S. from Frostburg State University and has six years' experience practicing, consulting and teaching permaculture design and implementation. ♻

The Top Green Colleges in the G.E.T. Region

Green Mountain College students working on the Riverine Floodplain Forest Restoration plant an American elm along Vermont's Poultney River. Image: Green Mountain College.

It is nice to see that there was at least one college in every state G.E.T. covers which made a key environmental list—the Top 20 Coolest Schools list compiled by the Sierra Club. Green Mountain College (GMC) tied for first place and is the second college in the U.S. to reach carbon neutrality. Middlebury College ranked #10 after hitting carbon neutrality in 2016. University of New Hampshire jumped 18 places this year and is ranked #2. University of Massachusetts at Amherst ranked #7 with its largest campus solar installation. Sterling College ranked #11, receiving praise for their program in which students at the school work on farms and forestland in exchange for tuition. Cornell University ranked #20 with its 36% reduction in campus emissions and 86% reduction in cooling energy.

Below are more details why these green colleges of 2018 rank at the top of their class:

#1 GREEN MOUNTAIN COLLEGE (tied with University of California, Irvine)

Score: 86.95 | Poultney, Vermont

The second college in the nation to reach carbon neutrality is aggressively working toward a new goal of powering its campus solely via renewable energy by 2020—with help from a student-initiated biomass facility and the purchase of carbon offsets from a landfill-gas-capture project. GMC has also tweaked its eco-centric core curriculum to better account for economic and environmental justice issues. New practicums have students examining the nexus of hunger, food, and homelessness in New York City and decorating the campus with a series of "What Is Social Sustainability?" posters.

#2 UNIVERSITY OF NEW HAMPSHIRE – Score 84.30 | Durham, New Hampshire

The home of the nation's oldest endowed sustainability office embeds ecology into nearly all of its academic offerings. UNH has the very first eco-gastronomy major as well as a dual major that allows students to study sustainability through the context of, say, economics or Spanish. The Wildcats, who made an impressive 18-spot leap in our rankings this year, pipe methane from a landfill to campus, thus supplying 85 percent of campus energy needs. Considering UNH's on-campus Amtrak stop, organic dairy farm, and food-waste-reduction system through which water is extracted from dining hall leftovers to be recycled before the food waste gets composted, eco-stewardship is clearly integral to the school's ethos.

#7 UNIVERSITY OF MASSACHUSETTS, AMHERST

Score 79.07 | Amherst, Massachusetts

The home of New England's largest campus solar installation is synthesizing its 400-plus environment-related courses into a new School of Earth and Sustainability, which will make eco-oriented resources, opportunities, and faculty more accessible while promoting collaboration across departments. All students and faculty can apply for support from the Sustainability Innovation and Engagement Fund. The fund helps underwrite an annual New2You back-to-school sale of recycled dorm wares, a student-run sustainable vineyard, and an organic CSA program.

Nearly 45 tons of produce are grown annually on the student farm. Image: University of Massachusetts, Amherst.

Sterling College students prepare seed potatoes for planting while a class prepares a hugelkulture bed, a permaculture technique for making a raised bed (background). Image: Sterling College.

#10 MIDDLEBURY COLLEGE

Score 76.99 | Middlebury, Vermont

After reaching its carbon neutrality goal in December 2016, the overachievers of Middlebury were hungry for more. In January, the Panthers broke ground on a Sustainability Solutions Lab designed to source students' most innovative ideas—for ways the school could source 100 percent renewable power by 2028, for instance—and to teach them how to seek support, calculate risks, and navigate the administrative

Cont'd on p.34

DIY Carbon Sponge: Try This At Home

Jessie Haas

Taking carbon dioxide out of the atmosphere and storing it in the soil carbon sponge is a beautiful concept but can just anybody do it? Yes. If you work with any size parcel of land, you can do it directly. If you don't, your choices as an individual can help. There are two main rules.

First: Grow more plants.

Second: Disturb the soil less.

Cover bare soil with living plants, everywhere possible. Mulch is good; it prevents soil carbon from oxidizing. But plants are better. They actively pump carbon into the ground as they photosynthesize; working in tandem with soil micro-organisms.

Once you've got plants, keep them photosynthesizing for as long a season as possible. Improving your soil with compost can give plants greater resistance to heat and cold, so they don't go dormant during hot spells, and stay green longer into the fall.

Start with the lawn, a less-than-ideal carbon sponge. Most lawn grass has short roots; soil carbon is best built where there is root depth variation. Also, we burn a lot of fossil fuels caring for lawns. (1 hour x 22 mowings x 0.5 gallons of gas = 11 gallons/gas x 17.7 lbs. CO_2 = 194 pounds of CO_2 added to the atmosphere annually. Calculation from Climate-Wise Landscaping, Sue Reed and Ginny Stibolt, New Society Publishers 2018).

So get rid of your lawn, or sharply reduce its size. Put in a rain garden, a no-till vegetable patch, or fruit trees. Use mulch under trees where grass grows thinly, or grow shade-loving perennials there. Turn part of a larger lawn into a meadow. Grow milkweeds and other pollinator plants. These kind of lawn alternatives have their own, slightly wilder kind of beauty and provide many environmental services.

On what lawn remains, mow high and less frequently. Allow dandelions and plantain to grow. Their deep roots help store carbon underground. Add white clover, which lets the lawn produce and store its own nitrogen. Aerate the soil, limit compaction with heavy equipment, and use an electric or push mower. (The CO_2 footprint of a push mower is 23 lbs. total, not annually.) A robot lawnmower is also an excellent choice, using about $15 worth of electricity a year and producing a spongey, well-mulched lawn with no work.


Wikipedia

Avoid using chemical fertilizer, which interferes with soil micro-organisms and short-circuits carbon storage. Spread compost instead, or spray with compost tea.

These steps can have a major impact if adopted by many individuals or by large landowners. If you work on a campus surrounded by acres of green lawn, ask managers to shift toward organic, low-carbon methods. A meadow with mowed walking paths can be as beautiful as a lawn, while building soil carbon and attracting wildlife.

In the vegetable garden, build soil carbon by minimizing soil disturbance and increasing soil organic matter. That means no tillage, or minimal tillage. Practice raised-bed intensive vegetable gardening. Build the soil up with compost that you create on-site. Mulch to keep the soil cool and moist. There are many books on the topic; I recommend The Vegetable Gardener's Bible, by Vermonter Edward Smith (Storey Publishing, 2000).

Weed gently to minimize soil disturbance. That means weeding early, while the weeds are small. (Do as I say, not as I do on this one!) Use rotted leaves instead of peat moss; peat stores carbon but harvesting peat releases it.

In the flower garden, minimize soil disturbance. Use fewer annual plants, more perennials and shrubs. Don't do seasonal plantings, where impatiens or marigold seedlings are popped in for a month or so, then pulled and replaced with something new. That's most often done by institutional landowners. Pressure from employees or trustees to change those practices can be helpful. ♻

If you have livestock, switch to holistic planned grazing. Instead of turning the animals loose in a large pasture for months on end, use an electric fence to confine them to smaller paddocks for shorter amounts of time. As the animals cycle through paddocks, the grass they first grazed can regrow, fertilized by the manure and urine the animals left behind. The root pruning caused by grazing, along with the storage of sugars caused by re-growth, builds soil carbon rapidly, while the animals happily rotate through a series of lush salad bars. Raising beef on well-managed grass builds soil carbon on the pasture, while avoiding carbon losses in distant grain fields. Consumers can look for 100% grass-fed beef and dairy—and local is better, as it helps build a grazing economy here in New England.

If you're a farmer, use cover crops. Shift to no-till. Feed cows grass and hay and plant corn fields to perennial grasses. Nobody can say change is easy, but dairy farmers especially are in a terrible economic situation right now, so this may be the time to make a shift in what you are doing.

These are not exotic concepts. All have been around for many years. What's new and exciting is the understanding that by building soil, we help our planet regulate its carbon cycle. Tilling the soil caused great damage to the climate. Building soil is a crucial tool to reverse that, and literally everyone can do it.

Jessie Haas has written 40 books, mainly for children, and has lived in an off-grid cabin in Westminster West, VT since 1984, www.jessiehaas.com.

Links available with the posting of this article on the G.E.T. *website.*

Greening the Harvest

Cont'd from p. 20

at once, to make efficient use of your oven. Use the microwave where appropriate; it can cut energy use by 80%. Unplug small appliances when not in use. Many of them use energy whenever plugged in.

How about the refrigerator, the big kahuna of appliances? To improve efficiency, locate it in a cool spot out of the sun. Defrost regularly. Let food cool before putting it in the refrigerator.

You may be able to do more. If the year has been a bountiful one financially, consider replacing your older refrigerator. New ones are far more energy-efficient. Your state may have an incentive program to offset the cost. Even if not, you'll see a noticeable drop in your electric bill. A new refrigerator typically pays for itself in about three years.

That said, Thanksgiving's biggest carbon hit is travel. Can you take public transport? Drive a fuel-efficient car rather than fly? And honestly, is this a trip you really want to make? Political discussions may be particularly difficult this year. Your relationships and the planet might both benefit if you stayed home. Use the money you save to upgrade your refrigerator.

Or follow the example of the young woman in Michigan who, dreading political arguments on Thanksgiving 2016, got her family excited about something they could all agree on, ending gerrymandering in the state. They started a petition drive that put the question on the ballot this fall. What could your family agree on? Deep down, there's usually something. Maybe that disparate group around your harvest table could transcend their differences and start something similarly big to help cool the climate.

According to Schendler and Jones, "We're perfect for the job. If the human species specializes in one thing, it's taking on the impossible.".

Links are available with the posting of this article on the Green Energy Times *website.* ♻

RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: **http://350vermont.org**
American Council for an Energy-Efficient Economy: Consumer guide to home energy savings - **aceee.org/consumer**
American Solar Energy Society (ASES): www.ases.org
Backwoods Solar: Specialty: solar, off-grid - **www.backwoodssolar.com**
Buildings Energy Data Book: buildingsdatabook.eren.doe.gov
Carbon Tax: carbontax.org
Clean Power Estimator: www.consumerenergycenter.org/renewables/estimator
CO2.Earth: See emissions harms, scientific advice, and pathways to follow. www.co2.earth
Consumer Guide to Home Energy Savings, Heating, Appliances, Refrigerator Guide, Building Envelope, Driving: http://aceee.org/consumer
Dept. Public Svc. (CEDF): publicservice.VT.gov/energy/ee_cleanenergyfund.html
Dsireusa.com: www.dsireusa.com Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.
Efficiency VT: This is a must-go-to site for immeasurable amounts of info. **www.efficiencyVT.com**
Energy Efficiency & R/E Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html
Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov
Energy Guide: Unbiased advice about today's energy choices. Find ways to save, lower your bills & help the earth's environment - **www.energyguide.com**
Energy Star Federal Tax Credits: www.energystar.gov/tax credits.
Federal Energy Regulatory Commission (FERC): www.ferc.gov
Federal Energy Regulatory Commission(FERC): www.ferc.gov
Find Solar: www.findsolar.com
Fossil Fuel Freedom: Group working to make Vermont's energy plan 100% free of fossil fuels:
To join this group go to: **groups.google.com/group/fossil-fuel-freedom-**
Greywater Info: www.oasisdesign.net/greywater
Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - **hes.lbl.gov**
Home Power Magazine: www.homepower.com
IREC/ Interstate Renewable Energy Council: RE educational info. **www.irecusa.org**
NABCEP/ North American Board of Certified Energy Practitioners: This organization that tests & certifies PV system installers. Individuals are Certified, companies are not. **www.nabcep.org**
NESEA/ Northeast Sustainable Energy Assoc.: www.nesea.org
National Association of Energy Service Co. (NAESCO): www.naesco.org
National Renewable Energy Laboratory (NREL): www.nrel.gov
National Solar Institute: www.nationalsolarinstitute.com
NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.org**
New Hampshire Sustainable Energy Assoc. NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. **www.nhsea.org**
New York Solar Energy Industries Association/NYSEIA www.nyseia.org
New York Solar Energy Society (NYSES): www. nyses.org
NFRC independent rating & labeling system for the windows, doors, skylights **www.nfrc.org**/
NH Office of Energy and Planning: www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm
Renewable Energy World: www.renewableenergyworld.com
Renewable Energy Vermont: www.revermont.org
SEIA/ Solar Energy Industries Association: The SEIA Tax Manual to answer your solar related tax questions. **www.seia.org**
SmartPower: www.smartpower.org
Solar Components: www.solar-components.com
Solar Jobs: Listed by city, state, and district, **SolarStates.org**
Solar Living Source Book: realgoods.com/solar-living-sourcebook
Solar Power Rocks: Impressive data and info ,including per state. www.solarpowerrocks.com/
Solar Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. **SolarStoreofGreenfield.com**
Tax Incentives Assistance Project (TIAP): www.energytaxincentives.org
The Energy Grid: www.pvwatts.org
The Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - **www.eere.energy.gov**
Track the Stimulus Money: www.recovery.gov/Pages/home.aspx
Vermont Energy and Climate Action Network (VECAN): works to start and support town energy committees as a powerful, people-powered response to realizing a clean energy future. www.vecan.net.
Vermont Tar Sands Action: Group working to stop the XL Pipeline and any other developments stemming from the Alberta Tar Sands. To join this group go to: **groups.google.com/group/vt-tar-sands-action**
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**
Weatherization, Energy Star & Refrigerator Guide: www.waptac.org
www.susdesign.com Online info for solar benefit with house design: overhangs, sun angle & path…

The Top Green Colleges

Cont'd from p. 32

challenges of effecting change. This year, Middlebury conducted an ecological assessment of its 6,000+ acres of forestland to account for flora and fauna as well as the lands' cultural/anthropological value and recreational and aesthetic bona fides.

#11 STERLING COLLEGE
Score 76.86 | Craftsbury Common, Vermont

At Sterling, where most students labor on farms and forestlands in exchange for tuition (and produce upwards of 30 percent of food served on campus), the focus is on how best to steward working landscapes. So it's fitting that students are putting Wendell Berry's writing to work through a new partnership with the Berry Center, located in the author-activist's native Henry County, Kentucky. Each semester, students have opportunities to go south and help cultivate a different landscape. Meanwhile, Sterling faculty is developing curricula for Kentuckians seeking to implement holistic and sustainable farm plans. Back in Vermont, students are learning the craft of woodworking using ecologically harvested timber at Sterling's new Rural Arts Center.

#20 CORNELL UNIVERSITY
Score 74.47 | Ithaca, New York

Last year, Cornell launched Anabel's Grocery, a student-run food supply providing low-cost access to local, organic, and culturally inclusive foods. It also broke ground on the Sustainable Landscapes Trail, designed to highlight 14 campus spots that showcase Cornell's commitment to natural lands management (think rainwater capture stations, pollinator plants, and permaculture plots). Since 2008, this Ivy has reduced campus emissions by 36 percent and cooling energy by 86 percent, largely through proprietary innovations such as Lake Source Cooling—running a pump from one of upstate New York's nearby deep lakes to pipe cold water through campus. The Touchdowns are now experimenting with Earth Source Heat, a new system that involves drilling into the earth's upper crust and piping thermal heat through the often-chilly campus.

You can learn more about the basis of the rankings at http://bit.ly/2018GreenestColleges-SierraClub.

In August, the Association for the Advancement of Sustainability in Higher Education (AASHE) released its 2018 Sustainable Campus Index. GMC and Sterling College achieved top spots. GMC received an overall top spot for its master's program. It also received a top spot for sustainability in the categories of curriculum, air and climate, and investment and finance. Sterling College received a top spot for sustainability in the category of food and dining.

The full list of top performers is provided in the report at http://bit.ly/AASHE_SustainableCampusIndex. ♻

GUIDE TO ADVERTISERS

Larry Plesent

Ingredient of the Month

The Law of 'Sticktion'

Long time readers of this column will recall that this writer, like Einstein, believes there is only one set of rules that govern all matter and energy transactions inside this astonishing bubble that we call our universe. Taken to its logical extreme, this theory means that whether living or dead, slow moving or very fast, light beams, thought cascades, ships and seas and sealing wax and the kid next door all act and react according to the same set of thermodynamic and special relativity principles.

Wherever you go in the universe, the rules are the same. It would be a very different place if all the different parts had their own playbook.

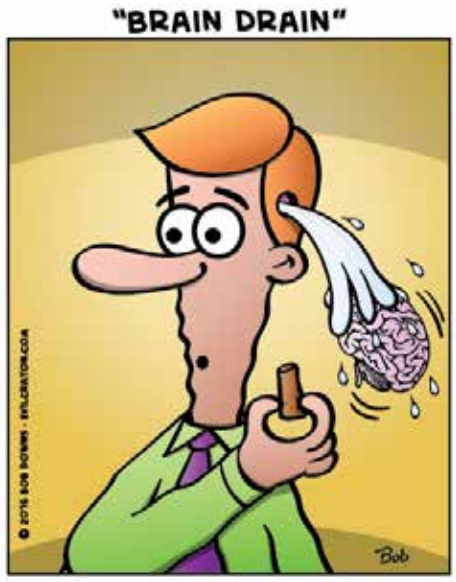
One of my favorites is the Law of Sticktion (stik/tion), a corollary of the Law of Inertia. Inertia teaches us that matter continues in its existing state of rest or uniform motion in a straight line, unless that state is changed by an external force. Sticktion teaches us that the longer an object is in one place, the more energy it takes to initially move it.

Imagine that you have a very large rock that has sat in one spot for a hundred years. During the decades the rock will have built up a significant amount of sticktion energy with the earth. It takes more energy to unstick it from the ground than would a similar recently moved object. If you don't believe me, go ask the nearest handyman.

Since humans are part of the universe, and subject to the rules thereof, we can observe sticktion at work in the human mind. People who think the same way for a very long time have a very difficult time accepting different perceptions of the same thing. In extreme cases, sticktion of the brain can lead to brain drain, or worse; the complete loss of all reason and common sense when confronted with emotionally charged hot button issues.

Take the emotionally charged hot button issue of little dogs, for example. Sure they are cute, but do you realize that little dogs are reproducing algorithmically? Two becomes four. Four becomes eight. Eight becomes sixteen, and so forth. In 57 years, the earth will be overrun with yappy little dogs making little messes from Timbuktu to Madagascar. Millions of humans will have to be employed to serve them. Soon little dogs will run the world and enslave us all to their nefarious biological rhythms.

But do people listen and heed these warnings? No they do not. Sticktion of the brain sets in at the mere sight of a little dog. Once they elicit the AWWW response, the subject brain turns to mush. Doggy mush in this case. Usually fatal.



Fight back against sticktion in the world and in your own mind. And how about a free puppy to go with?

Larry Plesent is a writer, philosopher and soap maker living and working in the Green Mountains of Vermont. Learn more at www.vermontsoap.com www.reactivebody.org and www.cancereraser.org.

[Editor's Note: This is a sattire. The author suggests thinking SNL, as you read and think about this story. The background to this story is based on real-life interactions with carpenters that Plesent encountered.] ♻

Two Vermont Towns Move on Plastics

Green Energy Times staff

Image: followgreenliving.com

The *Green Energy Times* article, "Garbage Patches in our Oceans," (bit.ly/GET-ocean-trash) outlined a rapidly growing problem with plastics, especially plastic bags and microplastics. When that article appeared in August of 2015, eight million tons of plastics were getting into the ocean each year, accumulating in ocean gyres. The situation has not improved since. The gyres are hundreds of miles across and growing.

Local governments in Vermont have started taking action. On July 1, a ban on use of plastic bags went into effect in Brattleboro, after being passed by the select board. This was not a quickly made decision. The community had been studying a number of approaches to plastic bags, such as requiring a minimum thickness, for quite awhile. The ban was a product of that consideration.

Brattleboro's ban is already having effects on other communities in Vermont. Earth Matters, an environmental group in Manchester, VT, brought the issue to that community's select board. While that board was not yet ready to put a ban into effect locally, it resolved to call upon the state to have a statewide ban on plastic bags.

The issue of plastics has grown rapidly. Microplastics, used in cleaning products and toothpaste, have been appearing in the food chain. Plastics floating in the ocean have been responsible for the deaths of millions of birds, who mistake small pieces of plastic for food and eat them, only to have them accumulate in and block their digestive systems. Plastics break down slowly, so they are rapidly accumulating in the environment. ♻

CVSWMD Helps Tunbridge Fair Compost 5.6 Tons of Food Scraps

Cassandra Hemenway

A CVSWMD trained "Waste Warrior" checks the bins at one of the waste sorting stations set up at the Tunbridge Fair this year. Credit: Kelly Sammel, the Superintendent of Concessions for the fair.

Picture five and a half rhinoceroses weighing one ton each: those rhinoceroses represent the size and scope of the food waste that got composted, instead of landfilled, during the Tunbridge World's Fair in September.

Thanks to a grant from the USDA, the Central Vermont Solid Waste Management District (CVSWMD) was able to help fair organizers with reducing waste this year, from composting food scraps, to providing clearly labeled recycling bins, to purchasing cigarette "butlers" so even cigarette waste could be recycled!

The 148 year old agricultural fair sees as many as 50,000 people over the four-day event, so a lot of trash gets generated, at last count, nearly a half pound per person. This year, CVSWMD helped cut the trash in half.

Grow Compost of Moretown, Vermont hauled 5.6 tons of food scraps from the fair; Black Bear Biodiesel of Plainfield, Vermont, picked up 250 gallons of waste fryolator oil. CVSWMD funded twenty recycling bins that diverted some (not all) bottles and cans out of the trash, allowing the fair to begin complying with Vermont's Universal Recycling Law (Act 148) which bans recyclables from the landfill.

Act 148 also bans compostable food scraps, leaf and yard waste, and other materials from the landfill over a phased in six year time frame. The full law goes into effect by July 1, 2020, so the Tunbridge World Fair's efforts with food scrap diversion set it up for success when the landfill ban on organics goes into effect.

In all, the fair reduced its landfilled waste by 12% this year. The statewide average for compost and recycling rate is 35%, so there's plenty of work to do improving the systems for the upcoming year, including offering more and better recycling options and improving the waste oil collection.

Here's a closer look at the numbers:

- 1,854 bags of trash were generated, or 92,700 gallons of stuff going to the landfill!
- 54 bags of recyclables were collected or 2,700 gallons.
- 56.25 totes of food scraps were collected, which is 2,700 gallons or 11,250 pounds (or 5.5 rhinoceroses!).
- 60 yards of recycled cardboard was kept out of the landfill as well.
- 250 gallons of fryolator oil were collected, unfortunately much of it was contaminated with soapy water and so difficult to recycle into biodiesel.

CVSWMD recruited 30 volunteers and 8 paid staff members to help sort materials at two Zero Waste sorting stations.

Both CVSWMD and fair organizers recognize improvements that should happen to increase recycling and composting and continue to decrease materials sent to the landfill. Nobody wants their fun at the fair to end up sitting in a landfill for a thousand years! But we also count this year as a success. For the first time in its history, the fair has offered significant recycling and composting options to fairgoers, and by doing so has reduced a significant portion of its trash. Plans are already underway for doing even more to increase recycling and food scrap diversion and cut down landfilled materials even more in 2019, thanks to the hard work of dozens of people, special one-time grant funding, and a lot of commitment to making this classic Vermont fair an example of how to waste less and use more of our resources for good.

About CVSWMD

CVSWMD offers an array of programing that supports its Zero Waste implementation plan. Programs include a robust School Zero Waste Program, the Additional Recyclables Collection Center, technical support and at-cost equipment for back yard composting, reuse grants, and workshops about composting, recycling, zero-waste tips and more. CVSWMD member towns include: Barre City, Barre Town, Berlin, Bradford, Calais, Chelsea, Duxbury, East Montpelier, Fairlee, Hardwick, Middlesex, Montpelier, Orange, Plainfield, Tunbridge, Walden, Washington, Williamstown and Woodbury.

Cassandra Hemenway is the CVSWMD Outreach Manager, a former journalist, and passionate gardener and composter. ♻

Elmore Roots' Permaculture Know-How

CONTRASTS

David Fried

Chocolate-scented Jerusalem artichoke blossoms in front of colorful hazelbert bushes. Image: David Fried

Each plant is a living testimonial proving that the universe likes contrasts. Like Gilligan and the Skipper, or Carlos and the flying nun, plants play off each other with light and color, shape and texture. The flower show is outstanding in its field!

Today we were pressing cider on the farm after days of gathering apples on ladders. I took a break for a short walk through the fields and observed the following: Long paw paw leaves against the rough bark of the black walnut tree. Orange-red hazelberts with golden yellow Jerusalem artichoke flowers in front of them. The earthy winding form of the kiwi vine up the straight grey rough wooden beams of the arbor. Each of these by themselves would look pretty good but contrasted against each other they jump out and shake you and seem to say, "Hey, wake up, we are amazing beings and we are transforming into our autumn dance right before your eyes!"

Whenever I am deciding where to plant a shrub or a tree, I consider what is behind it or in front of it or to the side. This new planting could easily be swallowed up by everything else growing wild or planted on this hill. But it is the very difference between the new plant and its neighbors that will give it its uniqueness and help it to really have its place. Some of my preferred highlights to date that have really worked are red or pink roses to the south and in front of native white evergreen cedars. Black currant bushes along a white fence. Yellow Jerusalem artichoke flowers to the south and in front of orange-red hazelberts in early October. I remind myself to stop and see the contrasts.

I am sure that the success of many plants is due to their diversity within themselves. On my walk I noticed a "Hansa" fragrant clove scented hardy rose in full blossom in the fall highlighted against its dark green leaves. Any pollinator will not only smell but also see this standout. Animals or people will later see the red rose hip that develops after the flower is gone and can harvest them or eat them, and in doing so, their seeds get dispersed and more of their species gets spread around the countryside.

One can also forecast the height a tree or shrub will attain and use this information to create a mélange of plant levels so you have waves of color and texture and not straight lines. Low native cranberries and Swedish lingonberries under and to the south of blueberry bushes are an example of this, along with a row of ten-foot hazelberts to the south and underneath forty foot butternut and nut pine trees. Aroniaberry bushes grow about five to six feet tall and can be planted to the south and below Juneberry trees which grow to about 15 feet. By themselves, you have a row of a native plant. Together, you have a symphony of color contrasts and fruiting seasons. A lot of songbirds will be dancing and praising your thoughtful selections, too.

I am not sure why people think they have to plant a line or group of the same thing on their land. In nature, everything is sprouting up in a conflux of swirling interesting blends. Let's see if we can observe and celebrate the soft distinguishing characteristics among the plants in our world and on our palettes. Combining short or tall, reserved or daring, each plant has its spot in the heart of the hillside. Celebrate the differences, explore combinations, and don't forget to stop and take in the exoticness of your local botanic diversity at its potent best.

David Fried runs Elmore Roots fruit tree and berry nursery in Elmore, Vermont. ♻

Extending The Growing Season with L.E.D. Grow Lights

George Harvey

LEDdynamics EverGrōT8 lights provide a longer growing season for lettuce sprouts and seedlings of Australian finger limes and fig trees in the greenhouse. Photo: Sylvie Singh-Lamy.

One of the nice things about the apartment where I live is the fact everyone here can take a share in the garden. Raspberries, squash, kale, lettuce, and a variety of other plants all grow on the small property. Pole beans climb round towers made of the steel wire mesh normally used for concrete. Tomatoes living in similar structures grow over eight feet tall.

The property is small, so we grow plants in pots in the driveway and parking places all summer, and they can be moved to stay out of the cold. We have citrus and fig trees bearing fruit. In the spring and fall, they live in the greenhouse.

In the winter, plants that need warmth come inside. Ripening calamondins turn orange, making the tree look festive for the holidays and putting thoughts of calamondin marmalade in our heads. But aside from that, past winters have been slow times.

This year, I had the really good fortune to get some EverGrōT8 grow lights from LEDdynamics. A few weeks ago, I planted two varieties of lettuce under them, and I had the first sweet leaves of them today. The success of that project makes me think I could keep myself in fresh produce all winter rather easily.

In years past, when I lived in a house with several windows with good southern exposure, I started onions, tomatoes, brassicas, and even watercress from seed for spring transplanting to the garden. This winter, I will probably also sprout some fig trees. I have found that potted fig trees are wonderful gifts for people who like plants.

Suddenly, I find myself really looking forward to winter. The LEDdynamics grow lights are not just what I wanted. They are better than I hoped.

The first thing I noticed about them was their weight and feel. The tubes are not made of glass and are not filled with the poisonous chemicals that could be released from broken fluorescent tubes, so the LED grow lights give me a feeling of safety. They also are very light, which makes them easier to install. I put mine under a shelf in my pantry, illuminating plant boxes on the shelf below.

The lights are engineered to grow plants. This means that the light they emit is in a spectra designed to support growth. There are two colors available: white and violet, which is what I have, in multiple spectra. The lights are specifically designed to operate in humid environments, which is important when they are to be right over plants that get watered every day.

The lights have low power consumption. They operate on a standard household current, and at 17 watts, they provide a savings said to be over 40% compared to fluorescent tubes. They are very efficient and give off very little heat.

I would highly recommend LEDdynamics grow lights as holiday season gifts. You can give them to anyone you love who loves to grow things. And I might suggest that you don't forget to love yourself. ♻

Outdoor Gear - Taking on Sustainability

Roddy Scheer and Doug Moss (EarthTalk®)

Tent maker, NEMO Equipment, is one of the smaller outdoor gear brands known for its commitment to sustainability. Image: Dean Hochman, FlickrCC.

It's true that Patagonia has long been a leader in sustainability initiatives. More than two decades ago the company switched over to organic cotton and soon started examining the environmental impact of every step in its supply chain. The next step was to start making fleece from recycled soda bottles — and eventually from its own worn out fleece products.

Later, company founder Yvon Chouinard spearheaded One Percent for the Planet, a non-profit coalition of 1,200 outdoor gear and apparel makers committed to contributing at least one percent of annual sales to environmental causes. Patagonia has also supported the work of thousands of grassroots environmental activism campaigns through its grants program. And more recently, the company kicked off its Worn Wear program to take back and repair or recycle any of its clothing or gear so the materials can live another lifetime.

While Patagonia may be the acknowledged leader in sustainability-oriented gear, it's far from the only player in the game. North Face, Osprey, Marmot, Outdoor Research, Columbia, Keen, PrAna, MSR, NEMO, Cotopaxi and others are also blazing new trails when it comes to greening their products and processes. And this common interest in doing the right thing has led most companies in the industry to unite behind common standards and best practices. To wit, 200 apparel, footwear and textile companies concerned about their industry's environmental impact joined forces in 2011 to create the Sustainable Apparel Coalition (SAC).

This non-profit alliance developed, maintains and updates the Higg Index, a set of standardized supply chain measurement tools that anyone in the industry can use to assess the sustainability of individual products or entire product lines. "With the Higg Index, the industry is addressing inefficiencies, resolving damaging practices, and working to achieve the environmental and social transparency consumers are demanding," reports SAC.

And just this past April, REI, the outdoor gear coop started by Seattle climbers in 1938 that has grown into the largest outdoor gear retailer in the country, announced its own set of sustainability standards that all of the brands it sells must adhere to in order to remain on the company's shelves. REI developed the standards with input from dozens of partner brands of various sizes and product categories.

"We work with more than 1,000 brands, both large and small. Some are on the leading edge in integrating sustainability into their products and supply chains. Others may have a keen interest in sustainability but lack the resources to fully implement a program," says Matthew Thurston, REI's director of sustainability. "We're in a unique position to unite our brand partners around a common goal, by sharing best practices and resources that we've learned from both our own work and that of the brands we work with."

Now customers can search on REI's website for keywords such as "organic cotton" or "fair trade" and find products from any number of different manufacturers that match not only their particular gear need but also satisfy their conscience as well.

Contacts: Patagonia, www.patagonia.com; One Percent For The Planet, www.onepercentfortheplanet.org; Sustainable Apparel Coalition, www.apparelcoalition.org; REI Product Sustainability Standards, www.rei.com/assets/stewardship/sustainability/rei-product-sustainability-standards/live.pdf.

EarthTalk® is produced by Roddy Scheer and Doug Moss for the 501(c)3 nonprofit EarthTalk. They are the editors of E – The Environmental Magazine. Read more at earthtalk.org or send questions to question@earthtalk.org. ♻

LEAF BLOWERS
Bad For the Environment and You

EarthTalk®, from the Editors of E - The Environmental Magazine

Upwards of 170 American cities in 31 states (as well as five cities in three Canadian provinces) have some kind of leaf blower restrictions already in place. Credit: Dean Hochman, FlickrCC.

Those leaf blowers sure can be annoying, just for the noise alone. According to the Centers for Disease Control and Prevention, using a commercial-grade, gas-powered leaf blower for just two hours can cause hearing damage and repeated use is a sure recipe for permanent hearing loss. And when you factor in the air quality damage from the inefficient gas motors on the models commonly used by maintenance workers and landscapers everywhere, it gets personal as it becomes a serious health issue.

California's statewide Environmental Protection Agency (CalEPA) reports that the best-selling commercial leaf blowers emit as much smog-forming pollution during just one hour of use as driving a 2016 Toyota Camry about 1,100 miles. CalEPA adds that landscape workers running a leaf blower are exposed to ten times more ultra-fine particles—invisible to the eye but easily lodged into the lining of your lungs—than someone receives standing next to a busy road.

Leaf Blowers emit as much pollution in one hour as driving a 2016 Toyota Camry 1,100 miles.

And these aren't isolated, hyper-localized problems, as experts warn that within a couple of years, smog-creating emissions from leaf blowers, lawn mowers and other small gas-powered non-vehicular engines will eclipse smog emissions from cars and trucks on the American road.

But rest assured, there are some rumblings of change. Upwards of 170 American cities in 31 states (as well as five cities in three Canadian provinces) have some kind of leaf blower restrictions already in place. LeafBlowerNoise.com maintains a list of cities across North America and beyond that have some kind of restrictions on the books.

And of course, there are cleaner, quieter ways to clear yard debris and leaf litter. Getting out the rake and broom is a sure-fire way to stay on your neighbors' good side by avoiding all that pollution and noise. And it's a great way to get some productive exercise on a fall day. Even better, get the kids off the couch and away from the screens to lend a hand.

Another alternative is to use an electric lawn vacuum which sucks up leaf litter and other yard debris (instead of blowing it around) with a lot less noise and without causing smog. That said, an electric leaf blower—either battery-powered or corded to an outlet—can get the job done with less noise and no spewing (albeit with less oomph).

Given recent outcries about leaf blowers, manufacturers have responded with new models that address many consumer concerns, as well as those of neighbors. For example, Echo's PB-250 was designed from the ground up to eliminate annoying noise frequencies and operate more efficiently while maintaining the flexibility of gasoline as a fuel. Husqvarna, Stihl, Black & Decker and Toro also have newer models which comply with most of the recently adopted leaf blower ordinances around the country. Check out the city of Burlingame, California's listing all models of leaf blowers that max out at 65 decibels in volume for quieter (and in many cases less polluting) models.

Contacts: Leafblowernoise.com; Echo PB-250LN Handheld Gas Blower, amzn.to/2A57UkM; Burlingame's "65 Decibel Machinery List," goo.gl/TvE5aE.

EarthTalk® is produced by Roddy Scheer & Doug Moss. question@earthtalk.org. www.earthtalk.org. ♻

Caveman Crayons
Asbestos? Really?

Jessie Haas

Crayons are one of humankind's oldest drawing media, invented right after the finger tracing a line in the dust. Archaeologists believe the oldest known piece of human art is a series of cross-hatches drawn across a shard of rock with an ochre crayon. Natural, wholesome, and suitable for kids, right?

Not necessarily. In September, the United States Public Interest Research Group (US-PIRG) released a report on some popular school supplies, which found trace amounts of tremolite, a form of asbestos, in some Playskool crayons sold at Dollar Tree.

The crayons in question are the green crayons in a set of 36, manufactured for Playskool by Leap Year Publishing. John Sorenson, spokesman for Leap Year, says the company complies with and is tested under Children's Product Safety Certification standards. He says Leap Year is "currently re-verifying" that the crayons are safe and asbestos-free, and has requested a review of US-PIRG's methods. (US-PIRG has conducted safety surveys of toys for three decades.)

Bizarrely, asbestos is legal in crayons, but as US-PIRG notes, "scientists and government agencies point out that it is unnecessary to expose children to asbestos." (Ya think?)

The Safer School Supplies Shopping Guide points out that other brands of crayons, including Crayola, Up and Up, Cra-2-Art, Disney Junior Mickey and the Roadster Racers, and Rose Art crayons are asbestos free. Playskool does sell crayon sets with an "AP" label from the Arts and Creative Materials Institute (ACMI) which do not contain asbestos.

US-PIRG recommends looking for the AP label on children's art products to be sure they are nontoxic. If that is absent, look for the Consumer Product Safety Commission (CPSC) label, which indicates that the product has been tested by a third party lab under government specifications. However, the green Playskool crayons are apparently manufactured according to CPSC standards.

What's a parent to do? Make a habit of checking with the Safer School Supplies shopping guide before making purchases. If you have the time and energy, a couple of "mommy blogs" offer recipes for making your own crayons, using waxes and pigment powders. Once you gather the ingredients, it doesn't look that difficult, and you can even get ochre powder. So, it's actually possible to skip the petroleum products and the asbestos and make an old-fashioned caveman crayon.

Jessie Haas has written 40 books, mainly for children, and has lived in an off-grid cabin in Westminster West, VT since 1984, www.jessiehaas.com.

Links available with the posting of this article on the Green Energy Times *website.* ♻

Image: Wikimedia Commons