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Tick Defense 101

W. Carl Mayer

The impact of ticks on humans, and the many debilitating diseases that can be transmitted by these tiny creatures are beyond the scope of this short article. Unfortunately, even the old, consoling adage "A tick has to be on you for twenty-four hours before it can infect you." is only true as long as we are looking at Lyme or bacterial infections. However, according to the NY Schoharie County Health Department's annual survey of ticks conducted in 2022, about 20% of the deer ticks also carried the Powassan virus. This virus can be transmitted in less than 15 minutes after being bitten. Unlike Lyme disease or other bacterial infections, which

Cont'd on p.37

Deer tick. (Scott Bauer, U.S. Department of Agriculture, public domain, via Wikimedia Commons)

PRO RACING GOING GREEN

Major auto racing organizations including NASCAR, Formula 1, and IndyCars are committing to reduce their carbon emissions.

Indy 500 race cars (www.indycar.com/indynxt). Inset: The H24 Fuel Cell Racer, the new prototype of the electric-hydrogen propulsion racecar of the MissionH24 program.

Martin Wahl

NASCAR's Big Announcement

On April 18, 2023, NASCAR announced its plan to reduce its net carbon footprint to zero across its core operations by 2035. The program, titled IMPACT, is an umbrella platform spotlighting sustainability, community engagement as well as other social initiatives. Additional sustainability priorities include 100% renewable electricity at owned racetracks and facilities, the development of a sustainable racing fuel, expanded recycling efforts, and on-site EV charging stations.

NASCAR conducted an assessment of its carbon footprint in 2022 and, while not revealing emissions from all their operations, indicated that the racecars emit 120,000 lbs. of CO2 during its 36-race season.

Formula One is More Forthcoming

Earlier, Formula 1 announced in 2019 that it plans to achieve net carbon neutrality by 2030 in all its operations including logistics, the main cause of their annual quarter-million tons of CO2 emissions. The race cars themselves represent only 0.7% of those emissions.

In May, Formula 1 had to cancel the Italian Grand Prix at Imola in Emilia-Romagna due to climate-change caused flooding.

Engines and Fuels

At opposite ends of the engine technology spectrum, NASCAR

Cont'd on p.24

CO2 Level Hits a New Alarming High of 425ppm

Dr. Alan K. Betts

Professor Eliot Jacobson said on Twitter, "Here on hothouse planet Earth, on April 28, 2023, CO_2 levels just breached 425.0 parts per million (ppm) for the very first time. This is a horrific day in the record books of what humans have done in their relentless desecration of this once pristine planet."

The diverse flood of responses shows how poorly many people understand what is going on. So, I will review the critical issues that lie ahead.

The sun heats the Earth. The burning of the carbon-based fossil fuels, which were stored in the Earth for millions of years, is warming the planet and driving rapid climate change, by driving up atmospheric CO2, a key greenhouse gas (GHG) that reduces the cooling of the Earth to space. At the start of the industrial revolution around 1700, CO_2 was around 280ppm,

and it had reached 315ppm in 1958 when measurements started at Mauna Loa. CO_2 is important because its atmospheric lifetime is on the order of a century, although the removal processes are poorly understood. Methane (CH4) is a more powerful GHG, but its atmospheric lifetime is much shorter, on the order of a decade.

The warming of the Earth and oceans from increasing GHGs has been well understood for about 50 years. Back in 1978, James Black, the chief scientist of the current Exxon-Mobil company did the global modeling and correctly concluded that doubling atmospheric CO_2 would be a disaster for the global climate and for life on Earth. He told management they had five years to change their business plan. Their response was simple, "Be quiet. We have trillions of dollars to bribe politicians and fund advertising and webs of lies to confuse the public for decades." This is exactly what they have done. For forty-five years the oil companies have deliberately hidden the truth that they are consciously destroying the Earth to maximize their profits. This is clearly a staggering crime against all life on Earth including our children. Millions are starving from climate disasters in poor countries and many have died or been forced to migrate. Catastrophic floods have killed many more. It is shameful that society and politicians have taken bribes and simply accepted these webs of lies and this criminal deceit.

The oil company profits have hit new records since the war in Ukraine started last year. The EU passed

Cont'd on p.22

IN THIS ISSUE

Concentration of CO2 in the Atmosphere

424.72
parts per million (ppm)
June 3, 2023

Learn more at www.CO2.earth.

GREEN ENERGY TIMES (G.E.T.)

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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 clean, 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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LETTER FROM THE EDITOR-PUBLISHER

Summer 2023 is Here!

This issue of *Green Energy Times (G.E.T.)* comes out just in time for summer, 2023.

Summer means camping for some of us. Check out the awesome portable power supply from RELiON Battery on page 7. We will be reviewing it in our August issue.

When camping or just enjoying being outdoors, know that the ticks are out in full force. We have two related articles with very helpful information on pages 1 and 38. The bugs of summer can detract from a good time outdoors, during recreational activities as well as while gardening. See page34 for agriculture-related information. There are solutions.

Gardening season is here in full color and production. It's such a great time of year for the wonderful fresh and local food that is available. Note that July 1 is International Co-op Day.

Did you realize that co-ops are not just food coops, but include many other businesses that believe in the cooperative standards? Both credit unions and even Ace Hardware stores are co-ops. Be sure to support your local co-ops for your fresh and local needs! Read more in our feature on page 20.

Summer also brings with it the sunshine, and its strongest electricity generation. There is no better time to go solar. We recommend going solar with any of our advertisers. With the climate emergency worsening by the day and the high costs of fossil fuels, it is time to take the plunge and begin your journey to generate your own clean energy. (By the way, what do you call it when there is a solar spill? You call it a good day!) We hope you will support the solar installers that also support *G.E.T.*

Summer and mowing create the need for emission-free solutions. Mowing with an electric machine is really the solution. For every green space that is mowed, there are indeed reasonable ways to lower all of our emissions. And the solutions will not only mean less maintenance, but less noise and are generally more affordable than continuing with gas-powered mowing options. What's more, you don't have to keep buying gas, so you get to keep that money in your pocket. If you do not have the time to mow yourself and use a service that still uses gas-powered equipment, consider a robot mower. There are many options to choose from. You can read two reviews of affordable riding mowers for larger lawns and options for commercial and larger needs with ads you will find on page 39.

Unfortunately, we did not receive our copy of *A Zero Waste Family* in time to do a full review when we ran the book review on *A Zero Waste Life in Thirty Days* by Anita Vandyke (April 2023, page .20). I would like to mention it once more and encourage our readers in households to consider reading it. Although I already follow many of the things mentioned in the book, I found the information to be of value for households to learn how to deal with our wasteful way of life. See how to get a copy on page 36.

And one more 'by the way': we are now in our 14th year of publishing *Green Energy Times*. Our first edition came out on May 4, 2009. Thank you for your support all these years! Please consider helping us continue with our efforts as costs to do so continue to rise. We appreciate and are very thankful for any contribution. If you have questions, please call us at 518.222.6567 or send an email to info@greenenergytimes.org.!

Happy summer! – Nancy Rae. ♻

TABLE OF CONTENTS

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The Next Step Towards a 100% Renewable Energy Future:

Vermont's Legislative Working Group on Renewable Energy Standard Reform

Peter Sterling

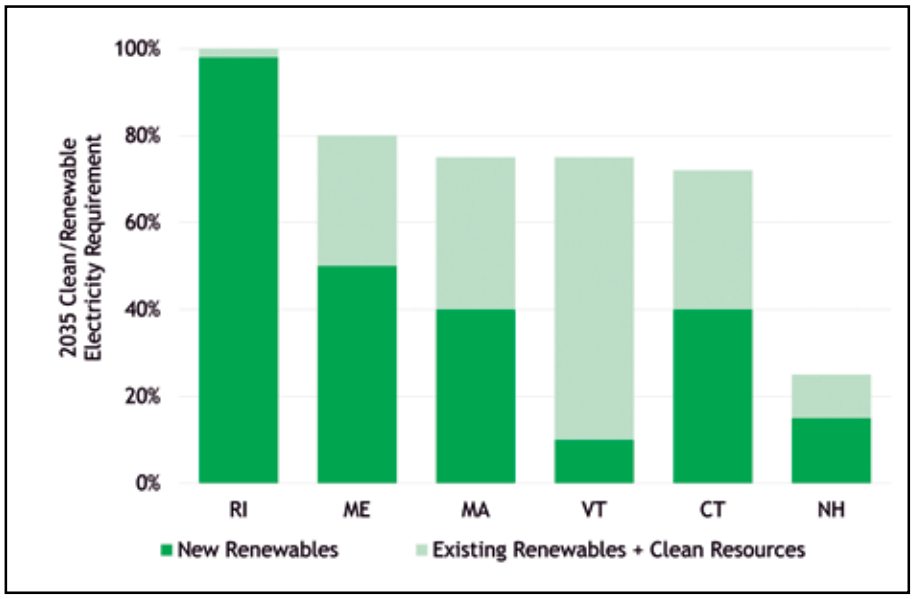
On May 11, on what turned out to be the next-to-last day of Vermont's legislative session, the Vermont Senate voted overwhelmingly to support the language added in the House of Representatives to S.112 to create the Legislative Working Group on Renewable Energy Standard Reform.

In a Legislative session dominated for months by the fossil fuel industry's campaign opposing the clean heat standard created by the Affordable Heat Act, getting S.112 to the Governor's desk is seen by most observers as the necessary first step for getting Vermont to a 100% renewable energy future.

This bill was passed only after months of hard work by a broad coalition of organizations committed to a 100% renewable energy future- VPIRG, 350Vermont, Rights and Democracy, the Vermont Chapter of the Sierra Club, Vermont Natural Resources Council, REV, Vermont Conservation Voters and the Conservation Law Foundation.

S.112 creates the Legislative Working Group on Renewable Energy Standard Reform charged with bringing together stakeholders from the environmental movement, utility sector, business community, low-income advocates and others to prepare legislation for consideration in the 2024 Legislative Session.

The Working Group is charged with reporting on eight broad topics including, "identifying any barriers to moving to a 100% percent renewable standard for all electrical utilities by 2030" and "how current programs impact environmental justice focus populations, households with low income, and households with moderate income and how a revised Renewable Energy Standard can ensure that benefits and burdens are distributed equitably."



Vermont's environmental movement will have strong representation on the Working Group with VPIRG, Sierra Club, Conservation Law Foundation, Vermont Natural Resources Council and REV all being at the table. The Working Group will be led by two yet to be named members of each the House and the Senate and will hold eight public meetings before the end of 2023.

During this process, the above-mentioned coalition of environmental groups will, among other things, be advocating for the following:

- Moving Vermont to a 100% renewable energy future by 2030
- Doubling the amount of new in state renewables to 20% of Vermont's power by 2030
- Creating a new "in region, new renewables" requirement of 30% of Vermont's power by 2030
- Ending Vermont's one-of-its-kind-in-New England Renewable Portfolio Standard eligibility for unbundled renewable energy credits from large out of region old hydro power

There are many reasons why Vermont needs to update its Renewable Energy Standard (RES). Written in 2015, the RES calls for just 75% of Vermont's power to come from renewables by 2032 with just 10% of that generated from new sources- the lowest new renewable energy requirement in New England. It's way past time to get Vermont in line with the rest of our region for bringing new renewables on line. This is the only way to truly decrease the amount of carbon emitted by generation from New England's electric sector.

In addition, since Vermont has no baseload gas-burning plants, the state relies on 81 such plants located in largely low-income communities in Massachusetts and Connecticut when we need more power, in addition to dozens of costly fossil fuel "peaker plants." It is long overdue for Vermont to end its heavy reliance on facilities in these communities for so much of our energy needs. Bringing more new renewables on line here in Vermont and throughout New England will help curtail the need for these and future fossil fuel generation facilities and begin the process of alleviating the environmental and health burdens placed on this communities.

Peter Sterling is the Executive Director of Renewable Energy Vermont, the trade association representing the individuals and businesses working towards a 100% renewable energy future in Vermont. ♻

For Just Climate Action, the Imperative of Cleaner, Cheaper Heat

Johanna Miller

In late March 2023, the Intergovernmental Panel on Climate Change (IPCC) delivered the final segment of its Sixth Assessment Report. United Nations Secretary General António Guterres described it as "a clarion call to massively fast-track climate efforts by every country and every sector and on every timeframe." He said, "Our world needs climate action on all fronts: everything, everywhere, all at once."

Thankfully, in early May, the Vermont Legislature took an important step to answer that call, decisively overriding Governor Phil Scott's veto of the Affordable Heat Act (S.5). This performance standard is designed to put Vermont on a path to doing our part to reduce planet-warming pollution in the thermal sector, in line with what climate scientists say is urgently necessary.

This policy direction is the culmination of years of efforts to grapple with how to thoughtfully, equitably, and affordably transform how we stay warm in our cold climate. Establishing a Clean Heat Standard was the top pollution-reducing recommendation of the Vermont Climate Council's initial, adopted Climate Action Plan. The approach is estimated to deliver more than twice as many pollution-reducing benefits than any other recommendation in the Climate Action Plan; an approximate 40% reduction of GHG emissions in the thermal heating sector by 2030.

Enactment of S.5 is important progress, setting in motion a two-year process to design and deliver on a cost-effective, equitable, and climate-accountable program, and that important design work is just beginning to commence. Fortunately, S.5 included clear guidance to inform this process, outlining an expectation of what policymakers expect the policy to deliver.

Heat pumps are a clean and affordable heating solution. (Wikimedia)

The Affordable Heat Act has a focus on affordability and prioritizing program benefits to serve low- and moderate-income Vermonters. It establishes an Equity Advisory Group tasked with helping ensure that no Vermonter is left behind in this needed and inevitable clean energy transition. And it puts critical constraints around what clean heat measures would be eligible in the program, and for the amount of credit any measure would receive, basing that eligibility on a lifecycle greenhouse gas emissions assessment. This "carbon intensity score" is important – and intentional. It's designed to put constraints on things we want to prohibit out of the gate (like fossil fuels or heating measures only nominally better than them) as well as dramatically reduce or phase out some eligible measures over time – like many biofuels.

It is not a new concept. We have had performance standards in place, thankfully, for decades. We have obligated our automobile industry to produce higher-mileage vehicles, saving consumers money and cutting carbon. We have required appliance and equipment manufacturers to increase the efficiency of their products over time. And we have tasked the electric sector with becoming more efficient and our electric utilities with procuring or deploying far more renewable energy resources over time.

In what is now Vermont's highest-polluting sector – the thermal sector – we have not asked the same of the fossil fuel heating industry. This is why the enactment of the Affordable Heat Act is such an important step forward.

Beyond the climate benefits of the Affordable Heat Act, the economic benefits are also significant. In Vermont, nearly all of the energy used to heat our buildings comes from fossil fuels, and every bit of that energy is imported into the state. Consequently, nearly 70% of the money we collectively spend to stay warm with fossil heat leaves Vermont. Not to mention the fact that our fossil-fired heat is tied to a global commodity market over which we have no control. And, recently, many Vermonters felt the brunt – and high-costs – of this price-volatile system. For many, the price of #2 fuel oil rose by $2.00 or more a gallon in just over a year.

These sharp cost increases are deeply inequitable, unsustainable, and avoidable – if we can design and establish a new program and business model that helps Vermonters access cleaner, less costly, more local ways to stay warm. That is exactly what the Affordable Heat Act is intended to do.

The most recent projections indicate the program would, if implemented, result in a reduction of Vermonters' overall heating costs by $2 billion, or an average of $7,500 per

Cont'd on p.26

THE ELECTRIC SCHOOL BUS SOLUTION

Barb and Greg Whitchurch

Kids and smoking. Yuk, what a problem. First it was cigarettes; now it's vaping. But all along, lurking in the background was a more insidious kids-and-smoking epidemic of which we are just becoming aware: our air pollution!

Let's get one thing straight right off the bat: the kids aren't choosing this particular vice for themselves; they're not sneaking around; they're not showing off to their peers. Nope, their parents are foisting this particular "bad habit" upon them -- right from birth!

The same issue that is causing the climate crisis is poisoning us and our children directly, every time we take a breath, and has been doing so for quite some time. We are soiling our own nest by treating the air we breathe as a sewer, and it has caught up with us.

In the U.S. alone, there are thousands of cases of childhood asthma every year caused by the air we all breathe. One in 15 children is affected by childhood asthma at this point, and the rate of growth is climbing steadily. Children are more susceptible to this exposure because their lungs are still developing (www.bit.ly/yale-asthma).

Looking at the whole planet, there are thousands of children dying every day because of the air they breathe. (Please use the search engine of your choice to see the many reports available on all of the statistics to which we refer in this piece.)

Lion is a popular e-bus brand in the Northeast and in Canada: www.bit.ly/lion-sb. Other EV school bus makers include Blue Bird (www.bit.ly/bb-ev-sb),Thomas Built, & IC Bus. (Whitchurch)

And now that we have all been alerted to these dangers by the National and International agencies we fund, if we continue doing this to our kids, it's by choice. For a long time, ignorance was our excuse, but no more.

If we decide to clean up our act for the kids' sake, how might we go about it? Well, one way would be to clean up their school vehicles -- the buses.

1. Are your buses still lining up outside the school and idling while they load up? It's not just carbon dioxide, carbon monoxide and nitrous oxides that poison young lungs, but also fine particulates in the exhaust that plug the tinier parts of airways (www.bit.ly/vt-ev-sb).

2. The air inside the buses is also a big problem (www.bit.ly/ct-school-bus). Just as living in a home where a gas range or oven is used, the effects of the exhaust are severe, even though not immediately apparent (www.bit.ly/nrdc-sb-dangers). (Feel sorry for the bus driver, too!)

3. People who still drive internal combustion engine (ICE) cars can care about this issue, too. Offer all parents the opportunity to write letters to their school boards, local politicians and the bus companies (see the appendices in the NRDC link above, beginning on pages 55).

4. A LOT of your tax dollars are being funneled into the effort to replace diesel buses with electric vehicles (EVs); but one must apply before September (see www.epa.gov/cleanschoolbus). Let's get some fair share of funding back home for your kids.

5. Politicians, municipalities, school boards, bus services, parents and students are all stakeholders and have a voice. Exercise that voice! Your search engine can get you contact information for all of those entities -- type "near me" at the end of your search terms.

6. 26,000,000 children ride 480,000 school buses each day. The pollution harm this causes to our atmosphere is significant (www.bit.ly/veic-mv-ev-bus).

7. The effect upon children's health is measurable (www.bit.ly/ct-ev-sb-attend). You can even look into calculating your child's increased risk of school bus-induced cancer using the formula on page 45 of the NRDC article above (www.bit.ly/nejm-cc-ff-children).

8. Share this link for an inspirational blurb that can give people an incentive to get involved: www.ElectricSchoolBus-Initiative.org/.

Vehicles with very large EV batteries (transit buses, delivery trucks, excavation and mining equipment, etc.) are being used to shave peak loads on utility grids, back up whole buildings when the grid fails in a storm, and more (www.bit.ly/get-geb).

There are now services where you could have your death-belching diesel bus refitted as a safer, quieter, cheaper, longer-lasting electric vehicle (www.bit.ly/ct-sb-conv).

Four school districts in Vermont, seven in Maine, two in New Hampshire, and four in New York are getting a total of 60 EV school buses. Last month, the Vermont Clean Cities program sponsored a series of electric bus demonstrations throughout Vermont and New Hampshire (www.vtccc.w3.uvm.edu/about/).

At five sites, over two months, a California-built BYD electric school bus was brought up from New Jersey to demonstrate to the students, parents, school administrators, and community members what an electric bus is all about.

The kids loved the test ride and marveled at how quiet and non-"stinky" it was. One of them said, "Can our school get some of these?"

Your authors can remember "the good old days" (1950s) when no one thought cigarettes or alcohol had long-term deadly effects. Back then, Americans made fun of the unhealthy drinking water in Mexico! Perhaps those days were not so good after all.

The Whitchurches live cheaply and securely with their EVs, heat pumps and induction range at their solar-powered Net Zero+ Passive House. For related articles, see www.bit.ly/get-w-ev. ♻

Many thanks to our section sponsor

Charging Your Electric Vehicle at Public Locations and at Your Home

Wayne Michaud

You have made the big switch to owning an electric vehicle (EV)! Electric charging has become the new way for you to refuel your ride. So, let us explore the different charging options that best meet your needs. This will depend on your EVs range of miles rating (which can vary greatly old to new), how many miles you drive per day or week, and even the time of year (battery range is significantly depleted in winter). The types of charging available are Level 1 (L1), Level 2 (L2), and Level 3 (L3), which is more commonly referred to as DC fast charging (DC FC). The charging system componentry is known as electric vehicle supply equipment (EVSE).

Public Charging:

First, let us briefly discuss non-home charging, also known as public charging, which commonly refers to L2 and DC FC stations. These stations can include one charger with one EVSE plug-in port, or multiple chargers and ports at one location. Most will be L2 which uses a universal J1772 connector (with an adapter for Teslas) and typically charges the battery 25 miles of range per hour. DC FC is only accessible at public station locations, since home electrical systems use AC power. DC FC delivers much faster charging than L1 or L2—up to ten miles of range per minute—albeit more expensively. For most EVs, the DC FC connector is known as CCS (exceptions include Tesla, Nissan, and Mitsubishi). Northern New England currently has more than 2,100 public L2 and DC FC EVSE ports; more than 450 of these are DC FC. Note that a percentage of DC FCs are Tesla Superchargers.* One additional source of charging outside the home can be at the workplace.

Home Charging:

L1 charging is the simplest and the slowest. Almost all EVs come with L1 mobile charging equipment: a cable of up to 25 feet, with one end plugging into a common household 120V outlet, and a pistol-grip connector that plugs into the car's EV port. L1's slow rate, known as trickle charging, typically provides three to five miles of range for every hour connected to an EV (or plug-in hybrid EV). This average of 72 miles in 24 hours varies summer to winter.

The remainder of this article will be devoted to L2 home charging. If you are in a more rural area and have a longer commute in your EV, L2 charging capability will be essential. L2's connector cable plugs into a 240V outlet, the same that a clothes dryer uses. With an average charging range of 25 miles in an hour, this will fully charge an older EV that is near range depletion in about three hours and a newer EV with up to triple the range in eight to ten hours.

Many homes have adequate amperage to handle L2 charging, but it will be best to learn what will work and what is safe, including considering consulting with a licensed electrician.

The location in the home that charging will occur depends on the proximity to an existing 240V outlet and if it can be shared with, for example, a dryer, or if a dedicated outlet needs to be installed. Outdoors is an option, but a garage will be the ideal location. Alternatively, a unit can be hardwired into an electric panel by a professional.

A level 2 charging station set-up in a residential garage operates on 240 volts. This can charge a near depleted battery in three to eight hours depending on the battery size. (pexesl.com)

Electric utility providers come into play on saving EV owners money. Some electric utilities in Vermont and New Hampshire offer residential customer L2 EVSE purchase incentives, with qualifications, ranging from $250 to $900. In addition, many utilities offer rate discounts for EV charging during off-peak hours or for being on a time of use (TOU) plan. Learn more about details of home charging at the following websites:

- Drive Electric Vermont: https://bit.ly/VT-charging
- New Hampshire Electric Co-op: https://bit.ly/NH-charging
- Efficiency Maine: https://bit.ly/ME-charging
- NYSERDA: https://bit.ly/NY-charging

The cost to charge an EV at home versus pumping fuel into a gas-powered vehicle can vary, but overall, according to fueleconomy.gov, EVs are about one-third the cost to power. A fuel costs and savings comparison for any model can be calculated here: https://bit.ly/calc-savings. For L2, installing this EVSE system can range from no cost (DIY) to electrician costs of $200 to $2,500 or more, depending on utilization of an existing 240V outlet, or the need of a new outlet and an electric panel upgrade.

Level 2 Charger Models:

- Let us look at some popular L2 J1772 UL listed home chargers (with Tesla adapters). If you have an accessible 240V outlet and are capable of drilling a few holes into a couple of studs for the charging box mounting bracket and included cable holder (cables are 20 to 25 feet), you can do it yourself. If not,bring in an installer. If not hardwired, these can be taken on the road where 240V outlets are available.
- **VEVOR Level 2** - $203. 32-amp/7.68 kW output. Compact, lighter charger. No Wi-Fi connectivity or smartphone app to set charging times.
- **Grizzl-E Classic** - $395. 40-amp/9.6 kW output. No frills charger. No Wi-Fi or app makes the lower price possible. Has rugged aluminum enclosure to enable outdoor installation.
- **Emporia Smart Home 48-Amp** - $399. Output: 48-amp/11.5 kW. Low cost but is Wi-Fi and app capable.
- **Wallbox Pulsar Plus** - $649. Output: 40-amp/9.6 kW. Compact, but high-end smart charger. Also available in a 48-amp version at $699. Highly rated for extreme weather making it one of the best choices for outdoor installation.
- **Enel X JuiceBox 40 Smart EV** - $699. Output: 40-amp/9.6 kW. Full smart charger, including working with Amazon Alexa.
- **ChargePoint Home Flex** - $749. Output: 50-amp/12 kW. Full smart charger, including Alexa compatible. Has adjustable power output, allowing for matching delivery to the circuit the unit is connected to. Superior holster.
- Other popular home models include **Tesla, Clipper Creek, Lectron, Blink, and Autel.**

Level 2 Outlet Splitters:

Splitters are used with existing or newly installed 240V outlets. While it is possible to plug an L2 charger directly into an existing dryer outlet, this presents problems of accessing the outlet, plus a dryer outlet is not designed to be repeatedly unplugged and re-plugged. A L2 splitter is a box that plugs into a 240V outlet and has two sockets: one for the dryer and one for the charger (some offer the capability of charging two EVs exclusive of a dryer or other appliance). They cost $200 to $350, but eliminate the need of professional installation. Models include the NeoCharge Smart Splitter (currently, the only splitter that is UL listed), Splitvolt, and Lectron NEMA Socket Splitter.

*Consumer Reports states, "Tesla's U.S. Superchargers use a proprietary charging plug. To enable non-Tesla EVs to use its chargers, the company has developed an adapter called the 'Magic Dock,' which incorporates the popular Combined Charging System (CCS) charging standard into the existing Tesla plug. It will work with nearly all EVs but the Nissan Leaf, which uses a different plug standard."

Wayne Michaud is Executive Director of Green Driving America Inc., a non-profit that advocates for and educates on transportation efficiency and cleaner transportation. The organization's "The Clean Transportation Path" presentation has been endorsed by Drive Electric Vermont. ♻

DRivE ELecTRiC.
SHaRE a RiDE.
WaLK. BiKe.
e-BiKe.
E-MoTorCycLE.
TrAiN.
TaKe a BuS...

The Amazing E-Bike Surge in a Post-Pandemic World

Dave Cohen

Many readers might know that the Chinese word for crisis incorporates the symbol for opportunity, or more accurately "change point." One possible way to more deeply appreciate this wisdom is in how the downright weary Covid years we just experienced enabled thousands of people to ditch their car usage, and bike instead.

Lectric's Xpedition is a budget-friendly e-cargo bike that can replace your car for some everyday tasks. (lectricebikes.com)

Of course, an increase in bike transportation does not make all the losses, loneliness and lingering impacts of the pandemic something to be thankful for. However, these days we need to take whatever we can get. And what has become increasingly clear is that without the help of the bike we won't arrive at a truly socially and ecologically-oriented transportation revolution. I am talking about things like a far greater connectivity to the human and more-than-human worlds, wise land use, active and healthy bodies, livable neighborhoods, preserving our natural soundscapes, improving our air quality, living more locally, and a long list of other vital things. These things are precisely what can never be delivered by the insane idea of hyperloops, the coming robocars (aka self-driving cars) or even the electrification of automobiles; that desperate attempt by the automotive-industrial complex to have us cling to a car culture that has failed us and the world in so many ways.

If we have learned anything from this virus that altered our lives so deeply it is that we need more connection and less fragmentation and social isolation. From that perspective, the bicycle has become a standout in transportation, and it has helped to redefine streetscapes and neighborhoods across the nation. I will suggest that much of this might not have been possible without the electric bike (e-bike).

E-bike and e-cargo bike adoption rates are now exploding across the nation. Some of this is primed by innovative e-bike rebate and subsidy programs offered by local government agencies. In the lead, Denver's rebate subsidy program is at the leading edge. Fueled through the city's Climate Protection Fund this initiative allows any resident to access a $400 e-bike voucher, while income-qualified residents can access up to $1,200, with an additional $500 for the more expensive e-cargo bikes.

Every time these vouchers have been offered, Denver residents have snatched them up immediately: more than 4,700 Denver residents became e-bike owners in 2022, and an additional 860 people benefited from the latest round of vouchers offered in January. This program is not only getting all these folks on e-bikes, but it is already applying pressure on the city to accommodate all these new riders with additional infrastructure. This turns the whole infrastructure issue on its head from "build it and they will come" to "come and they will build it," if you know what I mean. We need programs like this across the nation.

However, it wasn't just the pandemic and financial programs that did all this. It has also been a confluence of timely and stunning strides in the e-bikes space. Every week or so there is a release of new e-bikes and e-cargo bikes that can either be purchased online or in bike shops. Several recent offerings of e-cargo bikes are transforming the market around these amazing car replacements and heralding in what may be seen as a golden age of cargo bikes. One great example is Lectric's XPedition which is priced at $1400, which is super-low for a decent e-cargo bike! The XPedition can carry two kids or one adult passenger and a ton of other stuff (well not exactly a ton, but it is rated at 450 pounds hauling capacity), has a super powerful rear hub motor, hydraulic disc brakes (very cool for an e-bike at this price point) and among other things an option to have dual battery packs to extend the riding range to over 100 miles.

Turning our sights to what is happening in the northeast, Vermont is leading the way. Last year, Vermont offered the very first statewide e-bike subsidy program in the nation. While not nearly as robust as the Denver rebates or the subsidies in the millions of dollars set for states like California, the Vermont program opened the door for electric bikes to be taken seriously. Added to this are e-bike rebates from Green Mountain Power, the Burlington Electric Department and other utilities. One of the most impressive programs is from a small, local organization called Vital Communities in White River Junction. They secured grant funding to offer up to $1600 for 18 low-income individuals and households to purchase their e-bike or e-cargo bike. All the subsidies have been awarded, and the program is currently closed.

In addition to all this, there are e-bike "lending libraries" throughout the state coordinated by Local Motion and a state funded e-bike expert on hand to assist Vermonters in choosing the right bike for their terrain and needs (that's my gig!). In the Upper Valley of Vermont and New Hampshire, the program is run by Vital Communities. There are also lots of opportunities to try out e-bikes and e-cargo bikes at events throughout the summer and into the fall.

It almost goes without saying that we are at a change point. Between the climate crisis and a world on the brink, it is clear that change is coming whether we like it or not. For the people already replacing their car trips with e-bikes they are not only embracing this change (allow me to let you into a secret), they are having an absolute blast doing so. Maybe it's time for you to join in!

Dave Cohen is an integrative psychotherapist in Brattleboro, (davecohencounseling.com), specializing in approaches in mind and body modalities and ecopsychology. He is also the founder and director of VBike (vbikesolutions.org), an advocacy group dedicated to promoting new bike design and technologies for everyday bicycle transportation in Vermont. ♻

Correction to *"And What about Electric Trains in the USA?"*

(Published in the Feb.-April issue of Green Energy Times *on page 5)*

The caption to the photo said that Amtrak's Acela service is electrified for part of its run. Our reader, *Loring M. Lawrence, Manchester, NH,* pointed that the all 457 miles from Boston to Washington, DC are fully electrified and not just part.

This is a good correction to make. Thank you to Loring for letting us know of this error. ♻

MEET YOUR SOLAR INSTALLER

NORWICH TECHNOLOGIES

WHITE RIVER JUNCTION, VERMONT

George Harvey

Norwich Technologies has been growing before our eyes. This is true in several ways.

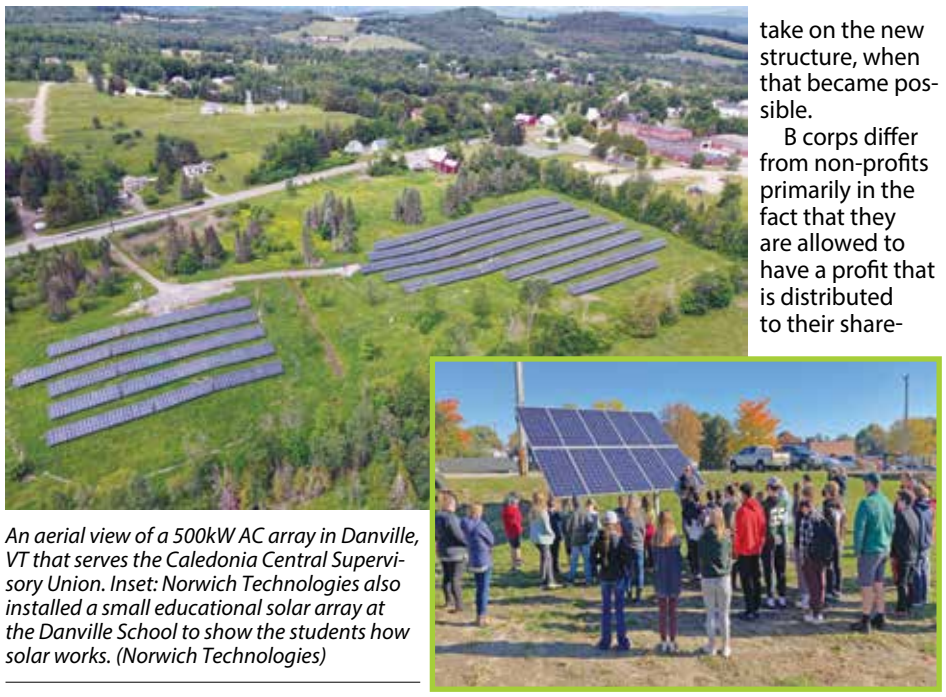
The company was always interested in actual technology, producing its own solutions to problems, with one of the strongest research programs we have seen. Of its 36 employees, five members of the research and development team have Ph.D. degrees. Clearly, this is not an ordinary solar company.

In 2022, *Green Energy Times* reported that Norwich Technologies had created three units, Norwich Solar, which focuses on larger solar installations, including those for schools, municipalities, and non-profit organizations. Norwich EV sets up electric vehicle charging stations, and RunTime Solar aims to manage and maintain solar assets.

Norwich Technologies has not just been expanding the types of projects it is working on. It has also been working at sites farther from its main office in White River Junction, Vermont. Now, they have field offices in New Hampshire and Maine. These offices were set up to provide for the needs in those states.

The expansion of Norwich Technologies is based on success. For example, for the 24 schools, towns, and non-profit organizations that Norwich Solar has installed arrays for, the total upfront cost came to $0.

In our view, however, the most exciting news from Norwich Technologies is that it has taken on the status as a benefit corporation, or B corporation (B corps), for itself and for its business units. Benefit corporation status is a rather new thing. B corps did not exist before 2010, when Maryland and Vermont passed laws allowing them. Since then, the idea of the B corporation has caught on so rapidly that over two-thirds of U.S. states allow them. In fact, they have spread to other countries, as well.



An aerial view of a 500kW AC array in Danville, VT that serves the Caledonia Central Supervisory Union. Inset: Norwich Technologies also installed a small educational solar array at the Danville School to show the students how solar works. (Norwich Technologies)

The idea of the benefit corporation grew partly out of the understanding that a corporation may legally be regarded as a person, for certain purposes, but it is a person without compassion, always putting profits ahead of all else. That understanding is not quite correct, of course, and some corporate leaders have always wanted to run companies that do show concern for the people of their communities, the environment, and the future, not just for shareholders, but for everyone. Such people pushed for B corps to be developed, and they had their organizations take on the new structure, when that became possible.

B corps differ from non-profits primarily in the fact that they are allowed to have a profit that is distributed to their shareholders. They differ from a conventional corporation, or C corps, in a number of ways relating to social or environmental responsibility, transparent operation, and concern for all stakeholders, including people who have no share in ownership, but are affected by corporate operation.

Seeing the way Norwich Solar Technologies was run in the past, it was not at all surprising that it took on B corporation status. The operation of the company already considered environmental and human effects of its work. But now, the change is official, for Norwich Technologies and also for its units Norwich Solar, Norwich EV, and RunTime Solar.

We should also point out that an organization can be a B corporation without actually being certified or held to that standard by any outside organization. There is a certification process run by an organization called B Lab, however. The standard to be a Certified B Corporation is very high and requires rigorous reviews of environmental and social impacts of operations. Of course, Norwich Technologies and its business units have sought, and achieved, that higher standard.

In its announcement of its new status, Norwich Technologies said, "More than measuring simply how many kilowatts of clean energy the company builds each year, Norwich Technologies is committed to measure the impacts to all of our stakeholders: employees, investors, customers, vendors and the communities in which we work. The vision of B Corp standards is embedded into every aspect of the businesses and the annual assessment will serve as a tool for constant improvement and goal-setting to increase positive impact.

"Norwich Technologies is in good company with thousands of other businesses around the world that are committed to using business as a force for good. This new type of corporation – the B Corporation – is purpose-driven and creates benefit for all stakeholders, not just shareholders. Together, B Corps envision a global economy that uses business as a force for good."

The idea of using business as a force for good is something we might all do well to remember – always.

The website for Norwich Solar and RunTime Solar is www.norwichsolar.com.

The website for Norwich EV can be found at norwichev.com. ♻

VT Solar Projects: Norwich Farm Foundation and the Newbury Solar Development

One thing we can say about Norwich Solar is that it is quite predictable in its own way. The company always has something going on, and it seems always to include things that are exciting. That's predictable.

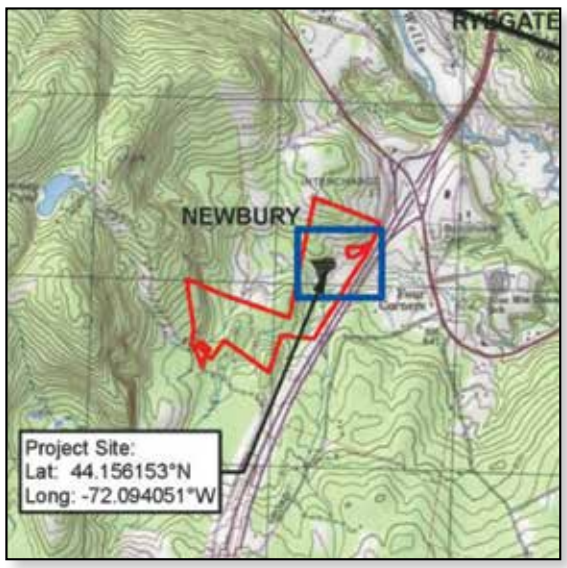
Norwich Farm Foundation's barn. The new roof will hold a 150kW solar array. (Norwich Farm Foundation)

Norwich Solar recently announced that it is building a solar array at the Norwich Farm Foundation (NFF) to support both community solar projects and the NFF itself. The NFF is working to bring a local dairy farm back into good working order. And while a solar array may not be the first thing we could envision on an old-fashioned Vermont dairy farm, it is hard to imagine a traditional dairy farmer passing up the opportunity to have one, if he or she could have had the chance. Simply put, the old farmers used just about anything that made sense, and solar can make good sense at a dairy farm.

The NFF solar system is being installed on the rooftop of a barn. As Vermont rooftop systems go, it is quite large, at 150 kilowatts (kW), AC. This will benefit the farm itself by reducing its costs, but it will also benefit the local community by providing a solar system that local households can buy shares of. This is available to any families that are customers of Green Mountain Power.

We might add that by the time this issue of *Green Energy Times* goes to press, it could be that the available shares of the NFF solar array will be all taken. Those who want to get shares in a similar array would do well to ask, however, because this one will doubtless not be the last.

In a separate development, a 500-kW array to be built by Norwich Solar in Newbury, Vermont has received a Certificate of Public Good from the Vermont Public Utility Commission. The Newbury array is a ground-mounted system that will generate enough electricity to provide the equivalent of the annual needs of about 135 homes. For those who like to think of avoided emissions, the amount of energy produced is about what would be used by 150 cars with internal combustion engines (ice).



A 500-kW array to be built in Newbury, VT by Norwich Solar. It will generate enough electricity to provide the approximate annual needs of about 135 homes and emission reductions equivalent to 150 cars on the road. (Courtesy Image)

The project in Newbury demonstrates how solar systems can be co-located with other land uses. Such usage can bring the greatest benefits to both the owner of the land and the community. One land use opportunity it supports is to provide long-term income for the owner. Doing that, it also contributes tax income for the town. In this case, the owner, Cassidy Timber Harvesting, is planning to develop homes, which are much needed in the area and will benefit the people who live in them and add more to the town's tax income.

The array is being used for net metering on a subscription basis. Most of this will be used by businesses. Net metering customers must be in the same power distribution network in which the array is sited, but we might remember that the electricity it generates has benefits far beyond that, as it also contributes, for example, to the renewable energy goals of the state.

The relationship of Norwich Solar, Cassidy Timber, and the town of Newbury seems to have been genial. Martha Staskus, Chief Development Officer for Norwich Solar commented, "It's been a pleasure working with the Town and Cassidy Timber in planning for the array. We're looking forward

Cont'd on p.14

After Ten Years, Putney Co-op's Solar Dream is Coming True

George Harvey

There are times when people enjoy their work so much that it shows. Interviewing Victoria Roberts of Southern Vermont Solar (SVS) about the installation her company is doing at the Putney Co-op, in Putney, Vermont, was one of those times. We might suspect that Roberts always likes her work, but in this case, the solar system is going up on the roof of her own co-op. She was clearly enjoying herself when she told us, "We do the majority of our food shopping at the Putney Co-op. They give so much for our community. I am a member there – I am part of it."

The highly visible and well-known Putney Co-op on Route 5 in Putney, Vermont. (Courtesy photo)

The Putney Co-op has been considering renewable energy for quite a while. Michael Wells, the vice president of the board of directors, told us they had been working on a solar array ten years ago, but "various snafus" had prevented the project from moving forward. Unable to install their own system, they bought into an offsite array for some of their electricity. The idea of having an array of their own never died, however. Wells said, "We are a co-op, and we like to be a model business, setting a good example for the community."

The Putney Co-op's system will have 82 Hanwha Q Cells solar panels, each with a capacity of 400 watts. This produces a system of 32.8 kilowatts (kW), DC, or 30.0 kW, AC. The design includes three inverters, made by SolarEdge. The solar panels will be mounted on the roof of the building using an IronRidge racking system.

As a food facility, the Co-op uses a lot of electricity, and its average monthly electricity bill was $1,748. Including the 30% Federal incentives, the solar system is expected to save $556 per month, offsetting 32% of the cost for the system.

The result of these figures is a payback time of 8.2 years. The system is expected to last at least 25 years, however, and two-thirds of the time the solar array is in use will be after it is paid off. This means a net saving over the lifetime of the equipment of $205,230, for a 275% return on the investment. We were interested to see that the levelized cost of energy from the system is 16¢ per kilowatt-hour, making it an example, showing that saving the environment costs less than polluting it.

> Saving the environment costs less than polluting it.

The Hanwha Q Cells model used for the Putney Co-op, is the Q.PEAK DUO BLK ML-G10. Its zero gap cell layout boosts module efficiency up to 20.9%, a value that is unusually high. It is also designed to deliver optimal yields of energy, regardless of the weather. This means that the cells will do about the best job possible during periods of low light, such as overcast or rainy days. The panels are warranted for a 25-year lifetime, and they are expected to deliver 86% of their original output after 25 years of use.

The Putney Co-op is in a highly visible location, just off Route 5. About a third of its trade is from people on the road, many of whom stop in while they are on trips. That makes the solar array on its roof a great advertisement for solar power, achieving Michael Wells' goal of being an example for the broader community.

The Southern Vermont Solar website is svtsolar.com. The Putney Co-op website is https://putneyfood.coop. ♻

MEET YOUR SOLAR INSTALLER

NEW HAMPSHIRE SOLAR

NEW HAMPTON, NEW HAMPSHIRE

Green Energy Times Staff

Peter Hall, owner of New Hampshire Solar (NH Solar), has a different approach to solar power. For that matter, he has a different approach to how a business should be run, and possibly even to how life should be lived. The goals do not include having a big business, or even a growing business. But they do include having a business whose six employees know every customer by first name.

New Hampshire Solar's office is in New Hampton, New Hampshire, which is not near the coastal Towns of Hampton and North Hampton, but rather is located at the geological dead center of the State near the town of Plymouth. The company was founded in 2017 and partners with VH Energy from Pittsfield for all of their installations. Since that time, things have evolved a bit and the demand for installations soon became simply overwhelming. The choice was made by NH Solar to focus their efforts primarily on bifacial ground mounted arrays and fully off-grid systems. A year ago, they also began to restrict their territory to roughly a thirty-mile radius around New Hampton to be able to provide the best possible service.

The recent influx of out of State buyers moving to New Hampshire during the last couple of years has brought a new demand for off-grid systems near NH Solar's home, largely due to the fact that the company is in an area that is relatively undeveloped. It is a place where new real estate buyers can still buy large acreage properties, only to discover that just getting grid power to that property can be a very expensive proposition. The cost to bring grid power any significant distance from roadside utility lines can easily approach or even exceed the cost to build a full off grid system even before taking the expense of monthly billings into account. The incredible recent developments in energy storage (LFP batteries) and smart inverters have now made off-grid systems powerful, safe and absolutely reliable. The off-grid inverter controls all aspects of the system, ensuring a constant flow of clean energy for the home. If there is a prolonged storm and thus no solar harvest, the inverter can automatically star a generator, run it just long enough to fully recharge the batteries, and then shut it down again. Also, most of the newer components in an off-grid system are "stackable", meaning that more power or storage can easily be added later on if the client's needs should change.

Back of a bi-facial solar array, with an adjustable rack showing a hand crank to adjust the angle. (Courtesy image)

NH Solar was one of the very first solar companies in New Hampshire to begin installing bifacial solar modules in their ground-mounted arrays. Hall really seems to enjoy talking about bi-facial panels and the advantages they have. He stated that properly installed bi-facial panels can provide as much as a 25% boost from the clear glass backside of the panel when there is snow on the ground. Winter is a time when the sun's energy is naturally very weak, and it is also a time when electrical consumption is high for many homes, so the extra energy harvested by the backside of the bifacial panel is a great benefit.

There are three types of ground mountings that NH Solar primarily uses for their bifacial arrays; fixed, manually tilted ground mounts, and dual axis trackers. The fixed arrays are generally the least expensive, and while they usually cost more than the more common roof mounted arrays, they are also much, much more productive. It was obvious that Peter Hall's personal favorite mounting is the MT Solar single pole tilting mountings. The 15-panel solar array is mounted on a single 9 foot tall 8" steel pipe anchored in the ground and has a pivot point in the middle. The angle of the array can easily and quickly be changed with a simple hand awning crank. When set to the optimum summer tilt of about 25 degrees the array is well up in the air and out of the way. During the winter however the optimum tilt for the low horizon sun is closer to a steep 50-55 degrees, and thus snow slides off the array instantly. Hall did say that the dual axis trackers, which are motorized and automatically move to always be pointed directly at the sun definitely are the most highly productive type of mount available, but they are also the costliest.

Peter Hall keeps a close eye on the market so the products included in all of the systems they build are as up-to-date as possible. Right now, he primarily favors Homegrid and SimpliPhi LFP batteries and Sol-Ark inverters for most of their systems. He stated that the SolArk inverters are particularly robust and adaptable, and the tech support from the Texas based company is exceptional. A Sol-Ark hybrid inverter can in fact even be optionally EMP hardened to resist solar flare or some sort of weaponized attack. Peter said he personally is not a prepper, but it does makes sense to be able to offer products to his clients that might have concerns about such things.

New Hampshire Solar's website is nhsolar.business.site. ♻

NH Community Power Coalition is Making Progress

George Harvey

Green Energy Times published an article on the Community Power Coalition of New Hampshire (CPCNH) back in October of 2021. Members of the Coalition were the Cities of Lebanon, Nashua and Dover; the Towns of Hanover, Harrisville, Exeter, Rye, Warner, Walpole, Plainfield, Newmarket, Enfield and Durham; and Cheshire County (https://bit.ly/CPC-of-NH).

*Old mill building and canal in Harrisville. (Magicpiano, Wikimedia Commons, www.*bit.ly/Harrisville-mill-building CC-BY-SA 4.0*)*

The purpose of the coalition was to set up programs by which the members could "aggregate and sell electric power on a community scale." There are several good reasons to do this. One is that it can reduce the cost of electricity for the ratepayers in a community membership. Another is for local people to have a measure of control over how their electricity is generated.

After a year and a half, we find there have been some delays, at least one of which produced an official complaint against Eversource, an electric utility. It seems, however, that there may have been some resolution to the delays. Simply put, things seem to be moving along, but not as quickly as some people might like.

An issue came up that was covered by New Hampshire Public Radio (https://bit.ly/Harrisville-complaint). According to town officials in Harrisville, Eversource was not sharing data about which customers had net metering, information that the CPCNH needed to set up its accounts. Harrisville officials called the failure "blatant" and complained to the New Hampshire Public Utilities Commission (PUC). The PUC responded to this by ordering Eversource to respond to the complaint that Harrisville had lodged.

It happens that other communities seem to have faced issues from Eversource. One was the city of Nashua, but others might have been affected. Clifton Below, head of the CPCNH, said it felt like Eversource was acting arbitrarily to put up obstacles not supported by New Hampshire law, according to a report from WBUR (https://bit.ly/CPCNH-WBUR).

The same report, however, provided some information from Eversource about the problems it was facing. The issue was about transferring accounts from one system to another, a process that Eversource said would take some time.

There are other issues that have slowed things down, and clearly both sides have taken positions. We might mention, however, that in 2021, Eversource was active in getting amendments to the laws being passed on community power, and it took part in achieving a compromise position on the subject. We can only guess why they were not ready for the change after so much time, especially since they helped in creating its design.

The delays have not affected all customers in the communities of the CPCNH. According to Below, those that are served by Liberty and Unitil have not experienced the same sorts of problems. We hope that by the time *Green Energy Times* is sent to press, the issues between CPCNH and Eversource will have been settled satisfactorily. ♻

A New Old Thing Under the Sun in New Hampshire

Michael J. Daley

For the first time in nearly a generation, the New Hampshire Public Utility Commission (NHPUC) has granted a distribution utility permission to own its own generation source.

If you are an electricity consumer under 30 years old, this is a new thing under the sun: a power company that owns not only poles and wires, but also its very own power source! If you don't understand why that's a BIG DEAL, go ask your parents or grandparents about Utility Restructuring in the 1990's, or read on.

Under a new law that allows New Hampshire utilities to own up to 6% of their total capacity in distributed energy resource – that is local renewable energy facilities – Hampton-based Unitil Energy Systems, Inc. applied for permission last October to build a five-megawatt solar installation in Kingston, New Hampshire.

The company asked the NHPUC to determine that the facility would comply with the law and that its construction would be in the public good, thus allowing Unitil to charge its ratepayers for the costs.

When utility restructuring swept the nation in the 1990's, the intent was to break the monopoly of traditional power companies by separating the functions of delivering power from the business of generating it in hopes of creating more competition, thus lowering rates for consumers. Another big incentive --- and a major reason why power companies cooperated in this self-destruction --- was because the process allowed them to escape so called stranded costs; that is, their bad investments in power plants like nuclear that left them burdened with years of high debt as cheaper power from gas and wind were coming online.

Unitil's Solarway initiative in Fitchburg, MA is a 1.3 megawatt solar array consisting of 3,708 panels. It powers 144 homes. (Unitil)

Restructuring has had seriously mixed results as NH consumers facing large rate increases know, but times are changing. Solar has come into its own proving its promise as a dependable power source exempt from fuel-based price instability. It is also rapidly becoming the cheapest new power source. Some utilities hope getting back into the power generating business using renewable energy will help them escape the price volatility of the marketplace.

In particular, Unitil states that benefits of the Kingston project are an increase in renewable power resources in the region, avoidance of some peak high power purchasing costs, and most specifically, a decrease in costs associated with line losses from long distance transmission: the project is local and directly connected to a Unitil substation.

Naturally, Don Kreis, the NHPUC's consumer advocate, expressed some reservations. A November 18, 2022 NH Business Review article stated:

"Don Kreis...has generally been critical of utilities owning their own generating assets. The Unitil proposal, however, 'deserves a serious look,' he said, although he added, 'If this is taken to the extreme, it would allow utilities to rebuild their empire.' But with the limits involved, it might serve the public good, he said. 'We are talking about 5MW, not the 1,200 that is in Seabrook, New Hampshire.'"

The NH Business Review also spoke with Sam Evans-Brown, the executive director of Clean Energy NH who said,

"It is an interesting debate...Some say third-party folks owning renewable energy can build it cheaper, better, faster. But is there a space for utility if they can make it more affordable? They can get low-interest loans." He also noted that it is ironic that utilities are making the case that renewable energy saves ratepayers money after some utilities long maintained that it would increase electric bills. He liked the idea that they present it as load reduction.

The NHPUC agreed. On May 1, it granted Unitil's request.

Unitil plans to begin construction later this year and have the project online by the end of 2024. They will take advantage of federal tax credits through the Inflation Reduction Act. The $16.3 million dollar project is expected to yield a net benefit of $2.5 million.

Source links:

- *https://unitil.com*
- *https://bit.ly/nhpuc-May1-RegulatoryOrder*
- *https://bit.ly/nhbr-unitil-SolarArray*
- *https://www.cleanenergynh.org*

Michael J. Daley is a life-long renewable energy educator and advocate, except for a brief time in high school when he thought nuclear power was cool. He lives in a tiny off-grid cabin in Westminster, VT with his wife, Jessie Haas. ♻

suncommon®

Solar for Farms is a Cash Crop

Between state and federal incentives, and the ability to offset rising utility costs, there are many outstanding financial reasons to install solar panels at your commercial farm. Not to mention: climate change and its effect on weather are heavily impacting farms, so taking steps to reduce our carbon impact is critical for all of us depending on healthy farms and a healthy planet.

A typical for-profit farm is eligible for a 30% federal solar Investment Tax Credit (ITC), plus depreciation, state incentives, and more. What does that mean in terms of dollars and cents? **Almost half of the cost of installing a commercial solar system is covered by these tax credits and incentives.** The payback timeline on a commercial solar system ranges from 5 to 10 years, and after that, you’ll have free electricity for the life of the solar installation.

These days, people care about sustainability, and they’ll feel good supporting businesses that share their values. Having a publicly visible commitment to clean energy in the form of solar isn’t just good for PR and social media – it can be a draw for customers, too!

Being an incredible steward of the land means incorporating regeneration and sustainability into every step of your business. However, if you’re not factoring in energy use as a part of your overall environmental strategy, you’re missing a big piece of the puzzle. **Contact SunCommon today to see how we can help you power more than just your crops with the sun.**

Certified B Corporation

Contact SunCommon today at solar@suncommon.com
suncommon.com/get

WE HAVE BEEN WAITING FOR THIS DAY!

George Harvey

The Solar Energy Industries Association (SEIA) and Wood Mackenzie have released their report, "Solar Market Insight Q2 2023" (SMIQ2). According the report, 6.1 gigawatts (GW) of solar photovoltaic (PV) capacity was added in the United States in the first quarter of 2023. In fact, during the first quarter of this year, 54% of all new electric generating in the U.S. was solar, and the large solar share is expected to continue, according to an article in *PV Magazine USA* (https://bit.ly/PVM-solar-projection).

Based on known construction data, the article projects that solar power will be installed at a record-breaking pace for the rest of this year. We can expect new records to be set regularly for the near future, leading to a point that installations have increased by a factor of three over the next five years. That is a compound annual growth rate of close to 25%.

New solar panels and an aging nuclear plant. (Pixy.org, public domain)

It might be a good idea to think about the math of those figures. If solar provides about half (54%) of new capacity, then tripling that capacity will mean that the amount installed would be about half again the total capacities for all technologies today. It is hard to imagine how this could happen unless the solar power is replacing generating plants based on fossil fuels and nuclear power.

Is this the end of unsafe energy?

By itself, the idea of a decline in fossil fuel capacity additions should not be really shocking. In its most recent Energy Infrastructure Update, the Federal Energy Regulatory Commission (FERC) sees 12,733 megawatts (MW) of "high probability additions" of natural gas generating capacity, and 14,975 MW of retirements, over the next three years. This means that we might consider that natural gas capacity in the U.S. may have peaked and is on the decline, and this would be largely because renewable energy is less expensive.

What about nuclear energy?

Advocates of nuclear power have a lot to say about how much nuclear power is needed to address climate change. Many people who have lived in off-grid houses have found that their solar systems with batteries can be more reliable than grid power. The neighbors lose power, but off-grid households do not. An off-grid household can have more reliable power than a nuclear power plant does. Nuclear plants must be refueled every eighteen months or two years, a process that can last for weeks.

Battery backup can be paired with solar or wind power for a stable source. NextEra Energy calls these installations "near-firm," and says they are able to make solar and wind systems as reliable as nuclear for providing dispatchable electricity at times of high demand. We should expect big increases in the capacities of batteries being installed to support both solar and wind systems.

NextEra expects the cost of electricity from batteries to decline over the next seven years to the point that the wholesale cost of electricity from near-firm solar and near-firm wind installations will be only a quarter to a third of the wholesale cost of electricity generated by small modular reactors. This is described in an article in an article I wrote for *CleanTechnica*, "Why Should We Pay Extra for Nuclear Power?" (https://bit.ly/Why-pay-extra).

Solar growth

The SMIQ2 report says the total installed solar capacity in the U.S. will be 378 GW by 2028. Part of this growth can be attributed to an improved supply chain, which had been disrupted by Covid-19. Also, the Inflation Reduction Act of 2022 promotes both renewable power capacity and facilities that can make components for building renewable power plants. The growth in the solar installing is to be matched by growth in solar cell and panel manufacturing. The solar cell manufacturing capacity of the U.S. is projected to rise from the 9 GW per year we have today to 60 GW per year by 2026, based on a look at facilities that are under construction in the USA or planned.

We should also note that unlike almost any other form of energy, solar PVs are scalable for development in system size. The range is of special interest because the federal authorities tend not to keep great track of smaller solar systems, instead depending on estimates based on data relating to small sales of solar panels. It is clear, however, that the 35% to 40% of solar capacity that is in small installations, mostly on rooftops and in back yards, will follow the same market trends as the utility-scale systems of 5 MW or more.

Solar growth is a hopeful development. We may have arrived at an inflection point. ♻

Windy News Continues to Blow Around the Capital Region of NYS

George Harvey

The State of New York is moving quickly to build up its renewable electric generating capacity. Quite a lot of its potential is seen as being in offshore wind power. According to the New York State Energy Research and Development Authority, five offshore wind projects with a total capacity of 4,300 megawatts (MW) are being developed. All of these are in Atlantic waters south or east of Long Island, but the figure is expected to be doubled or more with upcoming projects.

Clearly, that amount of wind generating capacity will require the manufacture of considerable amount of equipment, including masts, generators, blades, cables, and more. The total cost of what is now proposed is $4.37 billion, and that amount is also expected to be doubled, or more, in the not-so-distant future.

We would do well to ask where all that equipment will be made. The Inflation Reduction Act makes it very attractive to buy American products for renewable generating projects. One problem we face is that the country only has two offshore wind farms, one with five turbines made by General Electric, each with a capacity of 6 MW. The other has two turbines made by Siemens Gamesa, a European company.

Clearly, the American ability to make generating equipment and other components for offshore wind power has to grow a lot, and it must grow quickly. The facilities for producing masts and turbine blades really have to be sited in areas where their products can be moved directly from the factory to a ship or barge. This is because the products are too long to transport by road or rail. Even the generators for offshore wind power may be too big to move by land, because offshore wind turbines tend to be very big.

General Electric (GE) Haliade-X offshore wind turbine. (GE image)

New York State is well suited for offshore wind component facilities, because it has quite a lot of coastline where factories can be located, including much of the Hudson River. So, with a need for production and places for factories along the river, the factory projects are starting up. Green Energy Times covered earlier offshore wind development in January 2021, "NYS Has Big Plans for Green Energy" (https://bit.ly/NYS-green-plans).

GE turbine manufacturing in Schenectady, New York

General Electric has announced that it is planning to hire 200 people to work in a turbine plant in Schenectady, NY not far north of Albany. The company is planning to use the plant to make its 6.1-MW Vernova turbines. These turbines are considered too big to use for onshore but access to the Hudson River will make moving them to the ocean comparatively easy.

GE had already started development of plants at Coeymans, on the Hudson River, for masts, nacelles, and turbine blades. Like the turbine generating units, transporting these to the ocean should be relatively easy.

New facilities for Albany and Coeymans

New offshore wind power facilities have been planned for the Port of Albany and the Port of Coeymans, but now, more is planned for East Greenbush. Reports on this development do not go into details, because the companies involved have not let much information out. What is known is that a Danish company, Vestas, has taken an option on a 112-acre property there. Vestas has manufacturing facilities in at least sixteen countries and may be the largest wind turbine manufacturer in the world. At the end of 2021, it had nearly 30,000 employees.

The largest model of turbine that Vestas makes is the V236-15.0MW, which has a nameplate capacity of 15 megawatts. That is about the same size as the largest GE model. Vestas, however, has installed about eight gigawatts of offshore wind turbines worldwide already, a number that is not matched by anyone else. Vestas may be manufacturing its turbines in New York State in the near future.

Offshore wind development is being given a lot of support by the State of New York, which sees that development as a part of a path to a clean and resilient future. The result is that the state is a clear leader among the states of the U.S. in developing offshore wind power. ♻

VT Solar Projects – *Cont'd from p.8*

to bringing this project to fruition for more net metering customers. Newbury recognizes the benefits solar can contribute to the budget as well as achieving their renewable energy goals. We are very appreciative of their collaborative approach."

The Newbury array is by no means unique among the Norwich Solar developments. Net metering credits are generated from their solar arrays for businesses, municipalities, farms, and other organizations. The announcement Norwich Solar made about the Newbury array focuses especially on affordable housing. "In 2020 approximately half of Norwich Solar's projects benefited affordable housing organizations including Champlain Housing Trust, Springfield Housing Authority, Twin Pines Housing Trust, Randolph Area Community Development Corp., Capstone Community Action and Housing Vermont. With other similar projects in the pipeline for 2023, Norwich Solar will continue to bring new solar energy to the Northern New England region."

Norwich Solar's website can be found at www.norwichsolar.com. ♻

Please Don't Fall for the Nuclear Hype

Peter Bradford and M. V. Ramana

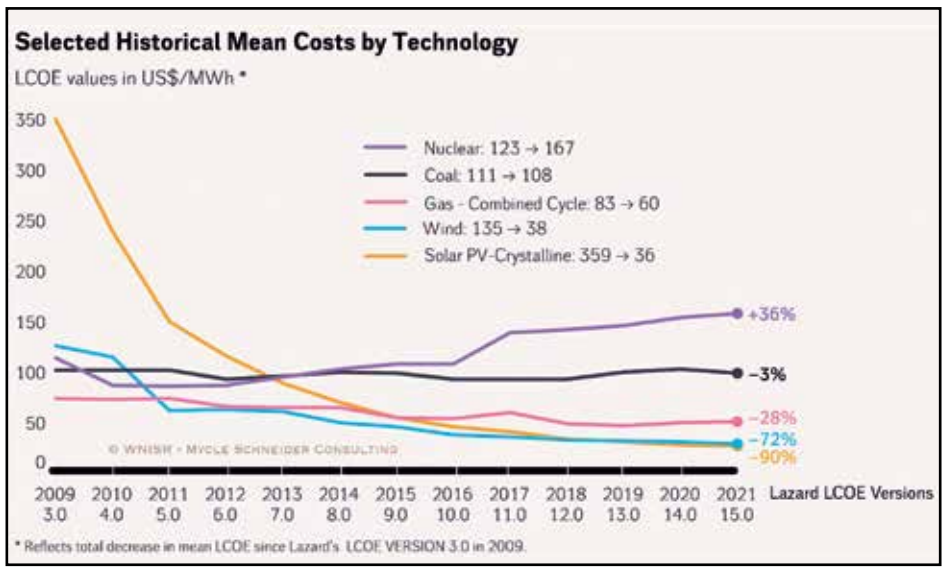
Since the age of U.S. nuclear power dawned with President Eisenhower's 1953 Atoms for Peace speech, New England supported the "peaceful" atom with waves of taxpayer and customer-funded subsidy. In early Atomic Energy Commission visions, the region was forecast to provide the sites for multiple nuclear parks, each with a dozen or more reactors as well as a fuel reprocessing plant and a fast breeder reactor.

Conferences and hearings were held, speeches given, promises and prophesies uttered, hopes stirred, massive public monies spent, societal problems solved on paper. But the innovative technologies all faltered in the face of economic reality. Their place on the drawing boards was taken by eighteen light water reactors, nine of them never-to-be-built despite nine figure expenditures. Nine other reactors were built. The last two – Seabrook and Millstone 3 – were so expensive that they can never repay their original cost. All but three have closed. Two of those demand massive further subsidy now, when they are supposed to be paying back those initial costs.

The hype around nuclear power has persisted in the face of endless economic disappointment. As a result of climate change and Russia's efforts to use fossil fuels as a weapon in support of its invasion of Ukraine, it is at a peak now.

Many U.S. states are considering legislation to incentivize the construction of new nuclear reactors. This enthusiasm is misplaced. Nuclear power has been continuously decreasing in importance. Between 1996, when the fraction of global electricity generated by nuclear plants peaked at 17.5 percent, and 2021 that fraction declined to a mere 9.8 percent. In comparison, non-hydro renewables, which supplied next to nothing in the 1990s, supplied 12.8 percent of the world's electricity in 2021.

The decline in the relative importance of nuclear power will continue because of the sharp drop in the cost of generating and storing solar and wind energy. Improving energy efficiency, long our cheapest resource, remains so still. Nuclear power meanwhile has become more expensive; building a new reactor is currently the costliest established way to generate electricity.



Plot of trends in the cost of generating electricity (the so-called Levelized Cost of Energy) from the 2022 World Nuclear Industry Status Report which is based on cost estimates reported by the Wall Street advisory firm Lazard from 2009 to 2021.

The most recent nuclear power plant, 2200 MW at the Vogtle site in Georgia, rose from an estimate of $14 billion when construction started to over $35 billion, with bills going up by some 15 percent. The pattern must be familiar to New Englanders. The costs of Millstone 3 and Seabrook both increased tenfold between the first estimate and plant completion.

The comparison between nuclear power and sources of electricity like solar and wind is complicated by the fact that the latter sources do not generate power steadily and depend on how much wind is blowing or sun is shining. But renewables can be the basis of a reliable electricity system provided suitable and affordable options, such as energy efficiency, demand response, technological and geographic diversity, and some storage, are incorporated. The cost of energy storage is rapidly declining.

Some proponents of nuclear energy point to theoretical technologies called Small Modular (Nuclear) Reactors (SMRs) as a source of much cheaper nuclear power. But no economically competitive SMRs operate anywhere. Building and operating SMRs will cost more than large reactors for each unit (megawatt) of generation capacity. Many small reactors built in the United States before 1975 shut down early for just this reason.

The cost estimate for six SMR units proposed for Idaho has now risen to an eye-popping $9.3 billion for just 462 megawatts of power, clear evidence of the higher per-MW cost of SMRs. Even without further increases, this SMR design is more expensive on a per MW basis than the Vogtle project.

Small reactors come with the usual nuclear power problems: potential severe accidents, the production of radioactive waste, and enabling nuclear weapons proliferation. Indeed, building multiple reactors together could increase the risk from certain types of accidents. Fukushima demonstrated how a single event can cause multiple accidents at adjoining reactors.

All else being equal, SMRs will produce more nuclear waste per unit of output than large reactors. Such waste remains dangerously radioactive for millennia after the plant ceases to function. There is no demonstrated solution to permanently isolate this lethal waste, whatever the source.

Nuclear reactors also take a very long time to build. The average nuclear plant takes around a decade to go from construction start to first generation. Advanced reactor designs are not yet ready for construction, so vendor claims for dramatically shortened construction are meaningless.

In contrast, the climate crisis is urgent. The world has neither the financial resources nor the luxury of time to gamble that nuclear power will somehow deliver on the promises that it has so often broken. As physicist Amory Lovins put it: "we must pay attention to carbon, cost, and time, not to carbon alone".

New England does not miss its past unbuilt nuclear reactors nearly as much as it misses the money wasted on nuclear plants, built and unbuilt. It should continue to heed the words of the old tune "got along without you before I met you. Gonna get along without you now".

Peter Bradford chaired the Maine and New York utility regulatory commissions and served on the US Nuclear Regulatory Commission. He has taught at Yale and at Vermont Law School.

Dr. M. V. Ramana is the Simons Chair in Disarmament, Global and Human Security and Professor at the School of Public Policy and Global Affairs, at the University of British Columbia in Vancouver, Canada.

Source links available at the online posting of this article at www.greenenergytimes.org. ♻

Hype About the Coming "Boom" in Small Modular Nuclear Reactors

Mike Bailey, op-ed

The *Atlantic Magazine* just published an article by Jonathan Rauch titled, "The Real Obstacle to Nuclear Power, it is not environmentalists – it is the nuclear power industry itself" is misleading, to say the least (https://bit.ly/Nuclear-obstacle). It echoes the industry's new, self-deprecating PR approach for small modular reactors (SMR's); "It's not the tree hugger's fault, the industry suits are to blame for lack of acceptance, but we're going to fix that!"

Behind this nuke-washing campaign is the World Nuclear Association, whose members are responsible for virtually all the world's uranium mining, conversion, and enrichment, reactor vendors, nuclear insurance, and finance. And they are all looking forward to a long-anticipated multi-million-dollar payday.

Echoing the Association's playbook, Rauch includes the words safe, safely or safety 19 times in his story, generally in quotes from industry spokespeople. And, it's not like Three Mile Island actually killed anyone! He also writes warmly about reactor security measures as both "elaborate" and as an area for potential savings. Also, he frequently suggests that public opinion is generally behind the SMR's or "coming around." That's certainly questionable. In fact, a very different story came out at the recent Security and Sustainability Forum at The George Washington University. It concluded there are still major 'drawbacks' to nuclear power, particularly higher costs, the need for government subsidies, and the lack of permanent waste repositories.

Manufacturing positive public opinion is critical to the licensing of SMR's, which have big advantages for investors but not so much for customers who will pay the bill. Take, for example, NuScale, a company highlighted in Rauch's story. Though he does not mention it, NuScale recently required a 50% rate hike in Idaho (going from $58 to $89 per megawatt-hour). By contrast, solar and wind are already below $34 per megawatt-hour and continuing downward.

Oh, and one final danger Rauch doesn't mention: as *Politico* recently reported, "One of the emerging concerns for the administration is the small modular reactors that produce clean energy, but which account for a new proliferation risk."

So, higher costs, the need for big government subsidies, no disposal options, and the potential for terrorism-related disasters. What's not to love? When there's a huge solar energy spill it is just called a nice day.

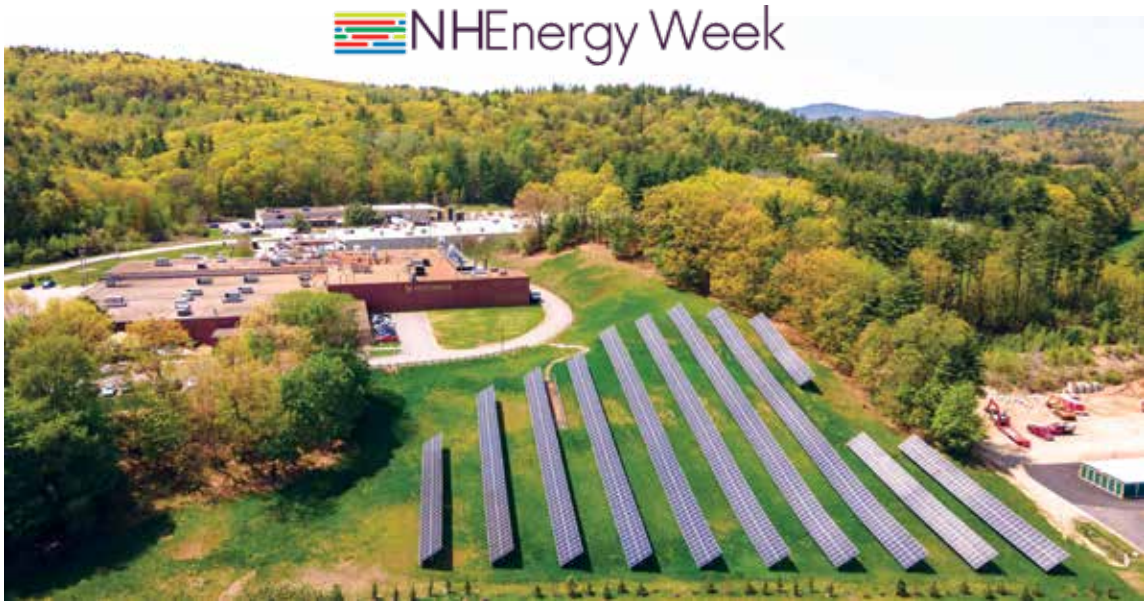
Mike Bailey is a Trustee of SolarFest and the former Executive Director of Strategic Marketing Communications for the New York University School of Continuing & Professional Studies. ♻

Recognizing New Hampshire's Energy Champions

Sam Evans-Brown

The winners of the highly anticipated "2023 Energy Champion Awards" have been announced, showcasing outstanding organizations and individuals who have made remarkable contributions to the energy industry. These prestigious awards recognize exceptional achievements in clean energy deployment, sustainability initiatives, technological innovation, and environmental stewardship.

The recipients have demonstrated leadership, vision, and a commitment to advancing the state's energy goals. From large corporations to non-profit organizations, the winners represent the diversity of the NH energy sector. Their groundbreaking initiatives and dedication to a greener future have not only transformed their own operations but also inspired others to follow suit. This article delves into the inspiring stories of the award winners, highlighting their impact and the innovative solutions they have implemented to address the pressing challenges of the energy sector.



Hitchiner Manufacturing installed a 510-kW solar array in 2021. The 1,334-panel ground mount produces an estimated 625,000 kWh annually. Hitchiner is based in Milford, NH. (ReVision Energy)

Large Business Energy Champion

Hitchiner Manufacturing, a 77-year-old advanced manufacturing company in Milford, New Hampshire, has won the Large Business Energy Champion award. With over 500 employees, Hitchiner Manufacturing has demonstrated excellence in the energy industry through its clean energy deployment, energy efficiency, and sustainability efforts. The company installed a 510kW ground-mounted solar array in 2020-21 and is actively pursuing a 2.6 MW solar farm, one of the largest projects in the state. Hitchiner has also been actively involved in supporting the clean energy transition by educating lawmakers, advocating for clean energy policies, and engaging with stakeholders. Its leadership has played a role in influencing key organizations like the NH Business and Industry Association to support net metering expansion. In the next five to ten years, Hitchiner's impact on advancing the state's energy goals is expected to grow significantly. The completion of its solar farm will position the company as a leader in advocating for renewables statewide and bringing clean energy solutions to decision-makers in Concord. The evidence of the company's advocacy efforts and effectiveness can be found in letters, op-eds, media coverage, and endorsements from political figures.

Small Business Energy Champion

The Small Business Energy Champion award goes to the outstanding Community Power Coalition of New Hampshire (CPCNH). In just 18 months, they have emerged as a major player in the Community Power marketplace, with over 30 cities, towns, and a county joining their cause, while 50 more have expressed interest. Their local control model empowers member communities to implement projects such as community solar and energy storage, leading to substantial cost savings and enhanced grid resilience. CPCNH's legislative advocacy efforts have been highly effective, driving policies that support clean tech, energy efficiency, and renewable energy. Their ongoing expansion plans will further advance New Hampshire's energy goals over the next five to ten years. This well-deserved recognition signifies CPCNH's monumental achievement and their pivotal role in shaping the future of energy in the state.

Municipal Energy Champion

The Town of Derry has been recognized as the Municipal Energy Champion for its outstanding commitment to sustainable energy practices and advocating for energy-saving upgrades in municipal facilities. Over the past two years, Derry has implemented various energy projects, including LED replacements, HVAC modernization, IT automation, and LED street light replacements, resulting in significant energy and cost savings. The town has also completed an energy conservation update in schools, joined an electrical purchasing consortium for renewable energy, and installed a state-of-the-art solar tracking system at the Public Works Department Recycling Center. Derry leads by example in energy efficiency, renewable energy, and clean transportation, aiming to eliminate carbon fuel emissions and reduce energy costs for taxpayers. Future plans include a large-scale solar field on the landfill site and the introduction of electric vehicles and charging infrastructure for municipal use. Derry's strong community engagement and increasing adoption of solar projects highlight its dedication to a clean environment and energy savings.

Legislative Energy Champion

Kat McGhee from Hollis, NH is the Legislative Energy Champion of the year. Kat is a leading voice, and top mind on energy issues in NH the General Court and is the ranking democratic member of the Science Technology and Energy Committee. Particularly noteworthy was Kat's work on the "Data Docket" bill which will create a statewide energy data platform, allowing consumers and third-party service providers to request their energy consumption data and use it to install beneficial energy saving or generating measures. Kat has been a consistent staunch advocate for the state's key clean energy policies, and is an effective strategist on making meaningful progress in the state of NH. She has demonstrated her effectiveness in bringing people together in support of bipartisan energy policy initiatives.

Young Professional Energy Champion

Mercedes Olster is the recipient of the esteemed Young Professional Energy Champion award. Her exceptional accomplishments and contributions in the energy industry, both within Enel Green Power North America and beyond, set her apart as a true champion. Mercedes's innovative projects, socially impactful interventions, and leadership have made a significant impact on the energy space. Her commitment to operational excellence and creating a more organized and scalable organization within Engineering and Construction showcases her visionary leadership. Mercedes has also championed the growth of women in the industry, establishing breakthrough programs and initiatives. As a co-founder and leader of multiple Employee Resource Groups, she has influenced policies and fostered inclusivity. Mercedes's advocacy for energy policy and community engagement further exemplifies her dedication. With numerous awards and accolades, she is an inspiration in the field.

Sam Evans-Brown is the Executive Director of Clean Energy New Hampshire. ♻

First Clean Hydrogen Power Plant in NH Nearing Completion

George Harvey

Hydrogen is by far the most common element in the universe. It is also chemically very reactive, which means that nearly all hydrogen on Earth is locked up in chemical compounds. However, if hydrogen is made available as a gas, it can be used as a fuel. It can power an engine, it can cook food, and it can heat a home.

Most hydrogen available on today's market is made from natural gas ("gray" hydrogen) or coal ("brown" or "black" hydrogen), using dirty processes that make it a dirty fuel, overall. If carbon capture is used, it can make either somewhat cleaner, producing what is termed "blue" hydrogen. Nevertheless, there are ways to make hydrogen from water by electrolysis using renewably generated electricity, so clean, "green" hydrogen is becoming available.

We have news that a startup company has a way to make hydrogen that is quite clean, but uses neither natural gas nor electrolysis. They call this "clear" hydrogen. The whole idea is new to me, and frankly, that puts up a flag saying that something should be examined before it is taken seriously.

When I see such a flag, the first thing I do is look to find out about the company, asking about its finances and what technology it owns. For Q Hydrogen, I was able to find 24 patents easily. Half of them have been granted already, each at significant expense, and the rest are applications. That is sufficient to tell me that this is not a joke.

Q Hydrogen is based in Park City, Utah, where its test plant is able to produce 10,000 to 50,000 kilograms (kg) of hydrogen per day. It may be hard to imagine what that means, because most of us have no experience to tell us what a kg of hydrogen is. According to the company, 12,500 kg of hydrogen is enough fuel to provide electricity for about 7,500 homes.

A few years back, Q Hydrogen decided to build its first clean hydrogen plant in Groveton, a village in Coos County, New Hampshire. Construction started in 2020, but it was delayed by the pandemic. Now we have news that the project is approaching completion, and it is expected to be operating this summer.

The New Hampshire plant will start by producing 10,000 kg of hydrogen per day. That output is expected to grow to 100,000 kg per day. A little simple math would seem to indicate that this means enough electricity for 600,000 homes. That eye-popping number means it could power nearly every home in the state.

The hydrogen, however, can be used for other things besides as fuel for generating electricity. Perhaps we should take a look at some of the potential. We should note from the start, however, that hydrogen is not likely to be used as a drop-in replacement for other fuels. Changes to existing equipment would be needed.

Hydrogen can be used as a replacement for natural gas for heating and cooking. It can also be mixed with natural gas for a fuel that can be used in existing equipment without adjustment. It can also be used as a fuel for internal combustion engines that now run on fossil fuels. Though cleaner, it is not perfect for internal combustion applications, because there would still be issues with oxides of nitrogen.

Hydrogen can be used with fuel cells to produce electricity. There are some limitations on this,

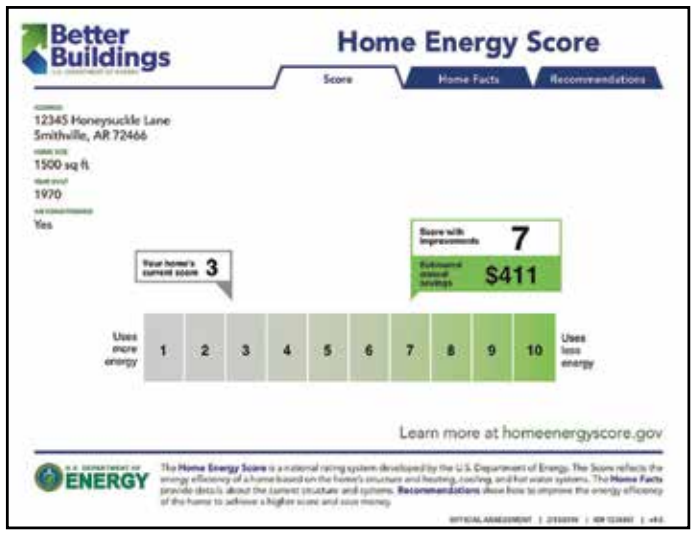
Cont'd on p.23

What Does a Home Energy Score Actually Do for Home Buyers and Sellers?

Julia Bassett Schwerin

Of all the ways property is a good investment – cash flow, amortization, market appreciation, tax deductions and value-added renovation -- only the last of these is firmly in the owner's control. A value-added renovation is one which makes the house more valuable at the time of rental, refinancing or re-sale. A value-added energy renovation also makes the home more efficient and saves on operational energy costs.

When fuel prices are driven up as happened over the last two years – 106% for natural gas, 63% for electricity, 69% for fuel oil, and 93% for kerosene[1] here in Maine – the only thing we can control is the amount and type of fuel our buildings use for heat and hot water by directing value-added renovation to saving energy. If done thoughtfully, investments in energy efficiency and electrification pay for themselves immediately in the form of lower energy bills, even if the capital is borrowed and repaid over time. Buildings with an energy score have been shown to get more at resale and rental.



The Home Energy Score generates a report that estimates home energy use, associated costs, and provides energy solutions to cost-effectively improve the home's efficiency. (betterbuildingssolutioncenter.energy.gov)

Where to Start?

New England in general, and Maine in particular, have the oldest housing stock, being that it was the first to be permanently settled by Europeans, and because we have done well to preserve historic structures. Very few tract homes exist here, and instead every home is unique. A home energy score starts with an audit to identify and prioritize value-added energy renovations specific to the building. Then the auditor issues a report which states," Now your building gets this score, but if you did these things, you could get this much better score that will help you win tenants, buyers and appraisers by showing you have a more valuable building. In addition, here are the rebates, loans and other resources available to help you."

Only by insulating, air sealing, and switching to the most efficient equipment can we lower our operating expenses and make our properties more valuable to buyers and renters. By efficient equipment, we include air source heat pumps, geothermal heat pumps, heat pump water heaters, and heat-recovery ventilation.

Sixty percent of Maine homes still use oil or kerosene for heat and hot water. Maine imports $4 billion in fossil fuels from out of state annually.[2] We have a Climate Action Plan to weatherize the homes in Maine built before there were building energy codes, and to install air source heat pumps, in order to drive down the 30% of carbon emission that buildings in Maine represent. Home energy scores would help.

Thankfully, we have a once-in-a-generation investment in the form of the Bipartisan Infrastructure Bill and the Inflation Reduction Act, which in the words of Governor Janet Mills, is all "To build a clean energy future." There is funding for expanded rebates for energy efficiency including money to support energy audits. Maine has a new Green Bank for making clean energy loans to building owners to make value–added renovations in weatherization and electrification.

All Together Now

Today people are united – from Paris, Maine to the state of Maine, to the United States of America, to the 170 counties signed on to the Paris climate Accord – in a race to do everything humanly possible to keep the earth from warming more than the 1.5 degrees Celsius threshold the majority of scientists think we cannot exceed without risking the collapse of ice caps and unleashing, irreversible and devastating flooding with resulting inundation of coastal populations and mass migration.

Let's face it, there's no "curb appeal" whatsoever in air sealing and insulation. You can't show it off at your cocktail party to your friends. Without an energy score you cannot compare the efficiency from one home to the next, so it is challenging to recoup your investment in weatherization at resale as a seller or to budget for energy costs as a buyer.

Why Energy Scores are Needed

Experiences from other areas that have implemented home energy scores point to their effectiveness motivating building owners to invest in energy efficiency. An energy score does more than show lower operating costs and higher resale value. It helps people prioritize where and how to air-seal and insulate. It helps guide them to resources such as rebates, tax deductions and low-interest financing to help them get the most leverage. It is a motivating force to drive needed change.

According to the Efficiency Maine Trust Single Family Baseline Study in 2015, and my go-to study for building energy science in Maine, air sealing is the largest source of heat loss in single family homes, followed by the thermal performance of walls, ceilings, basements, windows and foundations. Accessible attics, frame floors, and foundation walls are excellent candidates for insulation. Walls, windows, and doors are not so easy to insulate, but caulking and weather-stripping are inexpensive. There is a lot we can do if shown the way.

Maine Won't Wait is our four-year plan to reach our greenhouse gas emission goals of reducing emission 45% by 2030 and 80% by 2050 compared to 1990 levels and achieve carbon neutrality by 2045. Vermont and Massachusetts have already put energy scores in place and are models for our work, which has just begun. Energy scores will cause building owners to grasp the problem and take action on solutions because they will have something to show for it, if only a number on a piece of paper. All building owners are encouraged to get an energy audit with or without a home energy score established in their area and consult the DSIRE database for available rebates on the recommended measures.

Schwerin is a Maine Green Broker at Advisors Living Real Estate

Source: [1] Efficiency Maine Trust and the Maine Governor's Energy Office.

[2] Source: US EIA ♻

Casella Adds TerraCycle Pouch Service for Tough Recyclables in VT

Program targets hard-to-recycle items

Martin Wahl

Responding to the need for managing hard-to-recycle items in the waste stream, Rutland, VT-based Casella Waste Systems, Inc and TerraCycle of Trenton, NJ have partnered to introduce "TerraCycle Pouch by Casella," a subscription-based pickup service targeting more than 20 hard-to-recycle materials, including coffee capsules (e.g., Keurig), all plastic packaging, food and drink pouches, milk and juice cartons, fabrics and clothing, and toys. Casella delivers pouches to customers, who fill them with acceptable materials, seal them, and then scan the QR code on the pouch when it is ready for pickup. Casella then collects and aggregates the pouches for TerraCycle to recycle. A variety of subscription levels are available.

The Zero Waste Bag is provided to help recycle common household items that are note accepted in curbside recycling programs. (zerowastebagbyhbs.com)

The program, launched in October last year, is in a pilot phase and open to any interested individual, school, office, or community organization in select towns in and around Burlington, VT. Jeff Weld, Director of Communications at Casella, says that the pilot project is gaining repeat customers, and there has been interest from some customers in other areas for expanding the service.

In March, TerraCycle launched a similar program with HBS Trash Services, serving the Denver metro area and the Eastern Front Range in Colorado; the program is called "Zero Waste Bags by HBS."

TerraCycle currently operates a similar residential doorstep collection program in select regions of New Jersey and eastern Pennsylvania, having recently opened up Philadelphia as their first major metropolitan area. TerraCycle plans to continue expanding partnerships with waste management companies across the country and are pursuing a number of prospects.

What happens to the recycled materials?

After TerraCycle recycles the waste into raw material, it's sold to manufacturing companies who produce end products including outdoor furniture and decking, plastic shipping pallets, watering cans, storage containers and bins, tubes for construction applications, flooring tiles, and playground surface covers.

TerraCycle recently implemented Evreka, a global waste tracking system, to improving controls and monitoring capabilities, allowing TerraCycle to centralize and "scale" the tracking of all waste movements through the company's material recycling facilities, monitoring each step of the supply chain from receipt through stages of sorting and processing, to final recycling thus maintaining a recycling chain of custody.

For the TerraCycle Pouch by Casella and TerraCycle Pouch by HBS programs, some of the waste collected will be recycled into benches, playground cover and other items that will be donated to the local community's public parks.

Residents in NY, VT, NH and ME who are interested in recycling hard-to-recycle waste may participate in TerraCycle's free recycling programs and their paid Zero Waste Box service, which offers comprehensive, all- in-one recycling solutions for entire categories of waste.

What other projects does Casella have in the works?

Electric Refuse Trucks

Cont'd on p.35

Casella's electric Mack refuse truck. (Courtesy photo)

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

• To learn more about federal tax credits for home owners, home builders, and commercial buildings:, go to: https://www.energystar.gov/about/federal_tax_credits.

• Learn more about electrification rebates and tax credits associated with the Inflation Reduction Act at https://www.rewiringamerica.org/app/ira-calculator.

USDA RURAL DEVELOPMENT PROGRAM

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

• To see the USDA programs and services available in your state, visit https://www.rd.usda.gov/programs-services/all-programs.

Biorefinery Renewable Chemical, and Biobased Product Manufacturing Assistance Program

This program provides loan guarantees up to $250 million to assist in the development, construction, and retrofitting of new and emerging technologies. These technologies are: advanced biofuels, renewable chemicals and biobased products. For more information, visit https://bit.ly/usda_emerging_technologies_programs.

REGIONAL

The Grassroots Fund's Grant Programs

The grant program is designed to energize and nurture long term civic engagement in local initiatives that create and maintain healthy, just, safe and environmentally sustainable communities.

Three grant programs are offered:

• Seed grants are designed to support new (often less than 1 year old) environmental projects.

• Grow grants support initiatives that look to deepen their work or broaden participation.

• The Young Leaders program supports efforts with significant leadership by organizers under 25 years old.

Learn more at https://grassrootsfund.org/grant-programs

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 advanced wood pellet heating systems.

All incentives are listed at: RERC-vt.org.

Advanced Wood Heating Advanced wood pellet heating systems -- $6,000 per pellet boiler/furnace (in partnership with Efficiency Vermont). Commercial spaces over 5,000 sq. ft. may also be eligible for incentives. See www.rerc-vt.org or call (877) 888-7372.

• Retail sales of "Advanced Wood Boilers" are exempt from Vermont's 6% sales tax. http://tax.vt.gov/exemptions

• Residential Bulk Pellet Bins. Up to $3,000 rebate.

• The Small-Scale Renewable Energy Incentive Program is launching an income-eligible "Heating with Biodiesel" Pilot in October 2022. The Pilot is designed to offer assistance for American Rescue Plan Act (ARPA) eligible customers to reduce energy/utility costs with grants for the use of (and costs for inspection and minor modifications to convert to) B99 biodiesel heating fuel.

Low- and Moderate Income (≤120% AMI) – one-third (1/3) of current market price for B99 biodiesel ($/gallon) up to $1000 + $300 heating system inspection incentive = $1300 total incentive. For more information visit the Heating with Biodiesel page at https://www.rerc-vt.org/heating-with-biodiesel.

• Coal Change-out adder. Up to $7,000 additional incentive for a pellet heating system if replacing a coal heating system. Businesses can get up to an additional $27,000 incentive. Details at www.rerc-vt.org or call (877) 888-7372.

• More info at at www.fpr.vermont.gov/woodenergy/rebates. Unfortunately this FPR web site is now longer up-to-date. There is good info. there still but some is outdated.

Other Utilities Heating Offers

• Members of Washington Electric Co-op (WEC) can get a $1000 rebate on approved pellet boilers and $500 for pellet furnaces. This can be combined with the CEDF and Efficiency Vermont incentives for a total of $7000; $250 for qualifying pellet or wood stove installed by a qualified installer. This can be added to stove offers from CEDF and Efficiency Vermont.

• Members of the Vermont Electric Co-op can get a $150 credit on the purchase of an approved pellet stove: www.vec/energy-programs.

• Stowe Electric Customers can get a $150 rebate with the purchase of a pellet stove.

• GMP rebates available through December 31, 2021

VT TAX CREDITS

• Vermont offers an investment tax credit for installations of renewable energy equipment on business properties and wood and pellet heaters with at least 75% efficiency. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit.

• More info on the 2021 IRS Tax form at https://www.irs.gov/pub/irs-pdf/f3468.pdf.

Tier III programs

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

EFFICIENCY VERMONT

All incentives subject to availability, limits, and may change at any time. For complete details, and participating retailers/contractors, call 888-921-5990 or visit www.efficiencyvermont.com/rebates.

Lighting

• LEDs for indoor growing: $100 back for qualifying fixtures

Weatherization

• Comprehensive air sealing and insulation projects with an Efficiency Excellence Network contractor: 75% off eligible project costs, up to $2,000. Moderate income Vermonters get 75% off up to $5,000.

• DIY: $100 back for completing eligible projects, like weatherizing windows and doors, and sealing air leaks in your attic and basement.

Appliances (must be ENERGY STAR)

• Dehumidifiers: $25 - $40 rebate

• Clothes Dryers: $200-$400 rebate

Heating/Cooling/Water Heating

• Central wood pellet boilers and furnaces: $6,000 rebate (in partnership with CEDF)

• Advanced pellet or cord wood stove: $400 discount at participating retailers for replacing an old stove.

Heat Pumps:

• Air-to-Water System: $1,000/ton rebate

• Ducted Systems: $1000-$2000 discount at participating distributors

• Ductless Heating & Cooling System: $350-$450 discount at participating distributors

• Ground Source Heat Pumps: up to $2,100/ton rebate

• Heat pump water heaters: $300-$600 discount at participating distributors;

• Moderate-income Vermonters are also eligible for bonus rebates up to $500 for heat pumps and heat pump water heaters.

• Window air conditioners: $100 for select ENERGY STAR Most Efficient models.

• Smart thermostats: up to $100 back for select ENERGY STAR models.

• Electric utility rebates may also be available.

Other Opportunities to Save

• Home Energy Loan – finance up to $20,000 in energy-related home improvements with interest rates starting at 0%. Restrictions apply.

• Additional incentives may be available through your local electric utility provider.

Contact your utility for more information.

Incentives for Pro-environment Agriculture Behaviors

To protect the ecosystem around the Lake Champlain Basin, several programs have been introduced to encourage environmentally-conscious farming in the area by providing monetary incentives. A recent study has looked at two of these programs (http://bit.ly/EQIP-CREP-study), the Environmental Quality Incentives Program (EQIP) and the Conservation Reserve Enhancement Program (CREP). Both programs could benefit from reduced transaction costs and administrative complexity.

** Source: Vermont Research News - Center for Research on Vermont, 1.18.21.*

GMP Rebates Through 2023

Green Mountain Power (GMP) is extending its popular rebate programs through all of 2023 to help more customers save money while reducing carbon emissions.

Rebates include a $1,500 rebate on all electric vehicles, plus an extra $1,000 for low- and moderate-income customers, and a $400 base rebate on cold climate heat pumps with an extra $800 in incentives for income-eligible customers in partnership with Efficiency Vermont.

In 2022, the rebates and customized projects with business customers around the state will offset more than 173,000 metric tons of lifetime carbon emissions – the equivalent of taking 38,000 gas-fueled cars off the road.

Learn more about GMP's rebates on electric vehicles and charging at www.bit.ly/GMP-rebates-2, and heating and yard care at www.bit.ly/GMP-rebates-3.

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Department of Energy

NH DOE: All of NH DOE's programs, save the Residential Solar Water Heating and Residential Solar/Wind Rebate Program Rebate Program are now OPEN.

Commercial Solar Rebate Program

Effective March 6, 2020, incentives are limited to 25% of the total project cost or $10,000 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:

• $0.20/watt (lower of AC and DC) for new solar electric facilities.

• Expansions to existing solar systems are not eligible.

• Incentive levels for solar thermal systems are as follows:

• $0.12/rated or modeled kBtu/yr for new solar thermal facilities fifteen collectors in size or fewer; $0.07/rated or modeled kBtu/yr for new solar thermal facilities greater than fifteen collectors in size;

• Expansions to existing solar systems not eligible.

Contact: https://bit.ly/NH-DOE_CommercialIndustrialSolar or at (603) 271-3670.

Residential Solar/Wind Rebate Program is currently closed.

Residential Solar Water Heating Rebate Program is currently closed.

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

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

Residential Wood Pellet Boiler/Furnace

• 40% of installed system up to $10k

• Must meet thermal efficiency and particulate emissions standards

Contact: https://bit.ly/NH-DOE_Residential-WoodPellet for more information and current program status.

LOCAL INCENTIVES

Many communities provide property tax exemptions for renewables. Check your town website for more information.

• *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

• Information at www.energy.nh.gov/energy-information.

• **Plug-In Hybrid Electric Vehicles** (PHEV), and $300 on **Electric Motorcycles**.

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 comprehensive

While we try to keep things up to date, incentives are always changing. Please be sure to check with the appropriate sources provided for the latest information.

energy audit for $100 (rebated if improvements installed), and 75% instant rebate for eligible weatherization improvements up to a $8,000.

• 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/nh-rebates.

• 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 select ENERGY STAR® certified LED light bulbs purchased through participating NH retailers(offers vary by retailer, see store associate for details) Visit: www.NHSaves.com/nh-rebates.

• 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.

Plymouth Area Renewable Energy Initiative (PAREI): plymouthenergy.org

• **NH Solar Shares:** nhsolarshares.org

NHSaves: 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 - $750 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.

New Hampshire Electric Cooperative (NHEC) offers a slate of additional programs hat are available for NHEC members only. They include:

Electric Vehicle & Charging Incentives:

• Up to $1,000 incentive on the purchase or lease of a qualified EV (Residential).

• Up to $300 incentive to install Level 2 or larger charging stations, w/ Off-Peak charging rate (Residential).

• Up to $2,500 incentive to install Level 2 or larger charging stations (Commercial & Municipal).

High Efficiency Heat Pump Incentives:

• $500 per ton, w/enhanced rebates up to additional $500 per ton; 2% financing available. (Residential & Commercial)

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.bit.ly/GET-NH-4 for application criteria, FAQs and local program contacts.

Community Development Finance Authority (CDFA) Clean Energy Fund

Low-Interest Financing for Businesses, Non-Profits & Municipalities:

to support energy efficiency and renewable energy projects.

Small Business Energy Audit Grants

Rural Small Businesses & Agricultural Producers can apply for grants to cover 75% of a comprehensive energy audit cost.

Community Facilities Energy Assessment Grants

Non-Profits and Municipalities can apply to receive a grant covering 75% of the cost for an energy-related study.

Find out more at: www.nhcdfa.org/energy.

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED IN NEW YORK

There are 169 programs and incentives available at: https://www.dsireusa.org (enter your zip code).

Also visit https://www.nyserda.ny.gov/All-Programs/EmPower-New-York-Program for the latest NYSERDA solar, ground source and air source heat pumps, EV, residential, and commercial incentives.

Select New York State utilities offer incentives for heat pump systems.

Please check with your local utility for more information or to learn more about heat pumps, available rebates, and financing options on the NYS Clean Heat program website at https://cleanheat.ny.gov/.

Clean Energy Incentives and Tax Credits for Renewable Energy

• SOLAR: Incentives to install renewables: https://www.nyserda.ny.gov/ny/PutEnergyToWork/Energy-Program-and-Incentives/Renewable-Technology-Programs-and-Incentives

• **ADVANCED WOOD HEAT:** A 22% investment federal tax credit applies to the installed cost of home heating and hot water systems that utilize wood pellets, chips and cordwood at efficiencies greater than 75 percent high heat value.

• **GEOTHERMAL HEAT PUMPS:** The 26% federal tax credit was also extended for geothermal heat pump projects that begin construction in 2022. NY homeowners are eligible for a 25% State tax credit up and additional incentives could be available from their utility provider.

• **AIR SOURCE HEAT PUMPS:** Most utilities also offering incentives on both central air source heat pump systems as well as mini-splits.

Electric Vehicle Charging Station Make-Ready Program

• National Grid and other utilities will do an analysis of your business or municipality to evaluate installing EV stations and accessing the type of EV needed for your fleet. Learn more information from their website: (https://bit.ly/NG-EV-MakeReadyProgram.

Check out your local utility's website for was to save more on your energy-efficient projects:

- **National Grid:** https://ngrid.com/3H7hBPU
- **Central Hudson**: https://bit.ly/CENHUD_SaveEnergy
- **NYSEG**: https://bit.ly/NYSEG_SaveEnergy
- **PSEG Long Island:** https://bit.ly/PSEGLI_SaveEnergy
- **RG&E:** https://bit.ly/RGE_SaveEnergy

MAINE

EFFICIENCY MAINE

All incentives and rebates are subject to change without notice. For information on Efficiency Maine's programs go to efficiencymaine.com or call 866.376.2463

Home Insulation:

Efficiency Maine offers insulation rebates of 80% up to $8,000 for income-eligible homeowners and 40% up to $4,000 to Mainers of all incomes. .

See bit.ly/EffME_HomeInsulation. Residents can estimate home energy efficiency with the calculator at bit.ly/EffME_SavingsCalculator.

To find a vendor go here: https://www.efficiencymaine.com/at-home/vendor-locator/.

Multifamily Insulation:

Efficiency Maine also offers incentives for multifamily insulation and air sealing. Multifamily buildings with five or more units may be eligible for attic and basement insulation with air sealing incentives of 50% of the project cost, up to $5,000.

For more information go to https://www.efficiencymaine.com/at-work/insulation-solutions/

Heat and Cooling:

Rebates and financing for the installation of high-efficiency equipment. To find out more about heating solutions, for your home go to: https://www.efficiencymaine.com/heating-solutions/. For business heating and cooling solutions go to: https://www.efficiencymaine.com/at-work/heating-and-cooling-solutions/. Homeowners can estimate their annual heating costs for different heating systems using the Home Heating Costs Calculator here: https://www.efficiencymaine.com/at-home/heating-cost-comparison/. To find a vendor go here: https://bit.ly/EffME_VendorLocator. To find a qualified partner for business solutions, go here: https://bit.ly/EffME_BusinessSolutionsPartner.

Heat Pumps: Residents of any income are eligible for heat pump rebates up to $1,200. Income-eligible residents qualify for rebates up to $2,400, and businesses are eligible for incentives up to $4,800. Learn more at the Efficiency Maine heat pump website: bit.ly/EffME_HeatPumps.

Heat Pump Water Heaters: Efficiency Maine offers mail-in rebates and instant discounts up to $950 on heat pump water heaters. Low-income Mainers can qualify for an installed unit at no cost. Learn more at www.bit.ly/EffME_WaterHeatingSolutions. A Water Heater Cost Calculator to estimate savings is at bit.ly/EffME_WaterHeatingCostComparison.

Electric Vehicles (EVs): Efficiency Maine offers instant rebates for eligible battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) at participating Maine car dealers. Learn more at https://www.efficiencymaine.com/ev/.

Electric Vehicle Charging Solutions: Charging in a single-family home is convenient and inexpensive. Public EV charging host sites at businesses, municipalities, or multi-family residential complexes can increase employee satisfaction, demonstrate sustainability commitments, strengthen relationships with customers and attract new ones. Efficiency Maine offers information and tips for consumers and businesses looking to install EV chargers. Learn more at: https://www.efficiencymaine.com/at-work/electric-vehicle-charging/

Commercial: Efficiency Maine has programs for businesses of all sizes, including multifamily buildings with five units or more and Maine's largest energy customers, businesses, for profit or nonprofit; municipalities; schools and higher ed facilities; industrial facilities; non-residential facilities; multifamily and condominium buildings with five+ units. To learn more about incentives for energy efficiency solutions, how to get started, and program details, visit https://www.efficiencymaine.com/at-work/. To find a contractor participating in Efficiency Maine programs as a Qualified Partner: https://bit.ly/EffME_BusinessSolutionsPartner.

Appliances: $50 rebates available for ENERGY STAR® certified clothes washers: bit.ly/EffME_ClothesWasher_Rebate

REGIONAL: OTHER

The empower program is a good place to start by making your home or apartment energy efficient, more comfortable and healthy

Commercial Buildings EPA 179D

Take up to $1.88/ sqft if qualified) Visit https://www.energytaxsavers.com/ for more details.

https://www.energy.gov/eere/buildings/179d-commercial-buildings-energy-efficiency-tax-deduction

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While we try to keep this up-to-date, incentives are always changing. Please be sure to check with the appropriate sources provided for the latest information.

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

Co-ops' Day to Focus on Sustainability

International Day of Cooperatives

On July 1, co-ops and their members around the world will celebrate how cooperatives are contributing to a more just, inclusive, and sustainable future.

Erbin Crowell

Celebrated worldwide for more than a century and officially proclaimed by the United Nations General Assembly in 1995, the International Day of Co-operatives (https://coopsday.coop/) is commemorated annually on the first Saturday of July. This year, co-ops and their members will celebrate under the theme, "Co-ops 4 Sustainable Development," promoting how co-operatives are key partners in achieving the United Nations 2030 Agenda for Sustainable Development.

Co-ops around the world will be sharing with their members and customers, policymakers and community organizations, and the public how people are using co-ops to build a better future for everyone. Here in our region, the Neighboring Food Co-op Association (NFCA) is spreading the word: when you shop at your local food co-op, you'll not only get good food for you and your family, you're also building more healthy, sustainable, and inclusive communities by supporting the following:

Local Food Systems

The NFCA's annual impact survey found that member co-ops reported that an average of 25% of their sales were local products last year, supporting small producers and building more resilient communities.

Food Security

When you shop at your co-op, you're making healthy, affordable food more accessible to everyone in your community, and ensuring reliable markets for local farmers and producers.

Good Jobs

You're supporting more full-time jobs and higher wages for 2,465 people across our region, and 60% of co-op staff are also members, sharing in the ownership of their grocery store.

Sustainability

Your dollars support family farming, organic agriculture, reduced packaging, and a business model based on meeting people's needs rather than maximizing profit.

A More Inclusive Economy. Your Neighboring Food Co-ops are jointly owned and democratically governed by 173,000 members across the Northeast — people like you who are using co-ops to meet their needs and build a better economy that works for everyone.

Food co-ops are not alone! The co-operative business model is a natural vehicle for community partership and prosperity, contributing to economic, social, and environmental sustainability across the economy. From farmer co-ops to food co-ops, worker co-ops to credit unions, housing co-ops to mutual insurance, co-operative enterprise strengthens communities, enhances local resources, advocates for social responsibility, and promotes sustainable business practices based on long-term well-being rather than short-term profits. Here in the U.S., an estimated one in four people are a member of at least one co-op, and around the world more than one billion people are part of this people-based movement.

So, it may not be surprising that the International Co-operative Alliance (ICA) (https://ica.coop/)was the first worldwide business network to endorse the United Nations Sustainable Development Goals (SDGs) and be recognized as a partner in their advancement. Formally adopted by all United Nations Member States in 2015, the agenda provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are 17 sustainable development goals (SDGs) which are an urgent call to action to all countries around the world. They recognize that ending poverty must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

September 2023 will mark the halfway point of the 2030 Agenda for Sustainable Development, bringing urgency to the task of advancing the SDGs. "At the mid-point of the 2030 Agenda, efforts need to be deepened, and this can only be done with more co-operation," said ICA President Ariel Guarco. "Enterprises, which are responsible for organizing the production and distribution of goods and services, must focus on people and the planet. Co-operatives have a model for doing this and have been demonstrating it for almost 200 years."

You can learn more about what can be achieved through the power of co-operation by visiting your local food co-op at https://nfca.coop/members. For more information #CoopsDay, visit https://www.coopsday.coop.

Erbin Crowell is executive director of the Neighboring Food Co-op Association (NFCA), a co-operative federation of more than 40 food co-ops across New England and New York State. He also serves on the Board of Directors of the National Cooperative Business Association and is a member of the Cooperative Identity Advisory Group of the International Cooperative Alliance. ♻

Cooperative Businesses

Cooperatives (co-ops) vary depending on the service offered and the way that the members are organized. They also differ depending on the economic activity, how members use the cooperative and kind of management.

There are six types of classification: agricultural, consumer, credit union, housing, insurance and worker. These types of cooperatives include producer and marketing, retail supply, utilities, cable television, agricultural services, fish marketing, child care, farmers' markets and community service. Learn more about types of cooperatives at www.gov.mb.ca.

SolarFest: Home of the Solar-powered Stage

Featuring two sustainable music festivals in Brandon, Vermont

Mike Bailey

New SolarFest solar panels and storage trailer is delivered by electric truck beside the solar-powered golf cart. (Images courtesy of Mike Bailey)

Brandon, VT has always had a vibrant music and arts scene and is historically noted as home to the invention of the first patented electric motor by resident Thomas Davenport. It is the perfect permanent site for SolarFest and their solar music stage to feature top-tier performers and events.

SolarFest began almost 30 years ago by bringing people together with live music powered by the sun in the beauty and warmth of Vermont. In May, they hosted the launch of the Imagine Zero Music Fest, as they promote a new wave of festival sustainability that featured Dawes along with the Kat Wright Band, Myra Flynn, Billy Wylder, Michael Daves, Ben Kogan Band, and Brandon Heisler.

Now, on July 15 and 16, SolarFest celebrates the return of the full weekend festivities with two days of fun, workshops, food, exhibits, and the return of Dar Williams to the solar- powered stage. This year the SolarFest stage is run by a new, portable power trailer with 4kW of PV and 50kWh of onboard storage.

Two-time Grammy Award nominee Etana will headline with the reggae of her Raw Soul Rebels band, joining over 20 great performers across two days, including HuDost, Lara Herscovitch and The Highway Philosophers, Ray Vega's Latin Funk, House of Hamill, the Jim Gilmour Band, and the Falcon Ridge Festival "Most Wanted" preview tour of Phil Henry, Grace Morrison, Sam Robbins and Erin Ash Sullivan, plus the Maple Run Band, Cam Gilmour Trio, Louise Mosrie Coombe, Pamela Means, Tom Pearo, and the return of the SolarFest Singer-Songwriter Showcase. On the second stage there is also the Moose Jr. Band, interactive performances by Gamaliel Moses, and song circles with singer and songwriter showcase artists.

And that is not all! The SolarFest community is known for the inspiring most interesting conversations, bringing together outstanding artists, speakers, and practitioners to share their passions, the latest ideas, and real-world solutions to help shape a better world for us all. This year there are over 25 workshops on renewable energy, green buildings, healthy living, new technologies, electric transportation, and the latest word on national and local policies. And it is a great opportunity to talk one-on-one with experts and leading practitioners in all areas of renewable energy and conservation.

SolarFest'23 takes place Saturday July 15, from 11am to midnight and Sunday July 16, from 10am to 4pm, with a unique blend of music, art, and education at a relaxed family- friendly festival. The weekend ticket is only $40, with single day admission available. As always, children under 12 are admitted free with an adult. Complete details and tickets are available at www.SolarFest.org.

Mike Bailey is a sustainable energy consultant and a trustee of SolarFest, Inc. ♻

The Imagine Zero Music Festival audience enjoying the solar-powered music at the beautiful SolarFest fields in Brandon, Vermont.

The food court and picnic area feature delicious local vendors and food trucks that are run completely without generators and with only reusable or compostable service ware.

Canada's Wildfires Expose the Climate Change 'Spiral of Silence'

"It's really critical not to be alone with your climate anxiety, terror, grief," says Margaret Klein Salamon, executive director at the Climate Emergency Fund.

Zahra Hirji and Kira Bindrim

Reprinted from the Bloomberg Green Living blog post from June 10, 2023 found at https://bit.ly/bloomberg_CanadaWildFire

What should you do when the air outside contains dangerous levels of pollution? Stay indoors if you can. Buy an air purifier. Wear a mask to travel. It's a list of precautions familiar to people in cities like Delhi, Beijing and San Francisco, where air pollution or seasonal wildfire smoke are the norm. It's a list newly familiar to millions more people across North America, whose skies filled in early June with dangerous smoke drifting from fires in Canada. It's a list that will become more familiar every year, as climate change drives up wildfire frequency and intensity.

But how should you feel when the air outside contains dangerous levels of pollution? Or your community is flooding? Or drought is ravaging crops? There's a list for that, too. Grief. Terror. Rage. Guilt. Shame. Helplessness. Any and all of those reactions are understandable and worth sitting in, says Margaret Klein Salamon, a clinical psychologist and executive director of the Climate Emergency Fund, which funds disruptive climate activism. Salamon, author of *Facing the Climate Emergency*, is based in Brooklyn; she spoke to *Bloomberg Green* on Friday, as the skies over New York City started to clear.

What sort of reactions were you seeing from people as they experienced the sky turn orange and the bad air?

I think, like in most climate disasters, they stayed pretty focused on what was immediately unfolding. As far as I've seen, though it's not a huge sample size, they have not yet started to think: What about the next one? What's coming down the pike?

What do you think it takes to get people to the point where they are actually anxious, scared or just feeling more?

I mean, that is certainly the million-dollar question. Because this kind of event should, by all rights, trigger a kind of Pearl Harbor-type response. The country was bitterly divided over going to war, with the most popular view being isolationist. After that attack, it became abundantly clear that it wasn't a choice — of course, they don't want to go to war but we had to. This is the kind of reaction we need politically.

The wildfires in Canada produced vast amounts of ash and smoke which have been carried by winds across the border into the United States. New York City experienced significant haze. (freeastroscience.com)

What are the sorts of things people can and are feeling about climate change, and how can they start to process that?

The first thing is to recognize that what you're feeling is healthy, and that feeling takes courage, and that as you go on this process, it's critical to treat yourself with self-compassion. The situation is so extreme that the feelings will also be extreme.The second thing: It's really critical not to be alone with your climate anxiety, terror, grief. The number one feeling that people report to me when I ask, 'How do you feel about the climate emergency? They said, 'I feel so alone, no one understands how bad it is. My friends don't understand. My family doesn't understand.' They feel alienated and separate from other people because of this knowledge and emotional experience that they have. What's so ironic about that is that we all share the same atmosphere — this is happening to all of us. So, by all rights, it should be an experience that fosters emotional connection rather than separation and it can, if you talk to people about your feelings.

Why do you think it is so hard to just start talking about these feelings and the crisis in general?

It's emotionally overwhelming and it's difficult socially. When I talk to people about the scale of the climate emergency and what's at stake — that crops are failing and states are going to fail and civilizations are going to fail — I always feel guilty, among other feelings, because it's like being the bearer of such horrible news.

The Yale Program on Climate Communications talks about the spiral of silence, meaning people don't talk about climate because people don't talk about climate. The fact that people aren't talking about it makes it seem like they're not worried about it. Well, they're acting normal, so it must be fine. The implication is: Just by leading your normal life, you are actually contributing to mass climate denial because people are looking at you and seeing that you think things are normal.

The climate activists are a critical part of how to reverse this spiral of silence and make it into people yelling about climate change from the rooftops all the time. The activists are not acting normal. They're getting arrested 10 times and throwing soup on paintings and the extremity of their actions is also a demonstration of the depth of their feeling and fear, so it's enacting.

I want to talk about grief, climate grief. Can you define what that is? What are different stages of climate grief and why it's important to go through the grieving process.

Grieving is how we acknowledge and mourn our losses and adapt to new realities. If we don't grieve, we don't get to that stage. Grief is central as a key part of the human condition and it's a very important process to go through. With climate grief, there's so many losses. It's overwhelming. But I think the most personal and effecting element of climate grief is to grieve the future you thought you had.

Zahra Hirji is a senior reporter for climate at Bloomberg News. *Kira Bindrim is the editor at Greener Living at* Bloomberg News. ♻

CO2 Level Hits a New Alarming High of 425ppm – *Cont'd from p.1*

a windfall tax on oil companies, which of course the oil companies are trying to block. Globally, legal action against the oil companies is moving along, especially in the Netherlands. The district court in the Hague ordered Europe's largest oil company, Royal Dutch Shell, to reduce its carbon emissions by a net 45% by 2030 compared with 2019 levels. The court was also explicit in stating that the harms from climate change are violations of human rights. Last week in the U.S. the Supreme Court allowed state-law climate suits against oil companies to go ahead. Many have been in limbo for years. For example, the Baltimore suit, filed in 2018 in Maryland state court, alleges that more than 20 energy companies promoted fossil fuels while concealing information about the harmful changes of climate they cause, including rising sea levels and extreme weather. Other cases brought by state and local officials make similar allegations. Perhaps eventually the oil companies with have to pay for their long-term criminal fraud.

Human destruction of life on Earth for profit has been obvious for nearly 50 years. Mother Nature has taken over the climate to save life on the planet. (deviantart.com/MP-Design)

The deeper issues are radically different. Human destruction of life on Earth for profit has been explicit for nearly 50 years. Fortunately for the Earth but unfortunately for capitalism, humanity is no longer in charge. Mother Nature has taken over the climate to save life on the planet more broadly. This is a complex issue that I have addressed in the scientific literature (see alanbetts.com/research), and in outline in articles in *G.E.T.*

The oil companies, politicians and practically all of society have been bribed to live in webs of lies and deception. They also believe that their money and power give them control through technology. But their lies mean they cannot face the basic Truth that Mother Nature, who is the Creator herself, is far more powerful than humanity. She is now managing radically new climate extremes, amplified of course by climate change, using new modes we have never seen and we cannot predict before they occur. We think we have climate projections for this century but increasing melting of glaciers and icecaps, along with ocean changes, are driving faster sea-level rise that is likely to flood our coastal cities within decades.

It has been a winter of onshore storms on the west coast and more extreme storms and tornadoes across the country, especially in the south. As I write in early May, a remarkable stationary pattern called an Omega block has brought record snow (for May 1) to Marquette, Michigan, but a remarkable 90ºF for Missoula, Montana. Since Hurricane Ian amplified off the west coast of Florida to a Category 5 storm on 28 September 2022, flooding and severe weather have dominated Florida with frontal thunderstorms and tornadoes during the winter. The most recent extreme was a record 26 inches of rain in 24 hours in Fort Lauderdale on 13 April 2023 that closed the port and the airport, cutting off fuel supplies. From Mother Nature's perspective, Governor DeSantis is an obvious target – for his anti-almost everything mentality (including climate change, women, books, education and Disney), but he is too lost in his own politics to care.

Most of society is unable to communicate directly with the Creator, even though she can read our minds and help us. We are the only species on the planet that lives in this isolated world that comes from more than a thousand years of 'male power' over nature, women and indigenous thinking. Historically this goes back to the dictates of the Roman Emperor Constantine at the Council of Nicea. It is still an obstacle stopping us dealing with climate change.

The renewable energy world of *G.E.T.* is different. Everything you do to transform our energy system and reduce fossil fuel use will get the Creator's active support. This helps a lot even if you are unaware of her presence – but with awareness come many more connections.

Dr. Alan Betts of Atmospheric Research in Pittsford, VT is a climate scientist. See alanbetts.com. ♻

Concentration of CO2 in the Atmosphere

423.06
parts per million (ppm)
April 11, 2023

424.72
parts per million (ppm)
June 3, 2023

Learn more at www.CO2.earth.

Above top is the CO2 level from the front page of the April 15th edition of Green Energy Times *showing the CO2 level at 423.06 ppm. As of June 3, 2023, Co2 has risen to 424.72 ppm.*

Weathering the Future: Nova Science Trust

Dr. Alan K. Betts

Nova[1] has produced an excellent recent film about evidence-based solutions that will help all Americans face the climate challenges that are upon us: extreme fires, floods and droughts, extreme city temperatures and rising sea levels. It is focused on community level solutions that use new strategies and indigenous knowledge and wisdom to change direction. It discusses how to locally sidestep the processes driving extreme climate change which is coming from our addiction to carbon based energy systems. It avoids the social issues of our willingness to appease the fossil fuel industry's criminal efforts to maximize their profits, while destroying life on Earth.

The film starts with an excellent review of the system shift that has occurred in the U.S. weather to a new normal of extreme events that are far less predictable. The focus is on what we can do locally with more understanding and much wiser strategies.

In cities, heat deaths are increasing. Days over 90oF have been linked to 1000 deaths per year. Na'taki Jelks at Spelman College in Atlanta, Georgia realized that one airport weather station temperature was not enough, so she gave students temperature sensors and sent them through the streets. They found that some areas, dominated by asphalt and concrete without trees, were 7 to 10ºF warmer. Nearly 80,000 trees were lost in the development of the city in the past ten years. And if you are poor and have no air-conditioning, night-time temperatures can be fatal. In Phoenix, Arizona, temperatures may be over 100ºF, or even 110ºF. And there were 300 heat deaths in 2021. David Hondula was appointed by the city to find solutions. Shading direct sunlight drops temperatures up to 15 degrees, clearly lifesaving. Corridors of drought-tolerant trees have been planted, but their growth takes time. The city realized that recoating roads with reflective sealant reflected 35% of direct sunlight, making the reflective surface a remarkable 16ºF cooler and lowering the city temperature by two degrees. We now know that we can cool down cities at a relatively modest cost provided we have smart urban builders. This will delay the impact of accelerating climate warming.

Extreme droughts are increasing, and the extended mega-drought in California has led to a shortage of drinking water. In Orange County, California, 2.5 million people rely on ground water wells, and by the late 1990s sea water was coming in as water tables dropped. We used to dream up big engineering projects to get fresh water with dams and canals from far away, but populations kept rising. Extracting salt from ocean water was considered, but this needs a lot of energy on the scale needed. Then Mehul Patel, Director of the Orange County water district realized that they were pumping massive amounts of waste water into the oceans just to get rid of it, when processing it to clean water would supply their needs. This is a challenging mental shift for society that feels entitled to unlimited fresh water and would much rather dump sewage in oceans than process it. Yet processing using filtration, bacteria and reverse osmosis works; and now the water table is being restored by allowing 130 million gallons per day of purified water to seep into the ground through long pipes.

Fire is a severe challenge in the drought-thirsty forests of Northern California. Some recent fires have been unstoppable and have needed rapid evacuation. In the last decade, 24% of the California forest has burnt. Our historic 'industrial' strategy has been to prevent fires and cut trees for timber. Fortunately, Leaf Hillman, the Karuk Tribal Elder and the Karuk tribal community have shown the forest service a better long-term ecological strategy based on their use of fire for management for thousands of years. Traditionally fire was used to clear brush and encourage fire-resistant trees that were critical for the ecosystem to survive. The mental shift for our culture is obvious. In the 1800s, when cutting trees and fire suppression became the law, setting

Extreme weather caused by climate change destroys homes and causes forest fires. (Weathering the Future/NOVA)

fires was a serious crime. Now the Karuk and other indigenous people are getting burn permits and taking on the challenging task of managing small brush fires behind fire-lines with community help and pumped water resources for fire control.

Farming is another area where we need to make another radical shift to deal with an increasingly warm and extreme climate. Eastern Iowa grows corn and soybeans. When an extreme rainfall of six inches falls after a period of drought, it erodes the soil and some farms are losing five tons of soil per acre per year. However, one sixth-generation farmer, Elyssa McFarland, is not losing soil because she has shifted to no-till farming, rather than the centuries-old method of tilling with a plow. Instead she sows a cover crop in winter and uses a high-tech planter which injects seeds in a narrow strip, while not disturbing the cover crop. This preserves a very strong soil structure with aerated soils for root growth and air spaces to store excess water to reduce runoff and future drought. In my Vermont vegetable garden, I plant a rye cover crop in fall, and manage it and my soil carefully with a shovel and nothing runs off.

The rapid intensification of hurricanes in the Gulf, like Ida in 2021 and Ian in 2022 has done immense damage. It is connected to the warming of Gulf waters by 1 to 2ºF since 1980. The huge Mississippi delta in Louisiana has been losing land for a long time. Levees and dams upstream reduced the river sediment reaching the coastal wetlands. Oil and gas companies cut 10,000 miles of canals through the wetlands, speeding erosion. Now about a quarter of the Louisiana coast has gone. Hurricane Ida reached 150 mph, flooding and destroying homes, and destroying 75 square miles of wetlands. Local Tribal Elders, Rosina Philippe and Shirell Parfait-Dardar, are faced with leaving their ancestral homes where their people have lived for centuries. Instead they are looking for low cost restoration solutions. One is to bag millions of oyster shells to rebuild new living reefs, which reduce wave action 60%; and replenish oyster populations. So far they have done this on 8000 feet of coastline.

Of course, we need big system changes to move away from the destruction of the planet for profit. However, we need the wisdom of indigenous and tribal peoples to rebuild ecosystems and understand natural cycles. We need many local projects to rebuild land and cities wherever we can. Our poor understanding of the surface energy balance is remarkable. We need broader vision to back the Earth and develop the will to act together as swiftly as we can. Mother Nature is watching and will then support our communities in many deep ways.

[1] https://www.pbs.org/wgbh/nova/video/weathering-the-future/

Dr. Alan Betts of Atmospheric Research in Pittsford, VT is a climate scientist. See alanbetts.com. ♻

Hydrogen Power Plant in NH

Cont'd from p.16

because hydrogen lacks energy density (i.e., how much energy it carries per unit of volume). However, it can also be used to make ammonia, which is a much denser carrier of energy than hydrogen. Ammonia can also be used in a fuel cell with only water and nitrogen as products. Since nitrogen is already 78% of the atmosphere, there are many people who advocate for such use.

Hydrogen can be used for ammonia as a chemical, as that is one of the most useful chemicals we have. For example, it is important as an agricultural fertilizer. Dissolved in water it becomes ammonium hydroxide, which is the cleaning agent called "household ammonia." These uses are just the start of a long list.

One thing we should note is that the amount of investment going into hydrogen production is gigantic. New plants to produce hydrogen are announced often, with many of them involving investments of billions of dollars. These announcements come from both countries and leading companies, even though the market for hydrogen does not really exist yet. For example,

Site of the Q Hydrogen plant in Groveton, New Hampshire. (Q Hydrogen)

the Australian Renewable Energy Hub is intended to produce 1.6 million tons of green hydrogen per year, mostly for sale to Asian countries, along with grid power for local areas. It will have a renewable generating capacity of 26,000 megawatts, and it is expected to cost $36.7 billion. Its largest investor is BP, the oil and gas company, with a 40.5% share. That is just one example of many.

In light of what is happening in hydrogen production worldwide, the Q Hydrogen plant does not seem unduly large. What is likely to make it impressive, however, is the fact that it uses a relatively new, homegrown technology, which Q Hydrogen says is considerably less expensive than the alternatives. And that might give it an important future.

Q Hydrogen's web site is qhydrogen.com. ♻

Our Better Nature: Hopeful Excursions in Saving Biodiversity

by Curt Lindberg and Eric Hagen, Published by Vermont Alliance for Half-Earth (2022)

Book review by Jessie Haas

There can be no purpose more inspiring than to begin the age of restoration, reweaving the wondrous diversity of life that still surrounds us.
– E.O. Wilson

After pondering the decline of Nature – insect populations down by 50% in some areas, bird population down by 30%, the total weight of life on earth reduced by half – George Schenk, founder and CEO of American Flatbread, wrote in his journal, "I am the enemy of every green and living thing." His truck, his food, his home and vacations and livelihood, "are in direct opposition to nature. My modern economy is in direct conflict with my essential ecology."

So when he met the great biologist E.O. Wilson, Schenk asked, did what he was doing on his farm—composting, mulching, not mowing, leaving brush piles and rock piles and dead logs around for habitat—make a difference? Yes, Wilson told him. Everything that enriches life helps.

That's one big theme of this exciting, well-organized book published by the Vermont Alliance for Half-Earth, A Shared Life — Vermont Alliance for Half-Earth (www.vermontallianceforhalfearth.org) in partnership with North Branch Nature Center, Vermont Natural Resources Council, and the Lintilhac Foundation. Chapters written by fifteen different authors lay out the problem—degradation of the ecology, the 6th Great Extinction—and the history of conservation in Vermont, then almost immediately move on to solutions.

In 2016, E.O. Wilson wrote his book *Half-Earth*, contending that in order to stave off mass extinction and save 80% of current living species, humans needed to dedicate half the planet to nature. Impossible? Certainly audacious, but Wilson believed that people are inspired and fulfilled by embracing bold, difficult, and vastly beneficial goals. He wrote, "To strive against the odds in behalf of all life would be humanity at its most noble. Half-Earth Project - E.O. Wilson Biodiversity Foundation."

Inspired by Wilson's challenge, a group of Vermont conservationists formed the Vermont Alliance for Half-Earth. Our *Better Nature* tells the story of Vermont's ecological past, the heroic work done to conserve wild lands, and the reasons to do it. One chapter explains the crucial role of forests in sequestering carbon, and the different capacities of older versus younger trees. Message to humanity: Save those old-growth forests!

Though centered on Vermont, the book devotes a chapter to the Adirondack Park Adirondack Park National Historic Landmark – Official Regional Website (www.visitadirondacks.com) , which author Tom Butler (past president of the Northeast Wilderness Trust) calls "arguably the greatest example of rewilding on earth." This six million acres of formerly logged-over land was established in 1892, and is protected by an amendment to the New York State constitution. Half permanantly conserved, half privately owned, it serves as inspiration for a new way of living with nature. Butler writes, "The idea of blue and green ribbons of wildness knitting up to wrap the globe in beauty is deeply attractive." He finds hope that "a future ecological civilization is possible, if we work with urgency and creativity to create it."

Another chapter takes the reader on field trips with Vermont science teachers Sandra Fary and Trish O'Kane, who are introducing middle school and college students to the natural world. The middle section tells personal stories. Andlea Brett, who chairs the Governor's Racial Equity Advisory Panel, writes of growing up concealing her Abenaki heritage, losing her language, and also losing the meadow where her family used to harvest medicinal plants. The 'Field That Bloomed' has been reduced to "Bloomfield Drive," a suburban environment where the plants "... are no longer an expression of the land... The landscape we see now only tells us which plants respond well to a lawnmower... all the old stories have been cut off and scraped away." Vermont State Representative Jim McCollough and his wife Lucy talk about turning their farm into the Catamount Outdoor Family Center Catamount Outdoor Family Center - Winter & Summer Outdoor Recreation, and Charlie Hohn describes allowing the unmowable wet spot on his Montpelier lawn to blossom into a mini-wetland surrounded by native plants and lit at night by fireflies.

And that is the secret of half-earth. It starts small and intimate; half-mind, half-yard, half-playground. Not places where humans are absent, but where we live with nature. Doug Tallamy, in the afterword, proposes that "saving Nature" means saving ecosystem *Cont'd on p.35*

PRO RACING GOING GREEN

Cont'd from p.1

engines are pushrod-operated overhead valve, carbureted V8s - technology commercialized by Chevrolet in 1917, while Formula One's turbocharged V6 engines are hybrid with regenerative braking. Formula One banned refueling in 2010 primarily for safety and cost reasons, and the introduction of more fuel-efficient hybrid systems has helped maintain performance and endurance.

Four-time World Champion Formula 1 driver Sebastian Vettel is promoting P1 Fuel's carbon-neutral racing fuel that will be fueling his vintage race cars, without any mechanical changes to them, during the Goodwood Festival of Speed July 13-16. P1's synthetic fuel has also powered all World Rally Championship cars since 2022.

Sir Lewis Hamilton, seven-time World Champion Formula 1 driver, has expressed concerns for years about climate change and how slow governments and organizations have been to react. A vegan, Hamilton practices what he preaches, countering accusations of hypocrisy given the nature of his work.

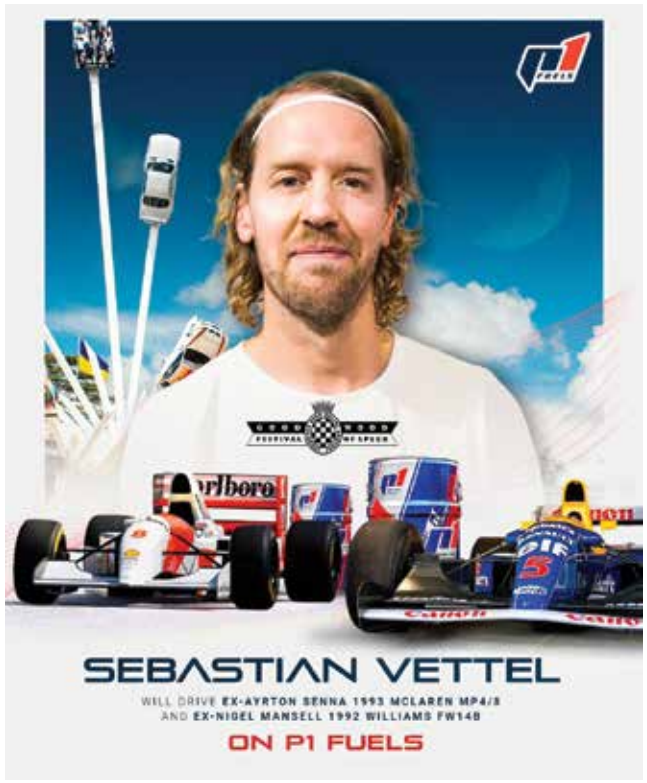
The fuel powering all NASCAR race cars today is Sunoco Green E15, unleaded gasoline blended with 15% ethanol. Ethanol, with its octane rating of 113 is blended with the gasoline to achieve an overall octane rating of 98, required for high-compression engines to prevent pre-ignition (knock).

IndyCars fueled with Brazilian Sugar Waste

Starting with the Firestone Grand Prix in St. Petersburg, FL in March this year, all IndyCar race cars, including those at the legendary Indianapolis 500, are fueled with Shell's 100% renewable fuel. The fuel contains a second-generation cellulosic ethanol produced from bagasse (the dry fibrous material remaining after crushing sugarcane) and other agricultural waste by Shell's partner, Brazilian sugar producer Raízen. It reduces greenhouse gas (GHG) emissions by 60% compared to fossil gasoline. First generation ethanol, typically derived from corn or sugar, suffers from food-versus-fuel issues, avoided by second-generation ethanol.

Electrifying the Grand Prix

The Fédération Internationale de l'Automobile (FIA) the parent of Formula One and the World Rally Championship, launched Formula E for electric race cars in 2014. The current Generation 3 car formula provides for rear wheel and front wheel motors, with a top speed of 200 MPH. The FIA claims these cars will generate 40% of the power needed during a race from their regenerative braking system; so effectively that they do not have conventional (hydraulic) rear wheel braking. So far, seven manufacturers from six countries have registered with the FIA to race in the category, with three private teams making up the rest of the field.



24 Hours of Le Mans will be a Gas

The Automobile Club de l'Ouest is working towards the creation of a class for hydrogen-powered prototypes at the 24 Hours of Le Mans in the next few years. MissionH24, a joint venture between the Club and GreenGT, a Swiss hydrogen-electric engineering company is conducting research and development in areas such as safety, performance and refueling. Originally scheduled for introduction in 2025, COVID contributed to delays, and now the plan is for the fuel-cell class to debut in 2026. Fuel cells combine hydrogen with oxygen producing electricity to power the motors with heat and water as byproducts.

Charges of Greenwashing

CleanTechnica, whose review of the 2022 Formula One Miami Grand Prix was skeptical about its carbon reduction efficacy, noted that the partner for the sustainability venture was Saudi Aramco. Aramco's plans call for increased investment in downstream petrochemical processing, the expansion of oil production and increased natural gas production. The inventory of what each of the ten teams (two entries per team) must transport annually to the 22 race venues is staggering: between 30 and 50 tons of gear. Formula One has a steep hill to climb to get to zero emissions.

To their credit, Formula One has not said they would rely on carbon offsets to achieve their goal. Since we reported on carbon offsets in the April *Green Energy Times* issue, there have been other disappointing developments in the carbon offset market: Delta Airlines is now the subject of a class action lawsuit alleging that it's claim of carbon neutrality is false. Additionally, the CEO of Verra, a leading carbon offset verification organization, has resigned following exposés in the press of its bogus carbon credit valuations.

The good news in all of this is that climate change concern is in the driver's seat in organized racing, and the future of sustainable racing promises to be exciting and a great deal cleaner.

After a career in data product management, Martin Wahl has worked in biofuels since 2006, currently with Lee Enterprises Consulting, a large bio-economy consulting group. Dividing his time between California and New Hampshire, he serves on Corte Madera, California's Climate Action Committee and is a Newfound Lake Region Association member.

**Interactive links for all source info can be found in the posting of this page on our website at www.greenenergytimes.org.* ♻

Let's Not Weaponize Gas Stoves and the Grid Against Climate Action

Anshul Gupta

What's the rapidly growing trend that Germany, Washington State, New York City, Ithaca, Montreal, and now the City of Beacon have joined?

In all these places, new homes and small buildings will stop installing most appliances fueled by polluting methane gas by year-end, extending the practice to larger buildings within three years or less.

The most cost-effective and energy-efficient way to tame the health- and climate-destroying pollution from burning fuels in buildings and vehicles is to power them with electricity. (public-domainpictures.net)

Energy, climate, and building experts from municipalities to states to nations are all reaching the same conclusion that the most cost-effective and energy-efficient way to tame the health- and climate-destroying pollution from burning fuels in buildings and vehicles is to power them with electricity. Electric vehicles and heat pumps use only a fraction of the energy of their fuel-based counterparts and will see their environmental footprint continue to decline as the electric grid transitions to cleaner generation.

Like most climate solutions, eliminating combustion also comes with tremendous public health benefits due to reduced pollution. New York currently leads the nation in premature deaths from pollution caused by burning fossil-fuels in buildings that disproportionately has an impact on people with lower incomes, people of color, pregnant women, children, and older adults.

With the US becoming the world's largest exporter of liquified natural gas, we now see both gas and gasoline prices soar in response to geopolitical disturbances. EV sales are already booming because owners prefer their handling, fuel efficiency, and low maintenance. Many builders and home buyers are choosing all-electric buildings that are superior in comfort, health, affordability, and emissions.

None of these benefits have prevented the fossil-fuel industry and its allies from attempting to sow fear, uncertainty, and doubt about our clean energy future with culture wars over gas stoves and scaremongering over grid capacity and reliability.

Research highlighting the health risks from gas stoves has been accumulating for decades. American Medical Association, American Lung Association, NYS Public Health Association, the Asthma and Allergy Foundation of America, and all NYS chapters of the American Academy of Pediatrics deem gas stoves a health hazard, particularly as asthma triggers for children. A recent public statement by a US Consumer Product Safety Commissioner just served to bring a long-standing issue into focus, and some saw this as an opportunity to help spark an anti-electrification backlash.

New York's climate scoping plan recommends a prohibition on new gas stove installations starting in 2035. The provocateurs of the controversy seem to be missing the point that by next decade, New Yorkers' desire fora gas stove will be on the level of their wanting lead paint or asbestos in their homes today. According to the Energy Information Administration, more than a quarter of US homes are already all-electric and a majority of Americans do not cook on gas.

Major utilities like Con Edison support electrification of our transportation and buildings and are confident in the electricity generation, transmission, and distribution systems needed to keep pace with the demand. The electric utilities are dealing with the reality that our electric grid is stressed in the summer while the heat pumps add to the winter electricity demand. Programs like SmartCharge help steer EV owners' charging behavior towards off-peak hours.

Cold-climate heat pumps and EVs would be just fine in upstate New York; much-colder Montreal's ban on fossil fuels in new construction starts next year, and 80% of new cars sold in Norway are now fully electric. By the time the New York climate law's mandates fully take effect in the middle of the next decade, these technologies will be much cheaper and more versatile with advances in microgrids and vehicle-to-grid and vehicle-to-vehicle charging.

Even fossil-fueled heating doesn't work during power failures without expensive generators. Electrification of our homes and vehicles actually has the potential to improve safety. Just like we stock up on groceries before storms, we'll be able to stock up on electrons. A fully charged Ford F-150 Lighting can power basic cooking and heating equipment for two to three days in an emergency. In any case, the climate plan doesn't prohibit backup generators or pellet stoves.

On the road, a half-charged battery of a stranded EV can run the seat warmers for a couple of days – something that will deplete a conventional vehicle's fuel in hours even if a snow-covered tailpipe doesn't turn it into a lethal gas chamber first.

During the 2022 holiday blizzard in the Buffalo area, four people died in gasoline-powered cars, at least 11 in their homes with fossil-fueled heating that doesn't run in power outages, and one from carbon monoxide poisoning. Generators could not keep up with blowing and drifting snow. A clinic was damaged from a catastrophic failure of their gas heating system. During the same cold snap, and also amid the terrible 2021 Texas winter storm, widespread gas network failures shut down power plants and caused millions of downstate customers to receive emergency warnings to curtail heating. Hundreds of residents of the New York City Housing Authority were without gas, some for weeks and months, due to dangerous leaks.

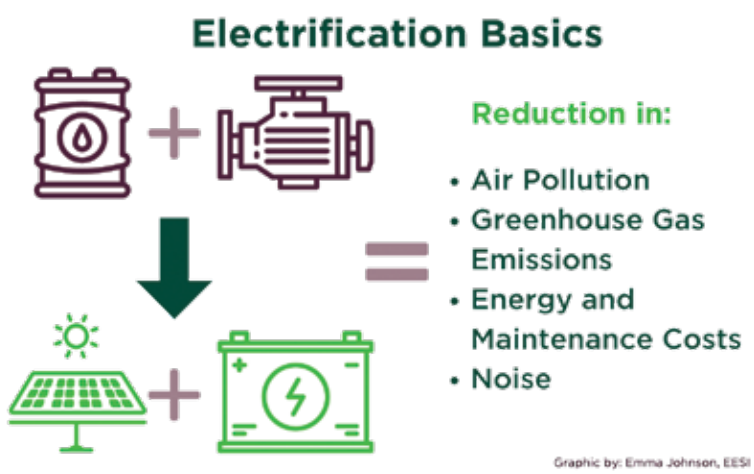
While power failures may not warrant delaying electrification, they indeed are a cause for serious concern. No amount of gas can help with electrically powered medical equipment, for instance. The frequency and duration of storm-related outages have been creeping up due to the worsening climate crisis and often inadequate maintenance of our power distribution infrastructure. Inadequate winterization of substations caused widespread power outages in the Buffalo area during the historic Christmas blizzard. Our aging grid needs significant investments regardless of our climate goals.

Similarly, electrification isn't just about the climate; it's also about doing more with less, more cleanly, more healthfully, and more reliably. Instead of assailing this beautiful future with disinformation and divisiveness, let's use beneficial electrification as a reason to unite for cleaner, safer and healthier energy and demand a robust, world-class electric grid.

Westchester, NY resident Anshul Gupta is a steering committee member of the NYS chapters coalition of the Climate Reality Project.

Originally published in the Yonkers Times *on March 24, 2023, https://bit.ly/GET-LNWTG.*

Source links available in our online posting of this article. Please visit our website. ♻



How Much Does a Heat Pump Save Versus Portable Electric Heaters?

Matt Power

You may be surprised how dramatically a heat pump can reduce your winter electric bill when compared to plug-in room heaters.

Heat pumps are more efficient at producing heat than portable electric heaters. One heat pump can produce 12,000 Btu which would take two and one-half electric heaters to produce. (Green Builder Media)

We have all used small electric heaters to take the edge off in a small office, bathroom, or even the kitchen. They're inexpensive, relatively safe, assuming they turn off automatically when knocked over, and cost nothing to install.

You may be tempted to just use some of these, rather than absorb the cost of installing an electric heat pump. But you will be wasting a lot of money and producing unnecessary carbon pollution.

Heat pumps use every watt more efficiently to produce heat. To illustrate this, let's do the math. To produce the same heat as a 12,000 Btu heat pump, you are going to end up running a bunch of small electric heaters.

I will use my home's heat pump as a baseline. It is a 12,000 Btu unit with a heating HSPF rating of 10. In temperatures down to single digits (Fahrenheit), it operates in heating mode at about 900 watts. That means that each watt produces about 13.3 Btu.

Let us say we want to produce the same 12,000 Btu using plug-in heaters. Each 1,500-watt device produces 5,100 Btu, so we are going to need about two- and one-half electric heaters to produce 12,000 Btu. But that is not the whole story. Because the heat pump is so much more efficient, it is going to cut our electric consumption to one fourth of the cost to produce the same heat as those portable heaters.

Maybe an easier way to understand this is to look at your electric bill.

A Whopping Waste of Energy

Let us say your utility just hiked grid power costs to 25¢ per kilowatt of energy in your region. Using 2.5 electric heaters for a month, 24 hours a day at 1,500 watts each, you would chock up a whopping 2,700-kilowatt hours of energy use per month.

Cost before distribution fees: $684.45.

To produce the same 12,000 Btu with a heat pump operating 24/7 would require 648 kilowatt hours of energy, at a total cost of $164.27 (before other fees). That's an almost ridiculous savings of $520.18 per month, or $6,242.16 per year.

Admittedly, this is an extreme scenario, where you are running heat constantly (probably a very poorly insulated house), but it illustrates why the investment in heat pumps is one of the best "after-the-fact" energy upgrades a homeowner can make. In this scenario, you could easily pay for the installation of two heat pumps in energy savings over a single year.

The real-world numbers are probably a bit more conservative. You will have annual maintenance costs to consider for the heat pumps, and your heating needs will only apply in the winter. But here's the flip side of that caveat. In the summer, your heat pumps typically work even more efficiently at cooling your home, using a little more than half the energy required for heating, replacing inefficient air conditioners.

Matt Power is Editor-In-Chief of Green Builder Media. *Power has reported on innovation and sustainability in housing for nearly three decades. An award-winning writer, editor, and filmmaker, he has a long history of asking hard questions and adding depth and context as he explains complex issues.*

Reprinted with permission from Green Build Media*'s blog on February 9, 2023 at https://bit.ly/greenbuildmedia-heatpumps-vs-electric-heaters.* ♻

Cleaner, Cheaper Heat

Cont'd from p.3

household, over the life of the installed measures, just from those actions taken by 2030. In the next two years, in an effort led by the Public Utility Commission and Public Service Department, Vermont will get more essential information – informed by experts, key stakeholders, and Vermonters – about the design, costs, and benefits of the program. And that information will inform legislative consideration and potential program refinement in 2025 – and require affirmative legislative approval before any program can be implemented.

For many people working to advance bold climate action for years – decades even – the Affordable Heat Act enactment is major progress to be celebrated. It sets the stage for us to do our part to mitigate the increasingly costly and consequential impacts of a warming planet. And it's fundamental to move us beyond the high-cost, price-volatile, and deeply inequitable status quo.

We have an opportunity to help all Vermonters save money by switching to more local, affordable, and cleaner heating options, like cold climate heat pumps, advanced wood heat, and home weatherization projects – and limiting strategies, like biofuels, based on important sustainability, cost, and climate considerations. We have an obligation to do our part on the climate crisis and answer the increasingly loud clarion call from UN Secretary General Guterres and the scientific community to do all we can – "everything, everywhere, all at once." This is how we here in Vermont can do our part to help avoid the worst impacts of a destabilized, increasingly inhospitable planet; impacts disproportionately borne by people across the world who didn't create the problem.

There are better, cleaner, and more affordable heating solutions. It is time to pursue them. The Affordable Heat Act is Vermont's biggest opportunity when it comes to climate action and economic justice. Let's not squander it.

Johanna Miller is the Energy and Climate Program Director at the Vermont Natural Resources Council. She is also an appointed member of the Vermont Climate Council. Reach her at jmiller@vnrc.org. ♻

Electric Heater Myths and Misconceptions

Size Does not Matter.

Electric heaters only produce their rated output, no matter how big or small they are. A big 1500-watt unit produces the same heat as a small 1500-watt unit.

Wiring Has Limits.

The reason most electric heaters only hit 1500 watts is because a 15-amp circuit (typical in most homes) can only handle 1800 watts. If you plug anything else into that circuit, you trigger the breaker. The heater alone uses 12.5 of those 15 amps. ♻

Efficiency Vermont's Efficiency Excellence Network (EEN)

Contractor Spotlight: Pellergy, LLC, Montpelier, Vermont

INTERVIEW WITH Andrew Boutin, General Manager

G.E.T. Staff

G.E.T.: How did you get started in this industry?

Andrew Boutin: I began by designing and building a wood pellet conversion burner system for my own home. I purchased a home with a steam heating system that was fired on oil, and I really wanted to find a more renewable solution. Having an engineering background in operations and product development, I took matters into my own hands and developed a wood pellet burner system that could convert from oil to wood pellets and maintain the existing boiler and steam distribution system. This project turned into the launch of Pellergy a couple years later.

When did you start your company?

AB: I started the company in 2005 after finding a path to get my wood pellet conversion burner tested and listed to UL Standards. We started manufacturing in 2008. In 2013 Pellergy, LLC became an Export Partner with Windhager Zentralheizung in Austria, and we began importing and installing the BioWIN automated wood pellet boilers. In 2015 we stopped the manufacture of our conversion burner systems due to a change in the EPA regulations. Today, we have a diverse offering including the BioWIN2 automated wood pellet boilers, wood chip systems and now air-to-water heat pump systems.

What is your service territory?

AB: Pellergy, LLC distributes the Windhager BioWIN2 pellet boilers throughout the USA. We work with local heating contractors to train on the installation, operation and maintenance of these systems throughout New England; and we install systems throughout Vermont and neighboring counties in New York and New Hampshire.

About how may customers do you serve

AB: Pellergy has delivered just under 500 wood pellet boiler systems since we started production in 2008 and importing in 2013, and we continue to support every system we have provided either through our certified installers or direct with the customer.

What is your area of expertise?

AB: Our automated wood pellet boiler systems have been our mainstay for nearly a decade. The explosion in demand for heat pumps in recent years has given us the opportunity to leverage our expertise in hydronic systems to focus on now air-to-water heat pump solutions for our customers.

Pellergy's training and demonstration facility in Montpelier, VT houses multiple models of the Windhager pellet boiler and bulk wood pellet storage solutions. (Courtesy image)

What projects do people try to do themselves that really should be done professionally?

AB: Anything having to do with hydronic HVAC systems. There are so many improperly designed systems out there lacking proper pumps, installed using the wrong materials and not controlled for maximum efficiency. Having experts involved up front can save you an incredible amount of money in the long run.

If you could only choose one type of project to reduce someone's carbon footprint or improve efficiency, what would it be and why?

AB: We always coach our customers to focus on weatherization first! Reducing the amount of energy needed to heat or cool your space is the best initial step you can take. From there, we help our customers burn fewer wood pellets and chips and use less electricity.

Can you share one job project (and some details) that really stands out to you as moving from inefficiency to efficiency?

AB: A few years ago, we were invited to participate in the HVAC system of an old 180's farmhouse that had been completely weatherized. The owner was interested in having a 100% renewable system, and we collaborated with another EEN contractor to install an air-to-water heat pump system that was backed up by one of our Windhager pellet boilers. This project brought in all aspects of increasing the thermal envelope performance, incorporating a cold climate heat pump system and enabling sub-zero, high efficiency automated wood heating through the integration of the pellet boiler.

What is it in your field of specialty is most valuable (related to energy efficiency or the EEN) that our readers ought to know about?

AB: We really stress the proper sizing of our boiler systems. For decades our industry has installed massively oversized fossil fuel fired boilers and furnaces. We work with each customer to run heat loss and gain analyses, heat emitter evaluations and size systems properly for the space they are conditioning.

Cont'd on p.35

PRETTY GOOD HOUSE - A Guide to Creating Better Homes

By Dan Kobert, Emily Mottram, Michael Maines, and Christopher Bailey; Taunton Press, 2022, 252 pages, $34.99

Book review by N.R. Mallery

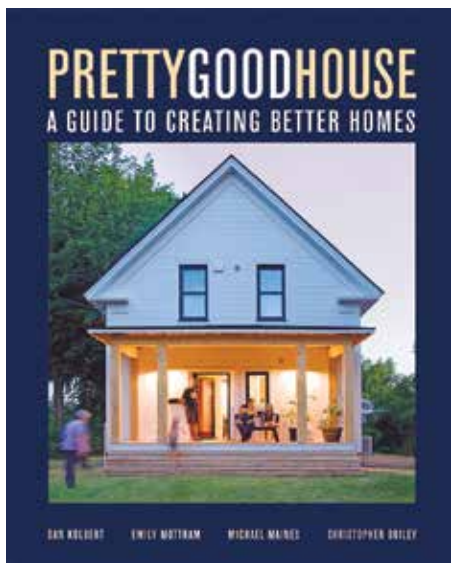
"In no time at all, Pretty Good House *became the nonstandard building standard, and it has become shorthand in the building-science world for a well-thought-out, carefully crafted house, designed to maximize performance and comfort within a budget. We now have the knowledge, the building science coupled with deep hands-on experience, to build much better houses. It is incumbent on those of us designing, building, or owning houses to make them better — more efficient, more resilient, and healthier — even as we strive to make them more comfortable, and beautiful. This book attempts to help us get there."*

- Excerpt from Pretty Good House

The book, *Pretty Good House: A Guide to Creating Better Homes*, is a comprehensive guide to designing and building homes that prioritize energy efficiency, comfort, and affordability. It emphasizes the importance of what building science has proven, providing practical guidance for homeowners, builders, and architects.

It is not a how-to book as much as a why-to. It is not a step-by-step guide, but is a guide to thinking through the critical issues of weather protection, air leakage, insulation and comfort, and vapor control. Each chapter ends with a list of issues to consider.

One key aspect in the book is the inclusion of case studies that provide real examples of pretty good houses. These case studies showcase a range of cost-effective strategies that have been successfully



implemented to achieve energy-efficient, comfortable, and healthy homes.

Examples of case studies featured in the book include the following:

- **The Greenfield House:** A renovation project of a 1950s-era home in Massachusetts that focused on improving energy efficiency and indoor air quality, while preserving the home's historic character. The project included insulating the walls and attic, installing a new high-efficiency boiler, adding an energy recovery ventilation system, and installing low-VOC finishes and materials.
- **The Cost-Effective Passive House:** A new construction project in Maine that aimed to create a passive house with a modest budget. The project achieved this goal by focusing on simple, cost-effective design strategies such as a compact shape, a well-insulated building envelope, high-performance windows, and an air-sealed and insulated foundation.
- The Affordable Net-Zero Home: A new construction project in New York that aimed to create a net-zero energy home that was affordable for a moderate-income family. The project achieved this goal by using a combination of passive solar design, energy-efficient building envelope, high-performance windows, a ground-source heat pump, and a photovoltaic system.
- **The Small Sustainable House:** A new construction project in California that aimed to create a small, sustainable home that was both energy-efficient and affordable. The project achieved this goal by using a combination of passive solar design, a well-insulated building envelope, high-performance windows, a ductless heat pump, and a rainwater harvesting system.

Each case study provides a detailed account of the design and construction process, highlighting the challenges faced and the solutions implemented to achieve energy efficiency, comfort, and affordability. By studying these examples, readers can gain insights into effective strategies for building high-performance homes that prioritize the well-being of occupants and the environment.

The book emphasizes a holistic approach to home design, balancing energy efficiency with other important factors such as comfort, durability, health, and affordability. It presents a set of guidelines and best practices for designing and building "pretty good" homes that are better than standard construction practices, but not necessarily as costly or complex as high-performance green buildings such as passive house.

It covers a wide range of topics related to home design, including insulation, air sealing, ventilation, heating and cooling systems, water conservation, indoor air quality, and renewable energy. The case study examples demonstrate how these principles can be applied in practice.

The goal of the book is to demystify high-performance building and make it approachable for people with the desire but not the experience to build a *Pretty Good House*.

Pretty Good House grew out of a monthly building science discussion group that met in Portland, Maine. Hundreds of people contributed to its development. The four co-authors include Dan Kobert, who is a building contractor in Portland, ME; Emily Mottram is a principal architect (registered in ME, NH and PA), building-science educator and a certified passive house consultant; Michael Maines is a building contractor, building science and certified passive house consultant and operations manager at a panelized building fabricator, based in Palermo, ME; and Chris Briley is a principal architect and certified passive house consultant at BRIBURN, Portland, ME. ♻

Resilient Buildings Group Celebrates Ten Years in the Field of Energy Efficiency

Resilient Buildings Group, Inc. (RBG) in Concord, NH will proudly celebrate its tenth anniversary on June 6. RBG's roots began in 1995 with a generous gift from Doyle E. and Lenore M. Jordan that created The Jordan Institute. The Jordans had a keen interest in funding research and policy initiatives that explore the links among the environment, public health, and the local economy. Their gift successfully launched a mission to improve the energy efficiency and resiliency of buildings throughout the region.

As the market for energy efficiency grew, the Jordan Institute developed a strategic plan to provide energy efficiency consulting services with a for-profit entity. In the summer of 2013, the Jordan Institute formed Resilient Buildings Group, Inc. to serve the rapidly growing market demand. Two years later, RBG's president, Dana Nute, bought RBG from the Jordan Institute.

RBG has since flourished, growing from three to 16 employees. The technical analysis services that RBG provides include building commissioning, energy auditing, construction management, high-performance building certifications, and other energy consulting services. A major driver of this growth has been the company's work with the NHSaves Energy Efficiency Programs.

The RBG team has grown over the past ten years to help serve the growing building and energy efficiency market. (Courtesy photo)

It is not news that energy is a hot topic. Chase Pennoyer, VP of Operations states, "With energy costs on the rise, the demand for energy-efficient buildings has only increased." Pennoyer continues, "We pride ourselves on protecting our customers from volatile energy markets." Rising energy costs coupled with increasing environmental awareness have only increased the need for RBG's services.

For the second year in a row, *Business NH Magazine* featured RBG in the "Top Companies to Watch" list in 2022. Clean Energy New Hampshire has also awarded RBG with the "Clean Tech Business of the Year" award in 2020. RBG has also been involved in community partnerships, supporting affordable housing, and contributing to nonprofit organizations that reflect these values. RBG is known for its commitment to sustainability and energy efficiency, and its reputation is a significant part of their marketing strategy.

After ten years, RBG's continued commitment to its mission has enabled it to create sustainable and future-proof structures that benefit both the environment and the building occupants. RBG remains dedicated to its vision of creating resilient and energy efficient buildings that positively impact the community and promote sustainable living. ♻

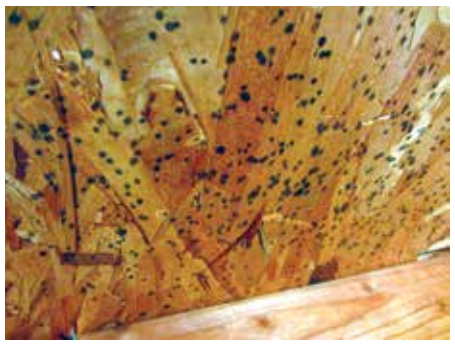
A Bunch of B.S.* (*Building Science, of course!)

Building Air Leakage: Quantity Versus Quality

Nate Gusakov

In the building science world, much has been made recently about the importance of understanding and reducing air leakage, both in new construction and renovation projects. 'build tight, ventilate right' is a well-known mantra throughout the trades, and in Vermont the energy building code (Residential Building Energy Standard, or RBES) has required all new houses to be built to an airtightness level of 3 ACH50 or less for years; as of 2024 that requirement will further drop down to 2 ACH50. In general, this is all good – air leakage into and out of buildings (infiltration and exfiltration, if you will) is a huge driver of heat loss and can also be one of the primary factors contributing to building assembly condensation problems. Of course, we want to reduce air leakage, right? Yes, but as we make buildings increasingly tighter we are potentially creating another issue for ourselves, and it's one that is full of nuance, hard to diagnose, and hard to predict.

The issue lies in the distinction between quantitative and qualitative analysis of air leakage. The quantitative part is pretty straightforward – measure the amount of leakage with a blower door setup and relate it to house volume or surface area. The common measure is air changes per hour at 50 pascals (Pa) pressure differential between the house and outside (ACH50). The code used to require 3.0 ACH50, and soon it will be 2.0. A certified Passive House needs to achieve 0.6 ACH50 or better. It is not too hard to quantify leakage, and so far, all of our verifications and certifications involving air leakage are simply quantitative in nature. If I go to certify that a house complies with code and I measure 1.5 ACH50, I say 'Great, that's a tight house, congratulations on your high-performance building.' If all of that air leakage is evenly diffused and distributed around low-risk parts of the building assembly, then indeed such an airtight house should perform well and remain efficient and durable for the long term. If, however, say half of the total air leakage is occurring through one or two large holes up near the roof that allow a focused flow of inside air right up to the cold parts of the roof assembly, then there is a very real risk of those places condensing regularly and beginning to form mold and rot the building. Because most of the building is good and airtight, the risks at the weak points are exacerbated.



Mold in the attic provides a qualitative analysis of air leakage. (stackexchange.com)

The solution to this concern is, of course, careful qualitative analysis of the existing leakage. It is all well and good to know how much air is leaking, but more and more we also must really understand where it is leaking, what is the nature of the holes and leakage (i.e., diffuse and 'systemic' through an assembly versus acute and concentrated at weak points in the assembly), and whether the leaking air will have access to vulnerable cold condensing surfaces. Do not settle for just a number when you perform an airtightness test on a building – get as much qualitative information about the leakage as possible, and keep an eye out for small concentrated leaks that lead to vulnerable assemblies!

Nate Gusakov is owner and founder of Green Mountain Enclosure Consulting, LLC. ♻

Coastal Children's Museum

Planning a capital campaign to build a new museum that is "green" and resilient to expected coastal flooding due to warming oceans

Jessie Haas

Coastal Children's Museum, in Rockland, Maine, (where the motto is, "We play to learn") is a small museum focused on the environment of the mid-coast of Maine, which comprises the counties of Knox, Lincoln, and Waldo. The mission of the museum is "to provide children and families the opportunity to explore, discover and learn about the natural world, the arts and sciences, and the diversity of Maine's mid-coast, through play." Board president Gayle Bedigian believes it is the only children's museum in the country with the unique stress on climate and the marine environment. A member of the Association of Children's Museums, Coastal has been in the same location for fourteen years and has struggled through and survived the recent onslaught of Covid, Monkey Pox, and RSV virus epidemics.

The hands-on touch tank at the Coastal Children's Museum is a popular exhibit.

This has not been without impact, however. Due to a small bank account and abbreviated schedule, the museum has had to cut staff. The Educational Curator, currently the only staff member, keeps the doors open two days a week, Fridays and Saturdays.

One day when the curator couldn't make it in, Bedigian ran the museum for the day. She said, "I was running here and there trying to check people in and lecture about our touch tank when a young man with two beautiful daughters came in and witnessed me running like a crazy person. He kindly asked what he could do to help me, and I asked him to answer the door, which he did. Then he asked what else he could do, and I asked him to start a computer. After many tries, he wasn't able to do that. On his way out he said, 'I am going to help you,' and I thanked him kindly. I thought no more about it until two or three weeks later when I got a call. 'Hi Gayle, I know how I can help you. I am going to give you some money.' I thought, 'How wonderful!' I had no expectations. I was gob smacked when a week or so later we received a check for $50,000. All he said was, 'Just please keep this museum open.' I just cried and cried."

Students go plankton fishing on the pier in front of the Coastal Children's Museum. (Courtesy photos)

The museum is very hands-on and interactive, with popular exhibits including a full-sized OPTI sailboat, an Under the Sea room with tropical fish and seahorses, a wind tunnel, a bear cave with a tunnel and tubes game, arts and crafts space, a wood workshop, a puppet stage, and the popular touch tank— yes, you can touch some of the sea creatures in the tank, which include sea stars, hermit crabs, sponges, and tube worms. There is a special exhibit which teaches children about Maine islands, and the museum offers the Learn About Maine Islands Learning Kit, which includes developed lessons, about two weeks' worth for K-3 students, with materials based on Kelly Briggs's book, Island Alphabet.

The museum is cramped for space at its current location, and the board is planning a capital campaign to build a new museum that is "green" and resilient to expected coastal flooding. To that end, they have engaged Weston Wright Architects, a firm which specializes in building for global warming and sea level rise and has also designed and remodeled other children's museums and schools. Wright is the author of a 2022 book, *More Water, Less Land, New Architecture,* which discusses resiliency from the Neolithic to the present, and proposes a next generation of coastal architecture. Of the Old Colony School, a Montessori school in Hingham, Massachusetts, Wright said in a 1995 *Boston Globe* article, "The school should boastfully acknowledge that children are here. It should be screaming about life, learning, fun, creativity." Along with that joyful shout, Bedigian intends a new building to be an exhibit to inspire creative future construction for coastal communities confronting climate change. Philanthropists who love children and nature will be welcomed with open arms.

Jessie Haas lives in an off-grid cabin in southern Vermont with husband Michael J. Daley. She's the author of 41 books for children and adults, including Revolutionary Westminster. ♻

Renewable Energy Program at Vermont State University

Students Contribute Energy Solutions for Vermont Municipalities

John Kidder and Allan Baer

The Renewable Energy bachelor's degree program at Vermont Technical College was founded almost 10 years ago to prepare students for rewarding professional careers in the renewable energy sector as managers, designers, and engineers. This program has a strong foundation of courses in engineering, science, and technology blended with business and management.

Vermont Tech students with Nate Brigham and Allan Baer on the second site visit at the Village of Johnson Water and Light Garage. Shown is Colby Surprenant, Nicholas Holbrook, Nate Brigham, Ryan Fish, Henry Pentland, Liam Henchey, and Allan Baer.

Some exciting developments are happening this summer. In July 2023 Vermont Technical College joins the other state colleges to become Vermont State University (VTSU!), expanding the opportunities for the program. Also, this summer the Renewable Energy program will be reviewed for external accreditation under ABET, which accredits most engineering programs at universities in the U.S. Starting in the 1960's, all the 2-year and 4-year engineering technology degrees offered at Vermont Tech have been accredited by ABET. Once the accreditation for the Renewable Energy BS degree is completed, VTSU will be one of only a few institutions in the U.S. offering an ABET accredited engineering program that focuses specifically on renewables.

Each year graduating seniors in the Renewable Energy program complete a "capstone" project that engages them to apply the cumulative knowledge, experience, and skills gained through their university studies to address real-world problems with the design and engineering of energy efficiency and renewable energy systems. A key goal of the Renewable Energy program capstone project is to support and engage with Vermont communities by soliciting projects from town energy committees, municipalities, and other community stakeholders that are looking for technical solutions to local energy challenges.

For the spring 2023 semester the capstone project focused on Vermont Act 172 and the Vermont Municipal Energy Resilience Program (MERP), which provides support and funding to Vermont municipalities to increase energy resilience, reduce energy use and operating costs, and curb greenhouse gas emissions. Vermont Tech is partnering on the project *Cont'd on p.33*

Renewable Energy at VSU

Cont'd from p. 32

with Allan Baer of the Renewable Nations Institute (RNI) with the goal of extending the work from the spring 2023 capstone course as a template for how students can contribute to efficiency and renewable energy workforce needs to support state and federal funding opportunities.

The MERP is administered by the Department of Buildings and General Services (BGS) and the Regional Planning Commissions (RPCs), who will assist municipalities to apply and complete energy audits and other steps to receive MERP funding. The application process will start in spring 2023 with the audits and project work occurring into 2024. Given this timing the capstone project was geared to provide preliminary energy needs assessment as well as work in design, engineering, performance modeling, life-cycle costing, implementation planning that could be of value to a small rural municipality to help inform them of what options they have for reducing carbon emissions and energy costs with a project that qualifies for state and federal funding.

The project began in January with a team of six Vermont Tech students - Thomas Ferguson, Ryan Fish, Liam Henchey, Nicholas Holbrook, Henry Pentland, Colby Surprenant – working with VTC professor John Kidder and Allan Baer from RNI. The team began the process by reaching out to various stakeholders, such as regional planning commissions and municipalities, to collect information, understand the key elements of the MERP, and explore potential projects.

After several meetings and considering different projects, the students chose to work with the Village and Town of Johnson Vermont and the Lamoille

Vermont Tech Renewable Energy student Liam Henchey with Tori Hellwig from the Lamoille County Planning Commission and Nate Brigham from the Village of Johnson collecting nameplate and other information about the buildings' systems during a site visit in March 2023. (Courtesy images)

County Planning Commission. The project involves the Water and Light Garage for the Village Garage is the municipal maintenance facility of the Johnson Water & Light Department of the Village and Town of Johnson. The Vermont Tech team is working with Erik Bailey, Brian Story, and Nate Brigham from the Village of Johnson as well as Tori Hellwig and Rob Moore (VTC '14) from the Lamoille County Regional Planning Commission, all of whom have been supportive with their time and guidance on the project. The student team completed the first site visit in mid-February and are actively working on the assessment, design, and engineering work.

The project provided capstone students with complex, real-world project experience that demonstrates their ability to apply specific engineering skills acquired and developed over the four-year Renewable Energy degree program. For the Village and Town of Johnson it provided technical assistance and decision support services (at minimum an ASHRAE Level 1 Energy Audit) pursuant to the submittal of an application for EERE project funding under the provisions of Vermont Act 172. An important goal of the project was to demonstrate the capacity of a student workforce to deliver vital community services under a variety of experiential learning pedagogies --- Work-Study, Service-Learning, and Work-Learning-Service --- to meet the objectives of the 2022 Vermont Comprehensive Energy Plan.

On April 26, the students presented the project results at a session on the Randolph campus with keynote remarks from Lt. Governor David Zuckerman and Secretary of State Sarah Copeland Hanzas. Following the session there was a panel discussion of how the work-learning-service model could be expanded at VTSU to support university students while they apply their education and skills towards helping the state meet energy transformation and climate goals.

John Kidder is the Professor of Engineering Technology, Vermont Technical College. Learn more at www.vtc.edu.

Allan Baer is the President of Renewable Nations Institute. Learn more at www.renewablenations.online . ♻

VTC student Colby Surprenant collecting data on the environmental conditions with Tori Hellwig from the Lamoille County Planning Commission and Nate Brigham from the Village of Johnson.

Regenerative Agriculture

Suzannah and Bob Ciernia

When the topic of climate change comes up, most people associate it with rising CO2 levels created by industrial emissions, the transportation sector, and the burning of fossil fuels to heat our buildings, warm our water, and cook our food.

But a significant contributor to CO2 in the atmosphere is agriculture and the methods used to produce crops and meat. From seed to table, conventional agriculture depends on a massive consumption of fossil fuel for fertilizers, pesticides, farm machinery, and transport. The result? Monocrops like corn and soy for livestock deplete the soil and require heavy applications of petroleum-based fertilizers and herbicides to be productive. After harvesting, the bare, dry fields are vulnerable to run-off and erosion of topsoil.

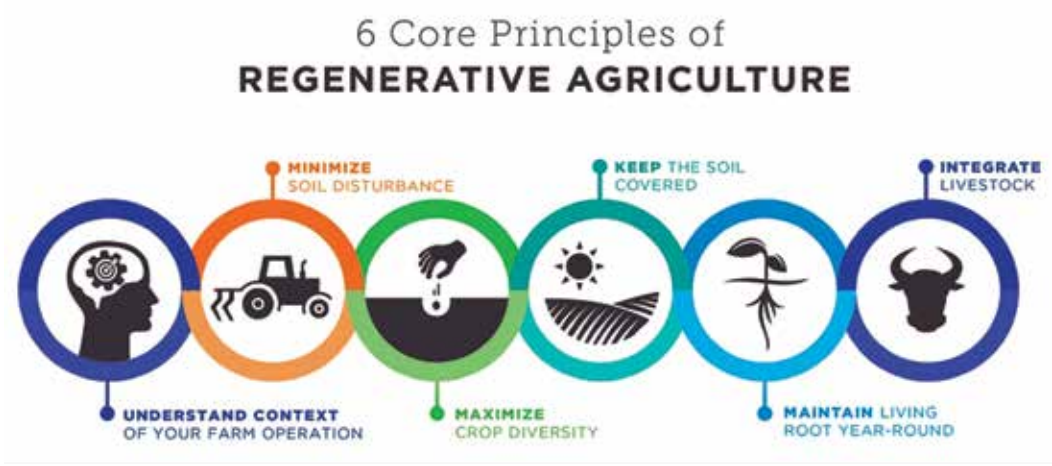
Ironically, in addition to raising CO2 levels through a heavy use of fossil fuels in its supply chain, agriculture itself suffers considerably from the climatic effects of its unsustainable practices: flooding, fire, drought, severe storms bringing hail, hurricanes, or tornadoes. These ongoing weather-related phenomena in turn threaten the ability of farmers to maintain our food supply.

Many farmers, ranchers, and leaders in the agriculture industry have come to realize that their problems will only get worse unless they begin to change to a better model. And it turns out there is a solution that improves productivity, stops erosion, restores soil health, increases pest resistance, and reduces fertilizer and herbicide costs. Two huge bonuses: this method helps drop the CO2 emissions from farming and ranching and is also remarkably effective at removing carbon from the atmosphere and sequestering it in the soil.

Regenerative Agriculture

Regenerative agriculture is a farming approach that restores degraded soils using methods based on ecological principles: adaptive grazing, cover crops, no-till planting, no (or limited) use of pesticides and synthetic fertilizer, etc.

Healthy soil is the key to a vast network of benefits that include better health, cleaner air and water, drought resistance, better rain absorption resulting in less run-off, more nutrient rich crops, and increased bushels per acre and profitability for farmers. And that added bonus for addressing climate change? For every 1% increase in soil organic matter, over five tons of carbon are sequestered per acre.[1]



What makes a healthy soil? A diverse abundance of bacteria, fungi, algae, and microscopic organisms that form a symbiotic network and function as an ecosystem that sustains all living things. Such an ecosystem cannot thrive if farmers are saturating the soil with herbicides and chemical supplements.

Changing to a better model and increasing their customers' bottom line (and their own) is causing corporate giants like Cargill to promote regenerative agriculture because it's in their own interest to do so. As a major corporate partner to large scale conventional agriculture, Cargill understands that profitability and risk are important factors farmers must consider before changing methods, which is why they funded a study by the Soil Health Institute on the economics of soil health systems on Midwest corn and soy. They wanted to know, do soil health practices increase or reduce profitability?

After selecting 100 farms in the nine U.S. states where 71% of our corn and 67% of soybeans are grown, the study found the following:

- 97% reported increased crop resilience to extreme weather,
- 88% of farmers growing soybean reported an increase in net income,
- 85% of farmers growing corn reported an increase in net income,
- 67% reported a higher yield than their conventional system,
- Net farm income increased by an average of $52/acre for corn and $45/acre for soybean.

But the benefits for farmers doesn't stop there. Helping the spread of regenerative agriculture is the new concept of 'farming carbon': the creation of a market that pays to have carbon sequestered. An example of this model is the Ecosystems Services Market Consortium, funded by an assortment of foundations and government departments, including USDA, Nature Conservancy, Walton Family Foundation, General Mills, McKnight Foundation, and others.

From their website: "ESMC's Eco-Harvest is an outcomes-based program. Producers are paid based on their outcomes, so the more they do, the more they are paid. Our program measures outcomes – these are based on system changes that result in the desired outcomes (e.g., increased soil carbon, reduced greenhouse gases, improved water quality or water use, enhanced habitat and/or biodiversity)."

Regenerative agriculture holds great promise for both farmers and the planet but, because of the many changes it requires of conventional agriculture, widespread adoption will need incentives and guarantees – and that's where government can help minimize the risk.

The Farm Bill is an omnibus, multiyear law that governs an array of agricultural and food programs and is up for reauthorization this year. It provides an opportunity for policymakers to comprehensively and periodically address agricultural and food issues and has a projected 10-year budget of close to $1.5 trillion. This is a perfect time to reach out to our members of Congress (https://www.usa.gov/elected-officials) and urge them to include provisions that will encourage and assist farmers who want to shift to regenerative agriculture, increasing their profits and repairing and restoring their soil (and the climate) at the same time.

Source: [1]"Regenerative agriculture is getting more mainstream. But how scaleable is it?," AgFunderNews https://beefupsustainability.com/purpose-and-strategy/feed-production/

Suzannah and Bob Ciernia are co-leaders of the Vermont Citizens' Climate Lobby Chapter. ♻

Elmore Roots' Permaculture Know-How

All Life is Cooperative

David Fried

I asked my friend and mentor Bill Mackentley what he would tell his six-year-old grandson Leafland to give him something to hold onto as he goes through life.

"Look at all the wonders under your feet!" he said.

All of life is cooperative. The trees are feeding each other.

Be constantly aware of the magic that is in the natural world.

It is so beautiful how life works together with other life.

Painting by Joyce Dutka

This cooperation is working on the macro level, and also on the micro level. Lichens (one example are the blue-green swirls of flat frilly cells growing on apple tree branches) are a combination of fungi and algae working cooperatively to produce a unified whole.

The late great Alex Shigo described a tree as "living and dying cells all working together to form a cohesive whole." Bill says that if it is true for a tree, it is probably true for us, too.

There is a total oneness in the world. We have this singularity and it is called "life."

No other planet, at least in our solar system, has this.

Later I asked Bill what is going to help us make it in the world as a planet and as human beings.

"More and more recognition of the oneness of all nature," he said.

We have to learn how to cooperate with each other and not just the two-legged ones.

We have a chance. We must be nicer to each other. Love all beings more.

Keep this awareness that we are all connected.

Plants and soil need nutrients. It is there. You just have to supply the biology to make it available.

You can make good compost to make a liquid spray. You can put the weeds you pull back into the ground, chopped up if you can, but get them back to the earth and cover them with hay. Any way to get them back in. The plants will use their own nutrients and the nitrogen fixers will use the atmospheric nitrogen and feed those bacteria helping them. It is a cooperative system.

Mycorrizae can increase the water-gathering capacity by a hundred to a thousand times, and they also increase the nutrients moving back and forth. The availability of water and nutrients helps everything, including the bacteria living in the soils who need food, too.

This operates not only in plant systems but in every organ in our body. The same systems are being used to spread life across the planet.

Trees send nutrients to any allied tree that happens to be in the area, for the progeny to survive. They make a liquid carbon material, a liquid sugar made from photosynthesis.

In Vermont, we have an oasis of forests and fields and a lot of people who care about the earth. Let's set an example of how to care for our living, breathing land and for each other.

There is a whole universe beneath our feet. Our work is to cultivate an awareness of the preciousness of all life. All of nature is teaching us how to cooperate like it does. Will we be good students?

David Fried is a writer and grower of native plants and super hardy fruit trees at Elmore Roots Nursery in northern VT. ♻

The Amazing Power of Compost to Increase Carbon Sequestration

Kathy Voth

What if you knew that doubling your forage output and increasing long-term carbon sequestration was as simple as spreading a thin layer of compost on pastures?

Peggy Rathmann and John Wick at their ranch in Nicasio, California. (Courtesy photo)

In 2008, John Wick and Peggy Rathmann began a study to determine how much carbon is sequestered in soil as a result of managed, intensive grazing. Working with UC Berkeley's Whendee Silver and the Silver Lab, they started by gathering data on the state of soils in their area. They gathered soil samples from 35 sites on 22 ranches in Marin County, California to get a baseline look at the state of soil carbon sequestration in the area. They were particularly interested in the more stable fractions of soil carbon – the kind that remains in the soil for twenty, forty, and even hundreds and thousands of years.

They were surprised to find some soil samples had much more of this stable carbon than the rest of the samples. These high-carbon samples all came from dairy farm pastures where farmers spread dairy cow manure on their pastures. It seemed that the addition of these large quantities of manure was increasing carbon sequestration.

This discovery changed the course of their research. Initially, they planned to look at whether keyline plowing and managed, intensive grazing were helpful for increasing long-term soil carbon sequestration. But these dairy farm soil samples gave them another option. They added compost to their research protocol, an alternative similar to manure, but more stable and without the issue of methane off-gassing.

Spreading the natural fertilizer (cc-by-sa/2.0 - © Hywel Williams - geograph.org.uk/p/4871235)

With more than a decade of data, here's what they found.

The purpose of the project was to find practices that could successfully increase carbon sequestration on grazing lands. Researchers compared the results of keyline plowing, Adaptive Multi-Paddock (AMP) grazing, and applications of compost to see which was most beneficial to graziers, and which was best at pulling carbon dioxide (CO_2) from the atmosphere and sequestering it in a durable form in the soil. It began in 2008 and measurements have been taken every year since. You can read more about this project at https://bit.ly/onpasture-power-of-compost.

The results: compost won hands down

Though the grazing treatment showed improvements in organic matter, those pastures remain a carbon source all these years later. Likewise, the keyline plowed treatment did not show any improvements in long-term soil carbon increases. But compost showed improvements in all areas.

"When you add compost to soils, it increases plant growth, helps maintain water-holding capacity and nutrient supply, and reduces erosion," said Dr. Whendee Silver, lead researcher on the project. "You end up with more organically rich soil and more nutrients, so the plants grow better, and those plants are pulling carbon dioxide out of the atmosphere and helping to slow climate change."

With just one application of compost, researchers found that forage production increased by 50% in year one, and when they analyzed the soil, they found they had added a metric ton of durable carbon per hectare (2.47 acres) to the soil. ('Durable' means carbon that stays put for 30 to 100 years.) The next year — with no further treatment — the soil had captured another ton of carbon, the next year another ton, and so it has continued. In fact, fourteen years later, forage production continues to be better. In addition, the soil's water-holding capacity has increased, so even through the severe California drought, forage is greener and more productive.

If you're a grazier or a gardener, growing more forage and food are great reasons to spread compost, regardless of how you feel about climate change. But, if you'd like to do something about warming temperatures, extended droughts, and extreme, unpredictable weather events, spread compost. A quarter inch of compost will continue sequestering durable carbon for twenty years before you need to do another application. In fact, a 2013 study by Silver found that adding compost to just five percent of California's rangelands could sequester the equivalent of 28 million tons of carbon dioxide over a three-year period, offsetting nearly one year of emissions from the state's agriculture and forestry sectors. Scaled up, this practice could make a significant contribution to preventing further climate change while providing plenty of food, fuel, fiber and flora.

As John Wick is fond of saying, by "carbon farming" we are creating a system where we are producing food, fuel, and fiber, and the more we do and the more we buy the better the climate is. All good!

Kathy Voth, is the founder, editor and publisher of onpasture.com.♻

Tough Recyclables in VT

Cont'd from p. 17

Casella is now testing two electric refuse trucks in their fleet: a Mack LR Electric and a Battle LNT EV. Casella was able to take advantage of grant funding from Vermont's Volkswagen Mitigation Trust to help finance the truck acquisition and the charging infrastructure. In an interview with MSW Management, Chairman and CEO John W. Casella notes that the power source for the trucks is 100% carbon free Green Mountain Power, so expected greenhouse gas reduction will be over 78 tons annually.

Advanced Robotic Waste Sorters

Casella has installed optical robotic sorters at two facilities: three sorting lines at their Rutland, VT site and another line in Stanley, NY.

Landfill Gas to Energy

Landfills naturally generate gases, about 50% of which is methane (aka "swamp gas") that if untapped, rises to the surface and dissipates in the atmosphere. Methane is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere, so preventing its release is important, and being able to use it as renewable natural gas for fuel is an additional benefit. Casella currently owns or operates five sites with landfill gas-to-energy facilities – Southbridge, MA; Morrisonville, NY; Stanley, NY; Angelica, NY; and Coventry, VT. They are in the process of working with third parties to implement facilities at two other landfill locations – Old Town, ME and Bethlehem, New Hampshire.

After a career in data product management, Martin Wahl has worked in biofuels since 2006, currently with Lee Enterprises Consulting, a large bio-economy consulting group. Dividing his time between California and New Hampshire, he serves on Corte Madera, California's Climate Action Committee. ♻

Pellergy, LLC

Cont'd from p. 27

Why should people use an EEN member over someone else?

AB: EEN Membership indicates not only a level of professionalism and commitment from contractors, but also a dedication to quality and performance.

What are the best ways to finance projects (or what incentives are available) for residential or commercial projects?

AB: A vast majority of our projects utilize renewable energy loan products such as Efficiency Vermont's Home Energy Loan Program. These loans typically offer lower interest rates and have easy application and qualification procedures that are important to our customers.

What are some questions you recommend customers ask when selecting someone to do work to meet energy efficiency goals?

AB: How can you ensure the performance of the system meets my needs? There is so much that needs to be addressed in answering that one question from the current level of comfort the customer experiences to what their goals are for increased efficiency and renewability; the level of involvement and control they wish to have over the system. A detailed answer to that one question should leave the customer satisfied that they have had their voice heard and that the contractor has done their due diligence in designing the right system. ♻

Our Better Nature

Cont'd from p. 24

function, which we can do in our own back yards. By reducing our country's 40 million acres of lawn by half, and planting native keystone species on the other half, we could create what he calls Homegrown National Park Home, larger than all our current national parks combined. The right plants bring the right bugs, to feed the birds and restore the cycles of nutrients and beauty. Half-town, half state? The legislature has begun to take that step with H. 606, which establishes a state goal of conserve 30% of Vermont land by 2030, and 50% by 2050. (As of this writing we await Governor Scott's decision on the bill.) President Biden has similarly committed to conserve 30% of United State's land and oceans by 2030 America the Beautiful | U.S. Department of the Interior (doi.gov) , and a 30 by 30 framework was adopted globally at COP15, the international biodiversity conference in late 2022.

This is a big dream, but there's reason to think we can do it. Nature is astonishingly resilient. If we stop doing harm, life returns. If we start doing a few good things here and there, life rejoices.

Our Better Nature is available at bookstores and online, and is being given away to libraries and nonprofits. Some of the essays and many valuable links are available on the Alliance for Half-Vermont's website Strategies — Vermont Alliance for Half-Earth (www.vermontallianceforhalfearth.org). Especially important is the National Wildlife Federation's Garden for Wildlife database, which lists native plants in order by the number of insect species they support.

At a recent presentation I asked Curt Lindberg what was the one thing he wanted to be sure people took away from his talk and the book. He thought for a moment and then said, "Do something."

Jessie Haas lives in an off-grid cabin in southern Vermont with husband Michael J. Daley. She is the author of over 40 books, most recently The Hungry Place.

Source links available at the online posting of this article at www.greenenergytimes.org. ♻

RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions. **www.350vermont.org**

American Council for an Energy-Efficient Economy: aceee.org

American Solar Energy Society (ASES): www.ases.org

Backwoods Solar: Specialty: solar, off-grid - **www.backwoodssolar.com**

Carbon Tax: carbontax.org

Clean Energy NH: www.cleanenergynh.org/

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: Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency. **www.dsireusa.com**

Efficiency VT: A must-go-to site for immeasurable amounts of info. **www.efficiencyvermont.com**

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/about/federal_tax_credits.

Federal Energy Regulatory Commission (FERC): www.ferc.gov

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-**

Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - **hes.lbl.gov**

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

NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.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 Energy Divison: www.nh.gov/osi/energy/index.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 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 Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - **www.eere.energy.gov**

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.

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**

Vermont Passive House: www.vermontpassivehouse.org/Resources/

Weatherization, Energy Star & Refrigerator Guide: www.waptac.org

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BOOKS

WORDS OF LIFE FOR THE HEALTH OF SOUL AND BODY Based on an earlier publication: "Cause and Development of All Illness." What effect does our destructive behavior have on nature, on the animals, and not least, on our own health? www.gabriele-publishing-house.com (also on Amazon.com and Alibris!) Toll-Free 844-576-0937).

BOOKS: 'A ZERO WASTE LIFE'

A practical guide to improving your life and your impact on the world in just one month by radically reducing waste while improving lifestyle. Incorporating thirty simple rules one day at a time, this manageable guide helps you form a more conscientious, intentional life. Stop wasting and start living. (apollopublishers.com)

* *Please read* Zero Waste Life *book review on p. 20.**

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ADVERTISERS INDEX

Tick Defense 101

Cont'd from p.1

generally require 24 hours of feeding, this viral disease cannot be treated with antibiotics. Although it causes only a few deaths each year in New York State, 50% of people infected will develop serious, life-long illnesses as a result.[1], [2] Scientists are finding an ever-increasing list of disease-causing microbes transmitted by these ticks: Lyme disease bacteria, Babesia protozoa, Anaplasma, Ehrlichia, and other rickettsia, even encephalitis-causing viruses, and possibly Bartonella bacteria.[3]

Therefore, it is imperative to be defensive and cautious around ticks. The goal of this article is to describe a few ways to reduce the chance of getting infected.

The most obvious strategy is to treat all your outer clothing worn in tick territory with the insect repellent and tick killer Permethrin, and that includes even socks and shoes. By the way, Permethrin is toxic if inhaled or ingested and should not be applied to one's skin, although it is safe to touch once it has dried.

Here are some best practices for spraying your clothing with Permethrin:

- Spray outside, in a well-ventilated area. Determine the wind direction if the wind is blowing, and spray in that direction.
- Spray clothing and gear while you are not wearing it and let it dry completely before wearing.
- Repeat treatment, when necessary, after about six weeks or six washings. Although Permethrin does not easily get dissolved by sweat or water, it breaks down slowly by exposure to sunlight (UV) and oxygen; therefore, storing the clothes in black plastic bags will prolong the effectiveness of the application.

Cotton balls to be sprayed with Permethrin. Place the treated cotton balls in a cardboard tube and place around the perimeter of your yard. This effectively reduces the transmission of Lyme disease from rodents. (Courtesy photos)

- Only use Permethrin approved for clothing.
- Pair the clothing treatment with a topical repellent (Picaridin) on exposed skin for optimal protection.
- Permethrin is fine for dogs, but use with caution near cats as they have a unique and sensitive central nervous system. It is toxic to them when damp.

Incidentally, since ticks tend to crawl up, it is a smart precaution to pull the treated, long socks over the treated pants bottoms.

Ticks do not jump, fly, or drop from trees onto your head and back. If you find one attached there, it most likely latched onto your foot or leg and crawled up over your entire body. Ticks are "programmed" to try and attach around your head or ears. On their normal hosts, ticks also usually crawl up; they want to blood feed around the head, neck, and ears of their host, where the skin is thinner and hosts have more trouble grooming.[3]

In summary, if you do not have a set of treated tick clothes to protect yourself on your outings, please consider that option seriously.

As an additional tick barrier, you may consider Mainejane's Tacklers,[4] sticky tapes around one's ankles, to catch the ticks as they try to climb up. They are especially useful, when one is not wearing treated clothing.

Lastly, there is an easy and effective way to reduce ticks in our immediate environment: Distributing around the perimeter of the lawn cardboard tubes stuffed with cotton balls that have been treated with Permethrin. Mice collect the cotton balls and take them back to their nests. The Permethrin binds to oils on the rodents' fur, killing any ticks that try to attach to them, without harming the mice. Since mice play an important role in the transmission cycle of Lyme disease, this treatment has resulted in statistically meaningful drops in tick levels, especially after repeated, semi-annual applications.

To make the tick killer tubes is easy: Place a single layer of cotton balls or dryer lint into a shallow cardboard box. Outside and downwind, spray the fuzzy stuff heavily with Permethrin and let it dry for a couple of hours. Then insert the treated fuzz into toilet tissue cores or similar tubes and distribute the tubes around the lawn.

A suggested, informative book on the topic is *Conquering Lyme Disease* by Brian A. Fallon, MD and Jennifer Sotsky, MD, published by Columbia University Press.

It would be wonderful if this information saved at least one person from the debilitating consequences of the many tick-borne infections.

Source links: [1] Bob Beyfuss, "It's a good time to go looking for wildflowers Outdoors", The Kingston Daily Freeman, Jun 14, 2022, Sec. D: LIFE; [2] www.cdc.gov/powassan/index.html; [3] https://bit.ly/uri-edu-tick-knowhow; [4] www.mainejanestacklers.com

W. Carl Mayer, taught Physics and Physical Science at Rhinebeck Schools for 39 years before retiring in 2007. He and his wife Joan live by the Hudson in Saugerties, NY, caring for the environment, growing vegetables, native pollinator-attracting plants, feeding birds, and volunteering for the Hudson River Maritime Museum. ♻

Larry Plesent

Ingredient of the Month
BUG JUICE

Summer is here. From the hollows to the valleys, bug season is in full force. Awareness and concern about tick- and mosquito-carried diseases has never been higher. I will not belittle the concerns many of my neighbors share in this regard. We all know someone suffering from the often-bizarre symptoms of insect-borne diseases.

If you find yourself paralyzed with a fear of the outdoors, country life is probably not for you. A sanitized urban setting might put you into a more comfortable frame of mind. Bugs and their kin were here long before we came along. And they will likely be here long after we are gone.

Rather than regurgitating the same old tropes about how to protect yourself from bug bites or how to properly remove ticks with tweezers (hint: pull slowly straight out), I will instead attempt to lay some fresh info down for you. After all, that's why you read G.E.T., and we try not to disappoint.

Photo courtesy of California Department of Public Health

Insects perceive the world through a variety of senses. First, a mosquito detects the carbon dioxide (CO_2) exhaled by a mammal. Let's call this mammal "Betty." Betty walks into a field, takes a breath of fresh air and exhales it with a tension-releasing sigh. From up to thirty feet away, mosquitos detect the CO_2 plume and follow it towards the source. As the mosquitos approach Betty, they begin to smell the lactic acid secreted in her sweat. Lactic acid is a natural byproduct of cellular metabolism which makes it a reliable marker for homing in on the target. (Aside: Some ticks can also sense you coming by vibrations traveling from the ground up the stalk of grass they are crouching on.)

As it gets closer, the mosquito senses Betty's body heat. Think of it as a kind of thermal imaging detector. It follows the heat trail to the source, in this case Betty's exposed hand. As soon as the critter lands on her skin it begins to "taste it" using sensors located on its legs. When the blood sucker finds a spot that tastes just right, she draws blood from Betty, potentially exposing her to a variety of viruses and bacteria, some of which are harmful to humans. Ouch! What is poor Betty to do?

In the past ten years, researchers have discovered 138 (mostly odor) molecules that affect mosquito sensors. Some temporarily shut the sensors down or confuse the mosquito (tick etc.), and some are considered attractants. Minty and flowery smells for example are known to attract mosquitos. Small amounts of limonene (think citrus peels and piney smells) attract them too. Larger amounts of limonene repel them. Go figure. Using lemongrass soap in the morning may draw more mosquitos to your skin than using no soap at all. Spraying larger amounts of lemongrass oil around and on your clothes repels them instead.

Lemon eucalyptus oil is a safe and effective repellent for both ticks and mosquitos. It is completely natural. (devotionsbyjan.com)

Lemon eucalyptus oil has emerged as a safe and effective repellent for both ticks and mosquitos. It is completely natural.

In recent tests, lemon eucalyptus oil nearly matched DEET in short term effectiveness and exceeded it in long term (four hour) testing. Note that we are not talking about a blend of lemon and eucalyptus. This is a unique plant species.

Picaridin, DEET and lemon eucalyptus oil ALL appear to be the winners here. Look for products containing these ingredients.

Another approach is to wash your clothes with an essential oil-containing soap or detergent. Vermont Soap (for example) has a new Organic Laundry Soap that does not contain limonene or flowery scents. Initial testing has shown it to be helpful for keeping ticks at bay, especially when combined with other topical solutions.

When working or playing outside I always remove my clothes afterwards and take a hot shower. This seems to help wash ticks away and is a good way to find them before they latch on. So far, I have had no visible tick bites this year.

I suggest using this type of multi-level approach to layer your own tick defenses. Use a spray on your clothing, especially on your legs and feet to help avoid picking up ticks. I coat the outside of my hat (for flying pests) and my socks with a lemon eucalyptus oil spray, then a quick spray over everything in between. When you get home remove your clothes and scrub down with hot water.

One of the most effective tick-killing tools you have is a hot dryer. Use it in combination with a laundry product that does not smell like pine, flowers or mint and you have a winning combination.

And just in case, keep those flat-bottomed tweezers close by.

Larry Plesent is a writer and natural products formulator residing in the green hills of Vermont. Read more at www.reactivebody.org. ♻

Mowing Electric: Two Riding Mower Reviews

Mowing electric makes so much sense today for many reasons: no emissions, little to no maintenance because there are no belts and no use of fossil fuels, or fumes. There are many positive benefits of mowing electric. Here we offer two reviews of two different riding mower options available today.

GREENWORKS 42" CROSSOVER T RIDING MOWER

N.R. Mallery

In search of an affordable electric riding mower to handle two to three acres of bumpy terrain, I decided on the Greenworks 60V 42" Cordless Battery Crossover T riding lawn mower with six 8.0Ah lithium-ion batteries and three dual-port turbo chargers. The company offers a zero-turn mower at the same price, but I still decided to get the Crossover T model.

After much research, my decision came down to this company because of personal experience with other products made by Greenworks, cost, good reviews and their background.

As stated on their website, "We've never been gas – we've been battery-centric from the beginning, since 2002."

The mower runs for over two hours and recharges in under 90 minutes. The power is equivalent to that of a conventional 24 HP motor.

The mulching cleanly cuts tall grass with a maximum blade speed of 17k ft per minute and it easily handles hills up to 15º. The rear cargo bin holds up to 200 pounds, and it can tow a cart with no problem.

The mower has 80% fewer moving parts than a gas-powered one for zero service downtime or costly upkeep. It is also four times quieter than gas mowers (90db), so it does not add to the constant drone of a mower's running all summer long.

I only needed a residential battery-powered riding mower, but Greenworks Commercial boasts cutting-edge technology to produce cutting-edge, battery-powered consumer and commercials grade riding mowers. They recently opened a new manufacturing facility in Morristown, TN.

While I have only had the mower for a few weeks, I am very happy with its performance and quality, and love not using fossil fuels. And i also really like the well-built carrying bag included for getting the batteries to the high-speed dual chargers and back to the mower.

Notably, I am not the only one who decided on the Greenworks mower because when the trucking company delivered the mower, the driver commented that he delivers two of them every week, and that it was his most popular delivery item.

A Year with the EGO 52" Z6 ZERO-TURN RIDING MOWER

Mike Bailey

The Star of SolarFest is Powerful, Versatile, Comfortable, and Always Performing

Mike Bailey

It is like watching the story of Tom Sawyer and the fence-painting to see a group of people, women and men, young and old, clamoring to be able to cut the fields at the SolarFest farm in Brandon, VT. It has been that way for the past year, and everyone still wants to have their turn zipping around on the EGO 52 inch zero-turn riding mower, blazing paths through the festival grounds, picnic area, parking, camping and hiking trails.

Thanks to the generosity of Joanne and Paul Coons, SolarFest took delivery of this battery- powered beast in June 2022, and we faced a daunting task as the grounds of the farm had not been tended for more than a decade. It turns out that was not going to be a problem, even with very limited experience of the all-volunteer crew.

The SolarFest EGO 52- inch Zero-Turn riding mower is the absolute favorite of all the volunteers who maintain the varied terrain on the farm in Brandon, VT. (Mike Bailey)

The EGO mower made short work of the high grass, reeds, and burdock that grew unchecked across more than 12 acres of fields that are now actively landscaped for the enjoyment of the SolarFest audience. With power equivalent to a 22 HP engine, the Z6 has four cutting speeds, is quick and agile at up to 8 mph, and it charges the six batteries simultaneously and can fully recharge 60Ah worth of depleted batteries in just a few hours.

Powerful, beautiful, and always ready to go – just like SolarFest!

N.R. Mallery is the publisher of G.E.T.

Mike Bailey is a sustainable energy consultant and a trustee of SolarFest, Incorporated. ♻