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Happy Golden Anniversary Earth Day! .... pp. 20-21

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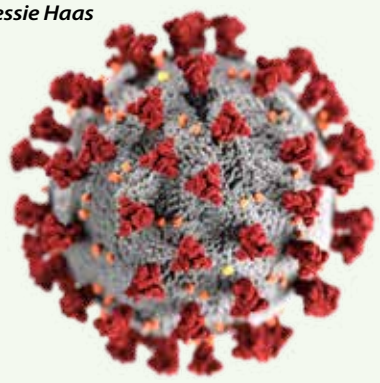
Is COVID-19 a Precursor to Climate Change?

Jessie Haas



The new coronavirus molecule. Image: Wikipedia

As Earth Day approaches it's clearer than ever: We're all in this together.

That's always been true on the only living planet we know for sure exists, but COVID-19 has taught us to see it and say it. Who is important now? Everyone, but the heroes are healthcare workers, grocery store clerks, delivery drivers, people who help us communicate while physically isolated from each other, the plants that pull-down CO2 and give out oxygen, and the rich, regenerative shield of biodiversity that has built health on earth forever.

As the economy slams on the brakes, many are pointing to benefits for our only planet. Emissions are down 25% in China. The canal water in Venice is clearer because of the decrease in boat activity. Fine particulates are down 40% in San Francisco under shelter-in-place, 28% in New York, 32% around Seattle. That's saving lives. Air pollution causes asthma and lung inflammation. Studies of SARS, closely related to COVID-19, show increased risk of infection and a doubling of death rate among those who breathed polluted air.

So, as life slows down and the skies clear, it's tempting to focus on silver linings. But Samantha Gross of the Brookings Institute says in Inside Climate News, "I actually worry about environmentalists getting too happy and worked up about the fact that emissions are going down." The effect is similar to losing weight when you're sick; usually there's a rebound, and you gain the weight back. That's not the same as signing up for Noom or Weight Watchers and really changing

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We Can Reach 'Drawdown' by Mid-2040s

A new report. The Drawdown Review provides the most in-depth assessment of climate solutions and their potential to reduce greenhouse gasses and build a climate-safe future.

All images: Project Drawdown

San Francisco (March 3, 2020) – A new report from the world's leading resource on climate solutions demonstrates that 'Drawdown' – the point at which greenhouse gas levels in the atmosphere peak and begin declining, stopping climate change – is feasible with existing, established technologies and practices.

Project Drawdown's new publication, The Drawdown Review, builds on the organization's inaugural analysis, published in the 2017 New York Times Best-Seller Drawdown, and takes into account the rapidly evolving landscape of climate solutions available today.

In order to reach Drawdown, the new analysis finds that we must not only quickly reduce emissions toward zero, but also support nature's carbon sinks to help sequester greenhouse gases that have already been emitted. This means climate solutions fall under the broad categories of: emissions sources that must be reduced; natural and engineered carbon sinks that can be expanded; and more fundamental societal solutions – especially improving access to education and health care for all – that accelerate the path to a climate-safe future.

Project Drawdown's findings show that we could cease global warming by the mid-2040s to the mid-2060s, thereby meeting the goals of keeping the world below 1.5 or 2˚C warming – important climate benchmarks set forward by the Paris Agreement on climate change. The Drawdown Review shows that meeting these goals is physically and economically feasible but will require much more aggressive and immediate action worldwide.

To reach Drawdown, and thereby bring us to a climate-safe world, the research

Cont'd on p.32

Time to Go Fishin'

George Harvey

We have over ninety species of fish in the Northeast, and many of them are abundant, fun to catch, and tasty. With climate change and pollution, we have some cautionary notes, but the opportunities abound for sport fishing all through the year. In fact, fresh water fishing may be one of the outdoor activities that has been so far least changed by warming weather.

True, the ice fishing season may suffer with warmer winters. But the biggest threats to fish species are still in the future, rather than the present. Invasive species that threaten aquatic environments exist, but their impacts are not as difficult as those felt by moose, for example, which are suffering declining populations due to invasive ticks.

Fishing in a stream in Vermont. Tim McCabe, USDA Natural Resources Conservation Service.

It is true that fishing is under pressures that all anglers should be aware of. While climate change has not yet altered fresh water fishing terribly,

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IN THIS ISSUE:

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GREEN ENERGY TIMES (G.E.T.)

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Hopefully we have not forgotten to mention anyone. It is your help that paves the way to a sustainable future.

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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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Tips to Reduce Your Carbon Footprint Every Day

G.E.T. *Staff*

Image: electricsaver1200.com

The *Green Energy Times* team wants to share some ideas with you on what you can do now to help the planet and reduce your carbon footprint. We hope you learn some new ideas that you can adapt to your everyday lives. Look for more ideas in the next issue.

1. If you drink coffee or tea every day at work, consider bringing in a ceramic mug from home rather than relying on disposable paper cups and plastic lids. They may not seem like much, but those paper cups and plastic lids add up month after month. Besides, everything tastes better in a mug.

2. Avoid eating meat one day a week (Meatless Mondays or whenever works for you!)

3. Purchase second hand when possible. For example, buy used books or use the library when possible.

4. Grow food on the nearest patch of land you have access to. You need sun and a way to water plants. Good soil can be built from the ground up. Use low-till or no-till organic methods. Growing your own food can reduce the carbon impact of dinner by 68% (cabaus.org/gardening-carbon-footprint).

5. Change over incandescent lightbulbs to LEDs. They use 90% less energy, while producing much less heat in your house (important in the summer). Since they also last much longer, there can be a good return on investment (www.tcpi.com/lighting-calculator).

6. Get involved. Help plant trees or milkweed, pick up plastic trash, carpool to a protest or a meeting, or start a hyper-local environmental group, to learn, take strength and comfort from the company of others and take action.

7. Drive smart. Slow down; go the speed limit or less. Brake and accelerate gently. Good driving can make a 33% difference in efficiency. DON'T IDLE. Your car gets zero mpg while idling (https://www.fueleconomy.gov/feg/driveHabits.jsp).

8. Schedule a weekly sabbath for your car. Let it rest and recover, while you do the same. On that one day, make it a rule to travel only if you can carpool or take public transportation.

9. Reduce the size of your lawn by planting a deep border of native plants to feed and shelter bugs and birds. Biodiversity isn't just a pretty frill, it's the main event here on Earth. Mow what's left of your lawn less frequently, and let the clippings remain as mulch, to help improve soil health and carbon sequestration. If you stopped using a power mower altogether, you could cut carbon emissions by 80 pounds per year (www.audubon.org/climate-makeover).Subscribe to Green America greenamerica.org for more ideas including their National Green Pages that lists sustainable businesses around the country.

Stop thinking that what you do about the climate crisis is less important than any other person, group, company, political party, or country. Change at any level is always dependent upon an individual. Be one of them. Do what you can, as soon as you can. ♻

LETTER TO THE EDITOR

Comment on "Tips to Reduce Your Carbon Footprint Every Day" in the January 2020 issue of *G.E.T.*

Having helped operate a "foam" cup industrial process back in the 70's and using true Styrofoam as a building product in the 80's, I learned the difference between the two.

The following is from Wikipedia:

"Styrofoam is a trademarked brand of closed-cell extruded polystyrene foam (XPS), commonly called "Blue Board," manufactured as foam continuous building insulation board used in walls, roofs, and foundations as thermal insulation and water barrier. This material is light blue in color and is owned and manufactured by The Dow Chemical Company.

In the United States and Canada, the colloquial use of the word styrofoam refers to another material that is usually white in color and made of expanded (not extruded) polystyrene foam (EPS). It is often used in food containers, coffee cups, and as cushioning material in packaging. The trademarked term is used generically although it is a different material from the extruded polystyrene used for Styrofoam insulation."

Styrofoam is a very helpful building product while expanded foam materials such as that used for cup, packaging, and the like are anything but helpful.

Sent in from Russ Lanoie, Conway, NH.
Contact: russlanoie@gmail.com.
Website: www.RuralHomeTech.com. ♻

Concentration of CO2 in the Atmosphere

411.11
parts per million (ppm)
March 28, 2020

Learn more at www.co2.earth.

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Vermont Committed to Acting on Climate Change Long Ago – in Words at Least

Johanna Miller

In 2006, the State of Vermont enshrined strong carbon pollution reduction goals in statute. Unfortunately, despite that commitment, Vermont's greenhouse gas emissions are 13% above 1990 levels, when they are supposed to have been cut significantly below that by now.

You need only look to city halls, town greens and to increasingly crowded committee rooms in the State House to see that people's patience is running out, as is the time to do something about this pressing problem. The world's leading climate scientists now say we have until 2030 – 10 years – to reduce our collective consumption of fossil fuels by half or risk increasingly catastrophic consequences.

Thankfully, there is a legislative effort to move beyond rhetoric to concrete steps and strategies that will ensure we are doing our part to tackle the climate crisis. In late February, the Vermont House of Representatives voted 105 to 37 to support H.688, also known as the Vermont Global Warming Solutions Act. Winning the support of Democrats, Republicans, independents and progressives, this bill turns our long-held climate pollution reduction goals into requirements.

BUSINESS AS USUAL WILL NOT GET US TO 90% BY 2050

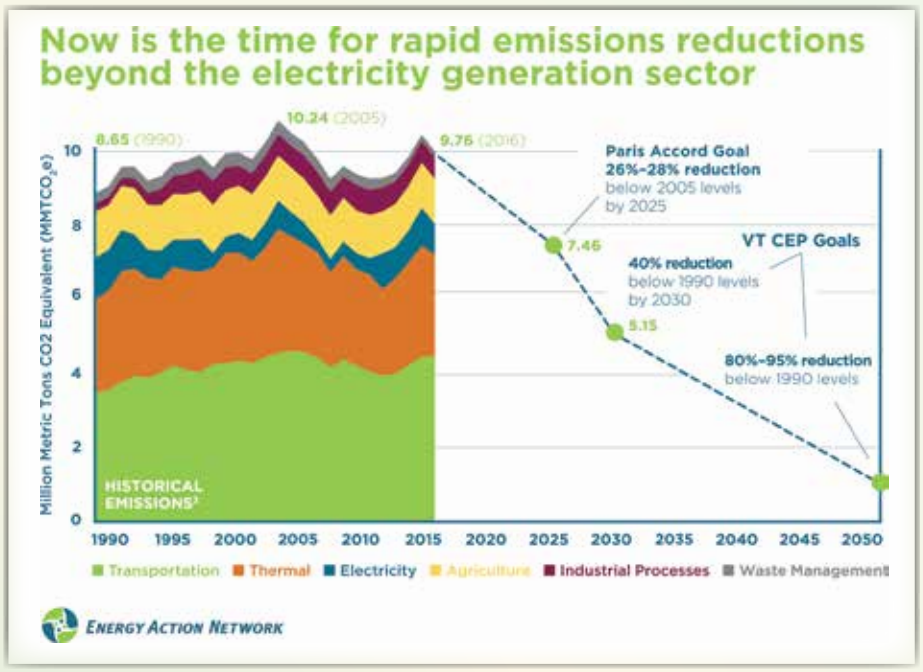
Modeled after similar efforts in Massachusetts, Maine and New York, H.688 sets the stage for a strategic process and approach designed to serve Vermont's unique needs and all Vermonters well.

H.688 establishes a Climate Council consisting of secretaries and commissioners of key state agencies, as well as outside stakeholders with essential expertise, to come up with a strategic plan for climate action. The charge of the Climate Council is to recommend strategies and solutions to:

- reduce emissions,
- ensure a just transition, protecting low income and vulnerable Vermonters,
- help communities adapt in a warming world, and
- harness the strengths of our natural resource assets – our farmlands, forests and soils – for their many carbon-shaving, resilience-creating benefits.

H.688 provides a missing framework to ensure long overdue, swift progress. It also provides accountability, which has been missing for far too long. That accountability comes in the form of enabling citizens to bring suit against the state if they fail to meet certain milestones with a narrow remedy of required action.

It's an essential foundation of strategic planning and accountability Vermont has long lacked. Thankfully, there are almost two decades worth of good work in this arena to set the state up for action – and success – to do this work well, including over a dozen plans, analyses, research and reports such as a comprehensive 2007 plan from Governor Jim Douglas' Climate Action Commission1, the stakeholder-shaped Vermont Comprehensive Energy Plan2 and, more recently, Governor Phil Scott's own Climate Action Commission's report3 which outlined over 50 strategies designed to put people to work and protect vulnerable Vermonters all while doing our part on climate change.



The reality is there is no more time to kick the can down the road. H.688 is a fundamental, essential bill that, strengthened by a strong House, the Senate should move swiftly to pass and Governor Scott should not hesitate to sign.

As Vermont Treasurer Beth Pearce made very clear in recent testimony supporting the bill, "Climate change is a threat to our way of life… and bottom line. Each year we delay, we have more risks and more costs."

Indeed.

Delayed, insufficient action is already taking a real toll on Vermonters lives and pocketbooks. Whether that comes in the form of increased public health costs and complications from potentially debilitating tick-borne Lyme disease. Whether that comes from paying for growing numbers of storm-ravaged roads, bridges, grid infrastructure and more. (Last year's intense Halloween rain storm, for example, racked up over a $6 million price tag for Vermonters to pay.) Or whether it comes in the form of diminished quality of life,such as, for me, losing community gems like the Morse Farm Ski Touring Center, which shuttered its ski operations in 2018 noting, "Climate change has not been our friend."

The reality is we have no more time to waste, and so many good reasons to act, including the tremendous job-creating, economic benefits of unshackling ourselves from fossil fuels.

Vermont must finally do our part to help combat the intensifying climate crisis by holding ourselves accountable to pollution-reduction progress. H.688 sets the strategic course to do this essential work well.

Sources available on GET's *website.*

Johanna Miller is the Energy & Climate Program Director at the Vermont Natural Resources Council and served on Governor Scott's Climate Action Commission. Reach her at jmiller@vnrc.org. ♻

A Resolution to Take Action on Climate Pollution

John Gage

This spring, voters in forty New Hampshire town meetings and local elections have a chance to ask their state and federal representatives to enact cash-back carbon pricing legislation. This policy is an efficient, fair, and beneficial way to incentivize producers and consumers to favor the energy efficiency and clean energy solutions needed for a secure climate future. A vote in favor does not cost a municipality anything but will help state lawmakers and Congress take action with a policy that economists say will rapidly accelerate the transition to clean energy around the world and put extra cash in most Americans' wallets.

John Gage at the Carbon Cash-Back Coalition table outside the polls at Windham High School on town election day, March 10, 2020. Windham, NH passed the resolution. Courtesy photo.

Of the twenty-seven towns that have voted so far, twenty-one have passed the New Hampshire Resolution to Take Action on Climate Pollution warrant article. Why do voters in "tax-free" New Hampshire like this? Because, as economist George Shultz says, "It's not a tax if the government doesn't keep the money." It seems voters do want a price on carbon if it's done in a way that protects their purchasing power.

Who is behind this? Residents in each town learned about the science, economics, and policy at carboncashback.org, then collected signatures to put the article on their town's warrant. The goal is to drive public discussions about cash-back carbon

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NH Solar Rebate Update

The PUC has announced the re-opening of the C&I Solar Rebate Program. The program will re-open on Monday, March 16, 2020. The PUC will conduct a public lottery to determine queue positions for applications. The deadline to submit applications for the public lottery is 4:30pm on April 17, 2020. The PUC will hold the lottery on April 21, 2020 at 1:00pm at the Commission's office, 21 South Fruit Street in Concord, NH. If the number of applications received does not appear to exhaust available funding, then the lottery will be cancelled.

For official information, visit PUC website at bit.ly/NHPUC-CandI_Solar_Incentives. ♻

Progress in Electric Transit

Drive Electric Vermont

David Roberts

There are clear environmental and economic benefits to switching over to electric vehicles for household travel, but the greatest savings and greenhouse gas reductions occur when we reduce the amount of driving we do. For individuals, that may include swapping out a car trip with walking, bicycling or working from home. Public transportation by bus and rail can also reduce vehicle travel for those living in areas served by these options.

Most transit and school buses on the road today are powered by diesel fuel, creating tailpipe emissions that add to pollution. This is particularly a problem in urban communities where higher concentrations of pollution can be more detrimental to human health. Noise pollution associated with diesel buses can also have impacts on neighbors along bus routes. Fortunately, advancements supporting electrification of personal vehicles, like decreasing battery energy storage prices, are also benefiting larger buses and trucks. Many bus manufacturers already offer electric options, with some focused exclusively on this market segment. Purchase prices of electric transit and school buses have decreased in the past few years, but they remain 25-40% more expensive than fossil-fueled vehicles to acquire. However, operating cost savings due to reduced fuel purchases and maintenance needs may cover the higher purchase cost over the life of the equipment, especially for high-use transit buses. Many transit operators have also used grant funding to cover the incremental cost, either through federal grants, state funds stemming from the Volkswagen diesel cheating settlement, or from other sources.

Green Mountain Transit (GMT) riders try the Proterra electric bus at the ribbon-cutting event on January 28, 2020. Image: David Roberts.

California is a national leader supporting the transition to zero emission buses. The State has developed regulations requiring all bus purchases after 2029 to be electric or hydrogen fuel cell. Bus operators in many northeastern communities have also started to embrace electrification. Colder winter temperatures have led most of these pioneers to start testing the waters with a small number of electric buses to ensure the technology and vehicles selected will meet their requirements in all weather conditions. Green Mountain Transit (GMT), based in Burlington, Vermont, is among the latest to initiate a pilot of two full-sized Proterra electric buses. These GMT buses were funded by a combination of sources, including a Federal Transit Administration (FTA) low or no-emission grant and funding provided by Burlington Electric Department (BED) to help them meet their state renewable energy standard obligations to reduce fossil fuel use. BED has already sourced 100% of their power from renewable sources, amplifying the emission reductions associated with the switch to electric buses. Recent analysis suggests the new buses will each result in 78 tons of CO_2 emission reductions annually.

GMT, FTA, BED and other project partners recently celebrated the delivery of the electric buses with a ribbon cutting event announcing the buses entry into regular operations following driver training programs. GMT also received FTA funding for two smaller buses that are currently in the procurement process.

The State of Vermont also recently announced Volkswagen environmental mitigation funding awards for their $2 million electric bus pilot program. Marble Valley Transit in Rutland was awarded funding for two transit buses. Barre Unified Union School District, Champlain Valley School District, and Franklin West Supervisory Union also received funding for two electric school buses each. This Vermont pilot includes technical assistance and monitoring that will document the experience of purchasing and running the buses to inform best practices as additional electric buses are integrated into transit and school operations.

You can learn more about what's happening in your region by searching for your state's Volkswagen mitigation program and inquiring with transit and school bus operators on their plans.

David Roberts is the Drive Electric Vermont coordinator. He has driven all-electric vehicles for the past seven years and says if you have to drive, drive electric. ♻

E-Transportation on Two Wheels

Jessie Haas

How can we drive less or pollute less while doing the driving we have to do? We all know transportation is one of our biggest emitters of greenhouse gas, but public transportation is spotty in the north country and rural areas. Electric cars and plug-in hybrids can be pricy. What's an environmentally-ethical commuter or delivery company to do?

A NIU way forward. Courtesy image.

How about electric bikes? They are listed by Project Drawdown as number 69 of its one hundred most effective solutions to global warming. According to Project Drawdown, half of all urban trips are under 6.2 miles, an easy distance for fit, young bikers or on flat ground. For the less fit or in hilly areas, or for longer distances, a bike with electric assist makes bike travel more viable and enjoyable. Tens of millions of Chinese now commute on e-bikes, largely in response to strict anti-pollution laws.

EZ Bikes and Scooters in Exeter, NH, is a leading purveyor of electric bikes, with several lines, Emotion, Magnum, and Addmotor. The Magnum Ui5, priced at $1299, is its economy bike. EZ Bikes has also recently added a line of electric scooters, manufactured by NIU, which the website identifies as the world's largest provider of "smart urban mobility solutions." For NIU, "smart" means environmentally friendly, but 'smart' can also mean cool and fashionable. Forbes predicts the NIU scooter will be "the new Vespa." The NIU Scooters were introduced in the United States in the fall of 2019, and more models are scheduled to hit the lots soon.

EZ Bikes is carrying three models of NIU scooters, with prices ranging from $2699 to $4599. As with all electric vehicles, range varies with temperature and driving style, but the most economical scooter, the MQi+ Sport, has an estimated range of 75 to 100 kilometers. This is made possible in part by a fourth generation lithium-ion battery made by Panasonic, which has a longer life and range and is lighter, safer, and more powerful than other comparable batteries. NIU scooters feature advanced controllers and come with a prepaid Sim card which allows the controller to be accessed 24/7. The controller has gps, theft-control devices, remote tracking, and vehicle diagnostics, including keeping tabs on battery life and motor performance. The NQI series (currently available in the U.S.) features a Bosch electric motor, dual-piston hydraulic disc brakes, oil shocks, LED lighting, an LCD dash, and an USB charging port. NIU scooters are manufactured in China. NIU debuted a new model at the Consumer Electronics Show in Las Vegas in January, and it is self-balancing, has a range of 150 miles, will go up to 50 mph, and has a self-parking feature. This is being marketed for "riders of any experience level," and is set to go into production this summer.

Though the price of an electric scooter is high compared to a bicycle, it's quite low compared to a car, and offers one of the most environmentally clean transportation modes available. E-bikes are even better. They have higher emissions than walking or regular biking, but outperform electric cars and most forms of public transportation. Even gas-powered scooters, of which EZ Bike sells several brands, are fuel-sippers, getting over 100 mpg.

In addition to the newly available NIU scooters, strides are being made in freight delivery by bike as well. E-cargo bikes are now available for as low as $1500 (the Radwagon longtail e-cargo bike from Rad Power). Four Vermont utilities offer e-bike rebates, including Green Mountain Power, and the possibility of Vermont subsidies is under discussion in Montpelier.

New York City began experimenting with e-bike delivery in December 2019. The city plans to permit up to 100 delivery e-bikes (run by companies like Amazon, DHL, and UPS) to park in commercial loading areas usually reserved for

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SMART COMMUTING IN NH & VT

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

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

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

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

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

IN NEW HAMPSHIRE

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

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

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

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

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

CONCORD AREA TRANSIT (CAT) - Serves Concord 603-225-1989 **concordareatransit.org**

CONTOOCOOK VALLEY TRANSPORTATION (CVTC) - Monadnock Rideshare for the southwest region 877-428-2882 **cvtc-nh.org**

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

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

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

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

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

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

IN VERMONT

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

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

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

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

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

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

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

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

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

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

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

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

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

Progress of E-cargo Bikes

Dave Cohen

Image: chicargobike.blogspot.com

To this day, whenever I hear New England legislators and even regional energy advocates mention bicycle transportation I frequently have to inquire, so what is a bicycle? I ask this because there's a sense that on their minds is a vastly outdated version of the bike. You know, someone hunched over a 10-speed bike, tooling up a hill with perhaps a rear rack.

It's time for New Englanders to get on with the big bike update! There's a worldwide revolution in design and technology that's dramatically altering what a bike can do. A lot of this has to do with the emergence of the electric bike. Thrilling advancements in the past 10 years with motor and battery technology make a 10- to 15-mile commute truly possible for way more people, hill climbing a non-issue, and hauling heavier loads more viable than ever.

However, the real shining moment perhaps belongs to the cargo bike. In the 1990's, there were only a handful of small frame builders in the US making cargo bikes. Then, in 1998 Xtracycle introduced the Free Radical, an attachment that could transform almost any bike into a longtail cargo bike suited to haul kids, cargo, laundry, plywood or practically anything you need to carry. That was a game-changer. But it wasn't until 2008 that Yuba Bikes introduced its Mundo, the first fully integrated longtail cargo bike. That opened up a whole new market. A few years later brought an avalanche of new products and designs for families, households and businesses to go car-free. Many are American entries like Madsen Cycles, Bike Friday, Surley and, of course, Xtracycle and Yuba, but quite a number also come from overseas.

But this story would be rather incomplete without highlighting the revolutionary combination of the cargo bike with e-assist technology. E-cargo bikes are demonstrating amazing potential for businesses and households wanting to shift up to the bike in a big way. Every major cargo bike company now has one or several models that include e-assist right out of the box. Carrying heavy loads, kids, or making gardening runs has never been easier on a bike. And now there are online companies, including Rad Power with their budget RadWagon longtail e-cargo bike going for as low as $1500! Compared to the major companies retailing their e-cargo bikes at upwards of $3000, the RadWagon is a real deal, but that also depends the level of hill climbing power you need and quality of components you'd like to have.

But best of all, e-cargo bikes have a unique way of inspiring local lifestyles, livable communities and physical fitness, unlike electric cars which mainly promise to exacerbate more sprawl, more traffic and more car-based lifestyles. And so, if we really want e-cargo bikes to really take off in New England we need support from state and local governments. Thankfully, Vermont is leading the way with four of the state's utilities offering e-bike rebates, including its largest utility Green Mountain Power. Now there's even talk of state subsidies to boost this great option and make a purchase even more viable.

Finally, if you really want to get the lowdown on cargo bikes and their potential to create change, catch a screening of the internationally-released cargo bike documentary MOTHERLOAD (www.motherloadmovie.com). It's time to go for the big bike update!

Dave Cohen is an integrative psychotherapist in Brattleboro, (davecohencounseling.com), specializing in approaches in mind/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 VT. ♻

E-Transportation on Two Wheels – *Cont'd from p.4*

trucks and vans. The bikes will also be exempt from parking fees. Many large companies already operate cargo bikes in major cities outside the U.S. Mike Parra, CEO of DHL Express America, is quoted in the New York Times as saying, "The DHL Cubicle has enjoyed great success in Europe, with each bicycle deployed taking at least one conventional delivery van off the road " This reduces congestion and local air pollution, as well as greenhouse gas emissions. Parra says that cargo bikes "will play an important role in hitting our environmental targets."

New York plans to allow small cargo bikes to park on wider sidewalks in the city and to travel on the city's network of 1400 miles of bike lanes. The pilot program concentrates bikes in the most congested area of Manhattan, from the Battery up to 60th Street.

Project Drawdown estimates that e-bike travel could increase from around 249 billion miles a year (mostly in China) to 1.2 trillion miles per year by 2050. This could reduce one gigaton of carbon dioxide emissions, and save e-bike owners $226 billion by 2050. It will also go a long way toward making global cities livable and breathable.

Links: www.drawdown.org/e-bikes; www.niu.com/en; www.ezbikesandscooters.com.

Jessie Haas has written 40 books, mainly for children, and has lived in an off-grid cabin in Vermont. ♻

FORD MUSTANG MACH-E
An Electric Mustang!

Greg and Barb Whitchurch

Equipped with an extended-range battery and rear-wheel drive, Mustang Mach-E has a targeted EPA-estimated 300 miles of range. Images: ford.com

Ahh, the Ford Mustang. A roar from the engine, belching exhaust, spinning tires, clouds of smoke, gasps of fear and excitement from the crowd, the smell of burning rubber and fossil fuels. It's all so old school now that the new Ford Mustang Mach-E is due out late this year. It will leave those earlier incarnations in the dust?

No roaring, no smoke, no spinning tires, but man, will it move! As with other electric vehicles (EV) conversions, you can count on improved balance, cornering, traction, control, acceleration, yet also increased safety and economy. And no pollution to threaten the astonished crowd. Yup, Ford has decided to move on from the torque, power and acceleration limitations inherent in the internal combustion engine (ICE) design.

Although the first edition is already sold out, Ford is taking reservations for other configurations at bit.do/mach-e. The Mach-E, which is a SUV, starts out at about $44,000, but Ford estimates the savings alone from owning an EV are $14,120 over five years of ownership (an average of almost $3,000 per year), which compares favorably with a $30,000 ICE car.

This figure reflects both the reduced maintenance and fuel costs, plus the federal incentives. There are often state and utility incentives as well. (Vermont's utilities kick in several thousand dollars more, plus many businesses and other organizations contribute toward these purchases for their employees.) See pages 14 and 15 in this issue for incentive information.

Bob McCullen, General Sales Manager at Grappone Ford (who has placed his own reservation), says that the FordPass phone app, which also acts as a key to the car, will assure that a driver is never too far away from a charger. But efforts such as the West Coast Green Highway, which is placing EV charging stations every 50 miles from British Columbia to Baja, California (bit.do/wcgh), are quickly assuaging anxieties about available charging.

As the pace of charger installation accelerates worldwide, New Hampshire is hard at work building out their EV charging capacity(bit.do/nh-ev-corridors); Vermont currently has 234 public charging stations (https://www.driveelectricvt.com/). Interestingly, although more and more workplaces and shopping areas are installing them, about 80% of EV charging in the U.S. is actually accomplished at the owners' homes. Level 1 charging is simply the grounded 120 VAC 20-amp socket already in your garage, which gives about five miles of range for each hour of charge. Level 2 is a dryer-type 240 VAC 30 amp (or more) socket, which will supply 10 to 60 miles/hour. Level 3 is "fast DC," which requires a very large and expensive installation often found at Hannaford's throughout New England, and some convenience stores and supplies 40 to 50 miles in just 10 minutes. PlugShare.com will show all levels everywhere in North America.

Back to the Mach-E. The folks at Grappone Ford made this little teaser: bit.do/grappone-mach-e. There are other informative Mach-E videos on YouTube. The extended range rear-wheel drive Mach-E is targeted for 300 miles; the extended range all-wheel drive should be 270 miles. The tricked-out GT model, with options including 459 hp, will do 0 to 60 in the mid-three seconds range --- 255 hp is standard on the base model. (My LEAF has 107 hp and my Kia has 201 hp and, given their instantaneous torque, both veritably LEAP out of entrance ramps onto the highways!)

Grappone Automotive Group itself is an Italian immigrants' success story. The fourth-generation owner of the business, Amanda Grappone Osmer, has leveraged her position to become deeply involved with local and statewide community support programs (bit.do/nh-rfw and DeweySchool.net/, and bit.do/grappone-comm, among many others), including employee support and development. The business has also provided important support to Green Energy Times. One example from several years back represents a forward-looking climate change response that would qualify as quite ambitious, even by today's standards; bit.do/grappone-remodel describes a showroom and office whole-building remodel of amazing scope and foresight.

The Mustang Mach-E is Ford's entry into the American EV marketplace. They've chosen the model that they think will best show off the advantages of the EV drivetrain, while satisfying Americans' desire for the SUV form.

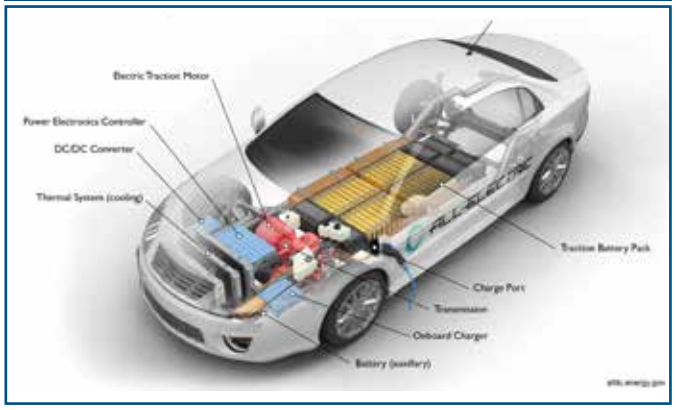
Barb and Greg Whitchurch have two EVs and live in a passive house in Middlesex, VT - bit.do/phc-li-vgbn. ♻

Comments for NH PUC Regarding EV-Related Policies

Randolph Bryan, NH Resident, EV Enthusiast | 12 February 2020

The New Hampshire Public Utilities Commission (NH PUC) is soliciting comments on the state's Electric Vehicle (EV) adoption policies as specified in SB-575-FN, enacted in 2018. Objectives should focus on Rate Design Standards for EV applications and Residential/Commercial Time of Use (ToU) rate offerings for EVs. I offer my comments and suggestions to the NH PUC for consideration. Subject matter references are available upon request.

ALL-ELECTRIC VEHICLE



A cutaway of an electric vehicle. Image: Department of Energy.

Background: EVs are now commonly regarded as heir apparent to become the dominant transportation drivetrain. This is predicted to happen relatively quickly (new car sales over 15 to 30 years) due in part to growing immediate need for clean energy solutions, improving cost - capabilities of EVs (battery technology and performance, lower manufacturing cost), and that EVs are substantially lower cost to operate (fuel and maintenance). EV prices have reached initial price parity with internal combustion engine (ICE) vehicles for some cases and will do so across the board by 2025, with most passenger car applications at parity by 2023. Adoption of EVs will likely continue to increase aggressively.

A critical market trend in the U.S. and world markets are growing mandates for substantial and full change away from internal combustion engines (ICE) by dates ranging from 2035 to 2050 (China, UK, Europe, Cal-Zev). The California Zero Emission Vehicle (CAL-ZEV) mandate states (including all New England except NH) have adopted ever stricter change schedules and incentivizing policies with commensurate success in change achievement. This is our immediate neighborhood and NH's policies can't afford to be left behind (attractiveness for business and tourism).

All the major car manufacturers are now committed to change most or all of their drivetrains to electric over the coming 10 to 20 years (notably Volkswagen and GM, with Ford, Toyota, BMW, and Nissan not far behind). Chinese EV manufacturers are among the largest in the world and poised to enter the U.S. in the coming years. Tesla has set the standard for EVs with great success, and, is gaining market share from the legacy majors.

At UC Berkley, a recent Berkeley Evaluation and Assessment Research (BEAR) study also concluded that EVs are good for the host state economy due to the increased portion of operating expenditures that remain in-state and improved air quality. This would be true for NH, also.

For utility and PUC consideration, residential and commercial solar can impact home and building energy use, but the addition of EV requirements will push demand higher than most on-site solar sources can supply, ensuring connection to the grid is needed.

EVs will represent considerable new load and revenue for the utilities. Much of the added load could be handled with few upgrades to the existing infrastructure if charging occurs during off-peak hours. This could allow lower electricity rates (better utilization of infrastructure) but won't happen without policies and rates to encourage this behavior. Also, it is reasonable to expect that not all EV charging requirements will be met by off-peak charging. So, additional power resources will be needed during peak and shoulder hours. Solar deployments (residential, commercial, municipal, and utility) can provide peak time power and energy sources that can offset the added load. Large and small solar deployments should be aggressively pursued, especially utility scale deployments.

Also, the NH PUC should consider that it is difficult for EV Service Operators (EVSOs) to be profitable. Car charging locations are critical for EVs to be adopted by the public and for EV tourists to feel comfortable about coming to NH. The nature of car charging sites is that the demand is spiky (car charging at high rate or not at all). Under low site use scenarios, typical of initial years of a charging location, demand charges tend to dominate the cost of electricity and make it far higher than, say, residential rates or most commercial use rates.

To encourage EV adoption in NH, I offer various objectives and policies to consider.

References are available upon request at randy@converdant.biz. ♻

Policy Objectives to consider for Rate Design:	Policies to consider:
Enable EVSOs to make money.	Lower/eliminate Demand Charges for EVSOs. Allow resale of KWH for chargers [done]
Spread charge infrastructure.	Encourage Make-Ready commitments to low income and non-garage multi-tenant dwellings. Include 'make-ready' in building codes
Prepare for faster Grid technology change.	Consider faster depreciation for Utility CapEx.
Lower the High Cost of NH Electricity.	Encourage faster adoption of lower cost renewables. Encourage off-peak charging. Encourage V2G use of customer EVs.
Policy Objectives to consider for TOU Rate Design:	**Policies to consider:**
Encourage off-peak charging.	Adopt dedicated residential/commercial EV charge circuits. Allow ToU rates on Residential Charge Circuit.
Encourage V2H/G power exchange	Prepare for V2H/G trials. Expand net-metering to include V2G uses.

EVSO means EV service operators.
ToU means time of use.
V2G means vehicle to grid – sharing power to/from grid to vehicle.
V2G/H means vehicle to grid or home – vehicle to home is a subcategory of vehicle to grid, using the vehicle only to provide power to/from the home.
CapEx means capital expenditures like buying equipment versus operating costs.
Make Ready is a term used by utilities to describe commitments and polices to bring grid power close to the end use point (like a parking lot of a multi-tenant building where no power currently exists). This brings down the initial cost of installing charging equipment in some places, making it easier to justify.

The Vermont Solar Carport

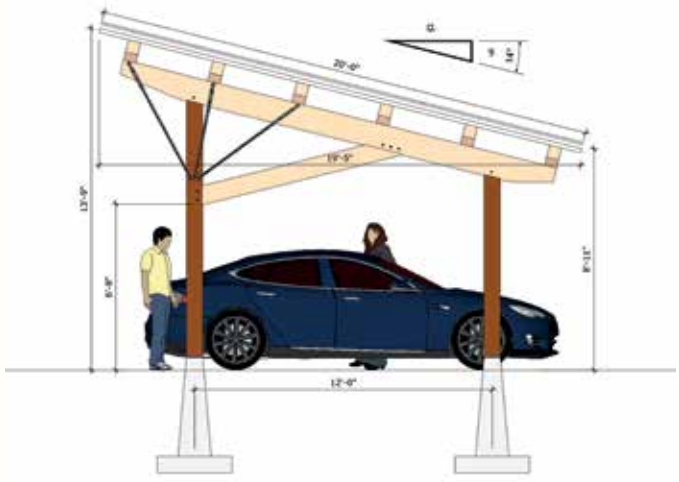
A New Green Offering from Two Worker-Owned Companies

THE FIRST FIVE VERMONT SOLAR CARPORTS SOLD WILL GET A DISCOUNT OF $1,000.

Responding to policy makers' push to more deeply integrate renewable energy into homes, businesses, and transportation, Catamount Solar and TimberHomes Vermont announced that they are teaming up to offer the Vermont Solar Carport. A marriage between beauty and function, the Vermont Solar Carport is a timber frame structure with a standing seam metal roof made with pine and white oak timber from New England forests and built right here in the Green Mountains.

"Our carport offers a lot in one package: it provides the economy and durability of roof-mounted solar, a classy parking shelter, and plenty of space to put bikes and kayaks, stack firewood, or store other outdoor gear," said David Hooke, one of the founding member-owners at TimberHomes Vermont. "Our unique design puts all braces and cables six feet, eight inches above the ground, so you can drive or walk into the carport from all sides."

Catamount Solar and TimberHomes Vermont have worked together on numerous projects over the years. Developing a jointly designed and branded product was the logical next step for these like-minded companies bringing to clients the strengths of each. The new product will be launched on Thursday, March 5 at 10 am at TimberHomes Vermont's Montpelier shop at 21 Fork Road.



"Our carports are available in one, two and three-bay models with space for 5.85kW, 8.8kW and 11.7kW of solar respectively, allowing customers to customize depending on their current and future power needs," said Andrew Wible, member-owner at Catamount Solar.

Launch of the Vermont Solar Carport. Images courtesy of TimberHomes Vermont.

VSECU, a credit union for everybody in Vermont and a leader in solar and energy improvement financing, is teaming up with Catamount Solar and TimberHomes Vermont. Special low-cost financing through VSECU's VGreen program can help Vermonters begin their transition from fossil fuels to solar and put their car under a handsome roof for an affordable monthly payment and potential savings on their electric bill. Subject to weather, financing and permitting, they can be installed in as little as six weeks from the first phone call.

"Anyone in Vermont who is investing in green energy for their home or business is eligible for our excellent VGreen loan rates and terms. VSECU is committed to making it easy for our neighbors to take steps toward their energy independence," said Laurie Fielder, the VGreen Program Director at VSECU. New Hampshire residents who become members of the Northeast Sustainable Energy Association (NESEA) can also access these low rates.

The Vermont Solar Carport is engineer-approved for New England. There are a variety of installation methods to allow for virtually all site conditions. The solar panel racks clamp right to the standing seam making a rugged, leak- proof roof that is easily able to accommodate future technologies.

This design stands out with its clean lines, hand-crafted pegged mortise-and-tenon joinery, and its showcase of locally sourced timbers.

The first five Vermont Solar Carports sold will get a discount of $1,000.

To learn more, contact Catamount Solar at www.Catamountsolar.com or TimberHomes Vermont at www.timberhomesllc.com. ♻

MANY THANKS TO OUR SPONSOR:

St. Johnsbury Solar Story

One Good Solar Array Leads to Another

George Harvey

The St Johnsbury 500kW solar system net-metering credits will be worth about $150,000 each year. Courtesy photo from Norwich Solar Technologies.

In St. Johnsbury, Vermont, on a piece of land that was pretty much out of sight behind the Green Mountain Mall (GMM), there used to be a sand pit. In time, the sand pit operations stopped, and the pit became just another non-productive piece of property, having no use and paying no taxes.

Fortunately, sand pits, landfills, and other such sites do have a use. They can be developed for solar arrays to produce clean electricity. Usually they either reduce municipal costs or pay taxes. NST began to take interest in development of a project at the sand pit in 2018 and had Preferred Siting discussions with the St J Select Board and Planning Board, amenable to the plan.

The array was to be 500 kilowatts (kW), the limit for municipal or school net-metered solar arrays. (The net metering cap for schools was raised last year so they can take up to 1 megawatt if needed from multiple arrays.) It was more than the municipality needed, so there would be additional electricity off takers. Norwich Solar Technology (NST), the developer, looked for the most obvious partners for the municipal system and approached the St. Johnsbury School District. By happy coincidence, this was just about the same time that the School District was looking for a way to reduce its use of grid electricity. They decided to take the available portion of the solar array.

The solar system behind GMM was a good financial deal for both the town and the school system. According to Kevin Davis, Vice President of Sales for NST, over the 25 years of their agreement, the town would save about $325,000 and the school would save $400,000, and the array will pay $125,000 in taxes.

The solar system is also a good deal for the environment. The array will produce 915,000 kilowatt hours annually, enough to power about 125 homes. That much clean electricity reduces carbon emissions by 17,000 metric tons, according to NST.

Getting the solar array built and running behind the GMM was not the end of the story. The school had put a fair amount of thought into how it could use a 21-acre parcel it had been given on Breezy Hill Road. It decided that it wanted to use the land for another solar system.

The solar array on Breezy Hill Road was approved at the town meeting on March 10. In terms of the capacity and expected productivity, this array will be very similar to the one near the GMM. In this case, however, the business arrangements will be different. The school district, which owns the land, will not get net metering credits for the energy produced, since they already have all of the net metering credits that they need to offset their bills from the first project. Instead, the school district will get income by leasing the land to the array, receiving $98,000 over the course of the 25-year contract.

The net metering credits will be offered to other Green Mountain Power customers, likely ones that cannot benefit from rooftop solar on their own property. It is expected that those credits will be worth about $150,000 each year. They are important because they give many non-profit organizations, including schools, an opportunity to benefit from solar power even though they do not have federal taxes against which they can apply the credits. Kevin Davis said, "Net Metering Agreements are ideally suited for schools, municipalities, and other non-profit organizations that cannot directly monetize the various tax credits that accompany solar projects like this, due to their tax-exempt status."

The solar systems in St. Johnsbury are not all about saving money, however. School superintendent Brian Ricca explained, "This is really about stewardship of our environment in St. Johnsbury." He stressed a need for public entities to address alternative energy options.

Norwich Solar Technology is based in White River Junction, Vermont. Its website is norwichsolar.com. ♻

Vermont Electric Co-op's Community Solar Program

George Harvey

Many people who would like to get their electricity from solar systems are restricted due to our living arrangements. Those of us who rent our homes are unlikely to be able to install solar systems, of course, and many who own their homes have unsuitable roofs and yards that are too shady.

There are solutions for these problems. Community solar programs were developed to address the needs of people who want solar power but are living where installing panels is not an option. Such programs are not all alike, however, and anyone who wants to get into one would do well to find out what is available, comparing the details. In some cases, developers put up a system, selling panels to subscribers. In other cases, the systems are owned and operated by utilities. Details of cost and payback vary rather widely.

Vermont Electric Co-op (VEC) has created its own Co-op Community Solar Program, and many VEC members might be interested in looking into it.

In the VEC community solar model, subscribers are not owners of panels, but instead sponsor them. Sponsorships can last for ten years or for twenty. The cost of the sponsorship of a panel is a one-time payment similar to the cost of a solar panel.

The investment by a sponsor is paid back in guaranteed, fixed amounts, not dependent on the cost of electricity or the time the sun shines, over a period of ten or twenty years. The program is intended to appeal to people who want to support solar power and have no means of their own to install it, but the financial incentive is not trivial.

To qualify for participation in the program, a person has to be a VEC member. The VEC service area includes all of Grand Isle County and most of the northern third of the state. Those who find such a system appealing but are not in the VEC service territory should probably contact their own utilities to find out what programs are available to them.

The FAQ area on the VEC website has more information (http://bit.ly/VEC-CS-FACS). Here are a few of them:

What if I change my mind or move? Will I get my money back? Yes, participants can opt out of the program at any time. Those who opt out will receive a portion of their initial investment back, depending on how long they participated. A participant can also transfer their sponsorship to another VEC member's account as long as that member has enough usage to take advantage of the monthly credit amount.

Will the solar credit change month to month? No, the credit is fixed and guaranteed to participants. The credit amount is based on a guaranteed generation per panel and VEC's value of solar. VEC guarantees that participants will receive this credit for as long as they are sponsoring panels.

Is VEC selling the Renewable Energy Certificates (RECs)? VEC is not selling the RECs for the portion of the project sponsored by VEC members. These RECs will be retired and will help VEC meet the goals and requirements of Vermont's Renewable Energy Standard, which was established in 2015 by Act 56.

Will I be eligible for federal tax credits for the cost of the sponsorship? No, the federal tax credit is already being claimed and is built into the price of the sponsorship.

Will I be required to pay taxes on the monthly credit I receive or include it in my tax filing? No, the monthly credit is not considered income.

To learn more connect with the great folks at VEC: https://www.vermontelectric.coop/community-solar or call them at 1 (800) 832-2667. ♻

Community Leaders Join Together to Form Community Power New Hampshire

Municipal and county-led project aims to bring competition, decarbonization, and local governance to the electricity sector.

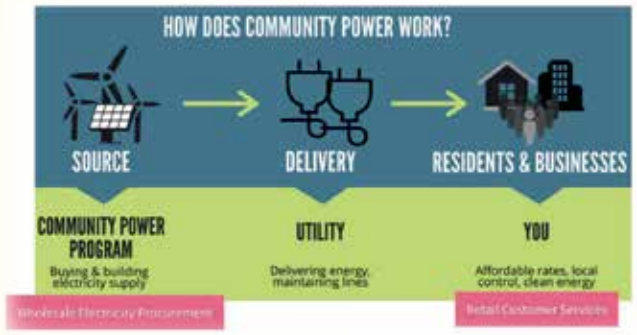
(This article was written jointly by a coalition of communities forming Community Power New Hampshire.)

Community Power New Hampshire (CPNH) was recently formed by local and regional energy committees, town managers and sustainability staff, elected officials, city energy managers, county administrators, and regional planning commissions. We have come together because we believe that through joint action, we can most fully realize the opportunity of a competitive, decarbonized, and locally-governed electricity sector as made possible through Community Power programs (RSA 53-E).

Our goal is to create a pathway to Community Power implementation that is accessible to all New Hampshire cities, towns, and counties. The two main objectives that will allow us to realize that goal are: (1) form a new, locally governed legal entity (CPNH) with the technical capacity to provide the services required of Community Power programs; and (2) support individual communities to develop their own Community Power programs, and join CPNH if they choose.

Why CPNH?

The Community Power Law (SB 286) was enacted in fall 2019. It enables local governments – cities, towns, and counties – to procure and provide electricity



Local governments - cities, towns, counties - can procure and provide electricity to their residents and businesses

on behalf of their residents and businesses. But the functions required for sophisticated wholesale electricity procurement and retail electricity sales and services require an economy of scale beyond the capacities of most NH municipal governments.

The solution is CPNH, a new entity governed by local governments to serve local governments. CPNH will competitively solicit and enlist service providers to implement advanced power procurement and other functions (e.g., data management and analytics) required to realize the full potential of Community Power. CPNH will enable individual communities and individual Community Power programs to set their own electricity rates and their own program goals.

We have identified the following goals for Community Power, some of which may be prioritized over others by different communities:

1. Strengthen local control and choice: Participating communities will have the ability to craft their own energy portfolios and evolve them over time, making decisions about energy supply rates, renewable energy content, and surplus revenue allocation.

2. Reduce and control cost: Community Power programs will have access to competitive rate offerings relative to their default utility energy supply, and the ability to better manage electricity cost drivers (e.g., capacity).

3. Accelerate decarbonization and renewable energy: Community Power programs may choose to procure renewable energy by purchasing Renewable Energy Credits, contracting with existing renewable energy generators, or enabling construction of new renewable energy systems.

4. Stimulate competitive, local markets for modern energy products and services: Community Power programs will have access to retail products and service providers enabling integrated demand-side management and market-based deployment of distributed energy resources including dynamic and real-time pricing options, distributed generation, energy storage, electrification of transportation and heating sectors, and energy efficiency.

5. Modernize local infrastructure and strengthen resiliency: Community Power programs may enhance resiliency of critical facilities through planned deployment of local energy resources and microgrids, as well as advanced interval meters and Smart Grid communications working in partnership with local distribution utilities and others to modernize our local infrastructure.

6. Streamline local and regional coordination: Community Power programs, working together with Regional Planning Commissions, counties, and other partners, can collaborate on electrification of public transit, streamline permitting for innovative technologies, and to remove other barriers to progress by coordinating action at the Public Utility Commission and Legislature.

At present, CPNH's activities are organized into four categories and working groups: (1) governance agreement; (2) regulatory and legislative engagement; (3) operating model design; and (4) community engagement. Local governments working on Community Power implementation are invited to contribute to one or more of CPNH's Working Groups.

Governance Agreement

CPNH and municipal attorneys are reviewing a Joint Powers Agreement (authorized by RSA 53-A), a contract among local governments that creates a new locally-governed legal entity (CPNH) to competitively solicit and contract for the services necessary for Community Power operations. Over the coming months, we will work together to refine the details of such an agreement, including the process by which additional local governments may join CPNH and participate in its governance.

Regulatory and Legislative Engagement

The Public Utilities Commission is considering a rulemaking process that will affect Community Power programs. Coordination with electric distribution utilities is an important part of Community Power. For example, the process for data transfer between utilities and Community Power programs should be clarified and streamlined. CPNH is already actively engaged in the regulatory process.

Operating Model Design

CPNH will likely have a mix of internal staff and sub-contracted service providers. For example, functions like (1) energy portfolio management and engagement in ISO New England wholesale markets; or (2) retail customer services (including data management, notifications, websites, billing), may initially be competitively sub-contracted to expert service providers. Enlisting of service providers will be conducted in a competitive and transparent fashion. Careful thought will be given

Cont'd on p.19

Green Energy Options Brings Commercial Solar to Monadnock Region

Pablo Fleischmann

Beth Caldwell of RGBC Associates and EMF Inc. (an IT service company) had a clear goal of transitioning the EMF building in Keene, NH to clean and renewable solar energy when she walked into the Green Energy Options Store in Keene. She had become sufficiently informed on solar energy investment to be confident that this could also be a sound financial decision; she could "do well by doing good."

The rooftop array installed by Green Energy Options for RGBC Associates in Keene, NH. Image: Albert Karevy.

Beth said, "Federal tax credits and long-term financial benefits made the project with Green Energy Options a sensible one. Just as critical as financial incentives, was our commitment to do what we can for our planet's future, where we are, with what we have. Climate change is not a trivial matter. We are convinced that what we do about our carbon footprint is more important than what we say. Our solar project was a wise financial investment, and a moral choice driven by our values."

Starting from this place, RGBC Associates and Green Energy Options began a systematic process of design, cost calculation, and a return on investment analysis that verified Beth's assumptions and identified a project approach that would fully meet their goals. The result of the design and cost-benefit analysis showed that the cost of investing in solar was less than the cost of not making the investment, and did not have the risks that accompany most investments. This work was all done before RGBC Associates invested a single dollar, resulting in a fully informed decision to go forward with a 107kW solar project.

Don McCormick, Commercial Solar Development at Green Energy Options said, "Most people do not yet realize what a strong and easy investment a commercial solar energy project is. It pays for itself by converting the money you are already spending on electricity and taxes, and using them to pay for a durable solar energy facility for you. If you pay taxes and use electricity, then it is cheaper for you to buy a solar energy project than to do nothing!"

RGBC Associates solar energy project was designed to fully net the anticipated annual energy load of the EMF building. To do so required a solar design that utilized all sections of the flat and pitched roof as well as a ground mount solar array six panels high by eleven panels long. Panel optimization was used to get the most out of each panel regardless of differences in solar access from momentary shading of portions of the array.

Bob Gogolen, RGBC Associates' co-owner and President of EMF Inc., worked closely with Green Energy Options throughout the development and construction process, both to provide input on decision points along the way, and to become an informed and educated solar energy facility owner.

Gogolen and GEO worked closely on ground mount siting to ensure parking and vehicular flow was ideal when the project was complete. The ground mount section of the solar array has become an aesthetic centerpiece and statement of RGBC Associates' commitment to green energy. As an expert in network and communication systems, Bob became instrumental in the design and troubleshooting of communications for the control and monitoring system and revenue grade meter.

On GEO, Gogolen said, "What impressed us most about Green Energy Options was their approach. They obviously understood the technology, but took a holistic approach to our needs: business, permitting, financial, current and future building usage, parking, aesthetics, and of course the technical side. This is what EMF does with our information technology customers. GEO went above and beyond when the inevitable twists and turns of a project this size posed challenges. And last but not least, it's fun working with people who share your concern for the environment."

Only two months after the beginning of construction, the now complete 107 kW solar energy system is providing energy to the building and the grid through the New Hampshire Net-Metering program and is on target to net all of the energy usage of the EMF building going forward!

RGBC Associates is now offering light commercial office and warehouse rental space in the EMF building that includes a menu of IT and other business service and support options. They believe that their investment and commitment to renewable energy and efficiency makes their space even more attractive.

Pablo Fleishmann is the co-owner of Green Energy Options of Keene, NH with his wife Valerie Piedmont. Green Energy Options is a Certified B Corporation and mission-driven business devoted to moving the Monadnock region toward greater energy independence, sustainability and regenerative ways of living. ♻

Many thanks to our sponsor:

Community Solar Mechanicville, New York

Chris Cusack

One of two adjacent solar arrays make up the combined project. Courtesy photo.

Arcadia has been a driving force in opening community solar farms across six states to date. Arcadia, solar developer partner ForeFront Power, and numerous state agencies opened the solar farm on Pruyn Hill Road in Mechanicville, New York, in December. This achieved an important milestone: New York's solar generation reached 2,000 megawatts (or two gigawatts) which is roughly a third of the 2025 state-wide goal of 6,000 megawatts (or six gigawatts). That, in itself, is a huge accomplishment.

Thomas and Janice Johnson, whose family has owned the land for over 100 years, leased the site to the operators. Talking with the couple, it was easy to see how proud they were of the accomplishment and of the innovative use of the land.

The solar array consists of 18,500 panels producing 6.12MW or over seven million kilowatt hours. This is equivalent to taking 800 cars off the road. The solar array feeds power directly to the grid, supplying enough power for an estimated 1,000 residential customers. In the installation of panel support structures, the wiring was run through an underground conduit to make the land maintenance (e.g. mowing) more efficient.

Compared to installing solar panels on an individual house, one of the many benefits of community solar is how it generically feeds the solar-produced energy into the grid. That means that local energy users are running off solar as opposed to non-renewable generated energy. More to the point, it's really democratized in that you don't need to be a high-income investor in solar to get solar-generated energy anymore. With community solar, all consumers of electric power in the area are now getting solar-generated power.

The appeal to electricity subscribers is they can take part in driving the change toward solar energy without having to own their own solar panels or their own home. Renters and homeowners alike benefit from solar energy generated at this site.

The financial arrangement between Arcadia and the subscriber appears simple but is actually clouded in handoffs. The subscriber signs up with Arcadia and gives Arcadia the ability to see and pay their current electric utility provider, in my own case the utility provider is NYSEG. Arcadia then starts to bill the subscriber for their monthly usage as documented by NYSEG. So, the subscriber pays Arcadia who in turn pays NYSEG.

The subscriber receives a 5% discount on their monthly bill for the portion they elect to get through the community solar farm. The subscriber can choose 50 or 100 percent of wind or solar or a combination of both, through Arcadia. The subscriber is paying Arcadia what they used to pay NYSEG, minus the 5% discount.

Interestingly, the subscriber can see on their NYSEG account the exact credit which NYSEG gives for the electricity fed into the grid via the community solar farm. Judging by the amount of credits on the NYSEG statement, Arcadia makes their profit on the difference between what the subscriber pays Arcadia and what NYSEG charges every month after the credits for electricity fed into the grid via the community solar farm are taken into account.

Not only is the community solar project impressive to walk through, but it is exciting to be part of the effort in some small way as a subscriber of Arcadia Power. Stemming off some carbon emissions makes me feel good on paper. Seeing it in real life was a crystalline moment.

Sources: www.wamc.org/mechanicville-solar-farm, and www.forefrontpower.com/nyserda-2gw.

Chris Cusack is a software engineer and blogger who is passionate about reducing our carbon footprint and improving our impact on the environment. His blog can be found at https://syncopatedcodes.com. ♻

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

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

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

USDA RURAL DEVELOPMENT PROGRAM

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

- Finance the purchase of renewable energy systems, and make energy improvements; energy audits. Funding is awarded on a competitive basis; grant funding cannot exceed 25% of eligible project costs and combined loan guarantees and grants cannot exceed 75% of eligible project costs.
- Applicants include Feasibility studies/ regular REAPs: agricultural producers and rural small businesses. Energy audits and renewable energy development assistance: local governments, tribes, land grant colleges, rural electric coops, public power entities. Grant must be used for Construction or improvements, purchase and installation of equipment, energy audits, permit fees, professional service fees, business plans, and/or feasibility studies. Find more at www.rurdev.usda.gov/ NH-VTHome.html or call 802-828-6080 in VT or 603-223-6035 in NH

BIOREFINERY ASSISTANCE PROGRAM

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

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

- Increase energy independence
- Promote resource conservation, public health, and the environment
- Diversify markets for agricultural, forestry products and agricultural waste materials
- Create jobs and enhance economic development in rural America
- For more information go to www.rurdev.usda.gov/BCP_Biorefinery

REGIONAL

NEW ENGLAND GRASSROOTS ENVIRONMENTAL FUND

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

- Must be volunteer driven or have up to 2 full time paid staff or equiv.
- have an annual budget up to $100,000
- "Seed" grants of $250-$1,000 and "Grow" grants of $1,000-$3,500
- Go to www.grassrootsfund.org/grants/ or call 802-223-4622 for more info.

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

The Small Scale RE Incentive Program, administered by Renewable Energy Resource Center (RERC), provides funds to help defray the costs of new solar thermal and advanced wood pellet heating systems.

Advanced Wood Heating Advanced wood pellet heating systems -- $6,000 per pellet boiler/furnace (in partnership with Efficiency Vermont). Details at www.rerc-vt.org or call (877) 888-7372.

- Retails sales of "Advanced Wood Boilers" are exempt from Vermont's 6% sales tax. http://tax.vt.gov/exemptions,,
- **Details at https://fpr.vermont.gov/ woodenergy/rebates**
- **Windham County**
- For residential low- and moderate-income residents there is a pellet stove program. Contact the Windham and Windsor Housing Trust for more information: Tara Brown at 802-246-2119
- For wood heating (pellet or chip boilers/ furnaces) in municipal buildings, schools, and non-profits contact the Windham Regional Commission: Marion Major at 802-257-4547 ext. 109 or windhamregional.org/energy/wwh

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

Pellet Sap Evaporators:

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

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

VT TAX CREDITS

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

Tier III programs

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

EFFICIENCY VERMONT

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 efficiencyvermont.com/rebates.
EVT has started a new program giving away free energy efficient products and appliances (including wood and pellet stoves) to income eligible customers. https://www.efficiencyvermont.com/ free-products

Lighting

- Special pricing on select ENERGY STAR® LEDs at Vermont retailers.
- LEDs for indoor growing: $100 back for qualifying fixtures

Weatherization

- Comprehensive air sealing and insulation projects with an Efficiency Excellence Network contractor: 50% off eligible project costs, up to $2,000. Moderate income Vermonters get up to $4,000 back.
- Air sealing and insulating your attic and/or basement with a contractor of your choice: up to $500; Moderate income Vermonters get up to $1,000 back.
- 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 - $400 rebate
- Appliance recycling: $50 + free pickup of secondary refrigerators/freezers

Heating/Cooling/Water Heating

- Central wood pellet boilers and furnaces: $6,000 rebate (in partnership with CEDF)
- Heat Pumps:
  - Air-to-Water System: $1,000/ton rebate
  - Centrally-Ducted System: $800/ton rebate
  - Ductless Heating & Cooling System: $400-$500 discount at participating distributors
  - Heat pump water heaters: discounts up to $600 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: $200 for select ENERGY STAR Emerging Technology models
- Smart thermostats: up to $100 back for select ENERGY STAR models.

Wood Stove Change-Out

CEDF Change-Out

Customer must have an existing/installed non-EPA certified stove to change-out:

- Pellet stoves: $1,000 incentive*
- Cord wood stoves: $800 incentive*

* These incentives end Dec. 16, 2019

- A $100 incentive is also available to replace the catalyst in an existing EPA-certified woodstove.
- $300 fed. tax credit now available on 2019 stoves purchases.

Efficiency Vermont offers a $650 rebate for a new pellet or cord wood stove. *

** Cannot be combined with above offer.*

Residential New Construction

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

Commercial and Institutional

- Buildings over 5000 square feet can get a rebate of $1.25/sf up to $50,000 from Efficiency Vermont, plus an additional $3000 from the CEDF.

Other Opportunities To Save

- Advanced Power Strips – special pricing starting at $6.95
- Sense Home Energy Monitor: $199
- Discount Pool Pumps – up to $500 back on select ENERGY STAR models
- Home Energy Loan – low-interest loans of up to $35,000 for home weatherization and heating improvements

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Public Utilities Commission

NH PUC: Get up-to-date information at https://www.puc.nh.gov/Sustainable%20 Energy/RenewableEnergyRebates.htmls

Commercial Solar Rebate Program

Incentives are limited to 25% of the total project cost or $50,000 if less than the AC incentive payment otherwise calculated, whichever is less. The Program is available to non-residential structures with a commercial electric meter located in New Hampshire. Incentive levels for PV systems are as follows:

- $0.40/watt (lower of AC and DC) for new solar electric facilities.
- 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 CISolarRebate@puc.nh.gov or at (603) 271-2431.
For C&I solar program details, go to: www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-CI.html

PACE

The state also has passed PACE (property-assessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes.
Please refer to the Residential PV program.

Residential Solar/Wind Rebate Program

-Effective January 2, 2018, this program offers rebates to qualifying NH residents who install photovoltaic (PV) or wind turbine electrical generation systems. Rebate levels are $.20 per watt of panel rated power up to $1,000, or 30% of the total facility cost, whichever is less. *Check for updates at http://www.puc.state.nh.us/Sustainable%20Energy/RenewableEnergyRebates-SREG.html*

Residential Solar Water Heating Rebate Program

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

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

- 40% of the heating appliance(s) and installation cost, up to a maximum of $65,000. An additional 30% up to a maximum $5,000 is available for thermal storage.

Systems must be 2.5 million BTU or less

Residential Wood Pellet Boiler/Furnace

- 40% of installed system up to $10k
- Must meet thermal efficiency and particulate emissions standards

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

LOCAL INCENTIVES

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

- *These are offered on a town-by-town basis.*
- The state also has passed PACE (property-assessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes
- Information at www.nh.gov/osi/energy. for more information.

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

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

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

NHEC offers incentives for Level 2 Electric Vehicle Charging Stations. For Commercial and Municipal Members – Incentives are up to $2,500 per charging unit. A maximum of two charging units may be installed off-peak hours at a rate that is lower than the basic residential rate.

NHEC's ENERGY STAR Heat Pump incentive structure for 2020 is as follows:

Heating and Cooling - (Must meet or exceed the minimum efficiency requirements - SEER 18/EER 12.5/HSPF 10) $500 per ton

Geothermal - (Must meet or exceed the minimum efficiency requirements - EER 16/3 COP) $500 per ton

Cooling only - (Must meet or exceed the minimum efficiency requirements - SEER 15/EER 12.5/) $70 per ton

Wi-Fi thermostats - (Must be installed with a heat pump also receiving an incentive) $100 rebate per T-stat

Weatherization Bonus – (Available for members participating in the Home Performance with ENERGY STAR Program) $250 per ton

Whole House Bonus – (Available for qualified heat pump applications that offset 80% or more of the total heat load. Two years of fuel use history is required) $250 per ton

ENERGY STAR Heat Pump Water Heater – (Must meet or exceed 2.3 energy factor) $750 rebate on 50 gallon or greater

Load Buy down – NHEC provides interest subsides through participating banks and credit unions for the installation of qualified heat pump installations. Must get pre-qualified. Loans up to $15,000 after rebate.

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 energy audit for $100 (rebated if improvements installed), and 50% instant rebate for eligible weatherization improvements up to a $4,000.

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

NH ENERGY STAR Homes

• Incentives for new homes which meet ENERGY STAR guidelines. Incentives include

• HERS rating fees paid by the utility, rebates for ENERGY STAR lighting, appliances –up to $4,000 based on the HERS score.

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

NHSaves Residential ENERGY STAR ® certified Products Program

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

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

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

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

NHSAVES Online Store

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

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

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

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

NHSaves: 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.

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 https://www.nh.gov/weatherization.htm for application criteria, FAQs and local program contacts

MASSACHUSETTS

Commonwealth Solar Hot Water (SHW) Programs

• Visit http://www.masscec.com/shw

MassSave Heat Loan SHW

Through this loan program, customers may borrow at 0% interest the costs of a Solar Domestic Hot Water and/or Thermal Heating system. Apply through receiving the MassSave Energy Audit. .

Energy Efficiency

• Visit www.masssave.com/residential-program.. Please call 866-527-7283 to schedule a free home energy assessment.

Mass. Solar loan Program

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

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

• Mass Solar Loan: www.masssolarloan.com. The most updated loan principal buy down rate based on household income can be found For Residential Members at http://www.masssolarloan.com/.

• Renewable Thermal Infrastructure Grant Program: www.mass.gov/funding

MA SMART INCENTIVE

This info may have been updated. Check website. SMART incentives are only available for PV systems sized under 25kW. All Eversource West and Most of National Grid Blocks are full for 25kW and larger. There will be a 400MW review process this spring and summer. Details at http://masmartsolar.com and https://www. mass.gov/solar-massachusetts-renewabletarget-smart.

MA STATE INCENTIVE

This info may have been updated. Ck website. MA State Incentives can be found at: www.masscec.com/get-clean-energy

• Incentive updates for air-sourced heat pumps: https://www.masscec.com/air-source-heat-pumps

• Wood stove Change-out program: https://www.masscec.com/commonwealth-wood-stove-change-out

HEATING PROGRAMS

This info may have been updated. Ck website.

• The Commonwealth Woodstove Change-Out program, a partnership between MassCEC, the Massachusetts Department of Environmental Protection and the Department of Energy Resources, offers rebates to assist Massachusetts residents in replacing non-EPA-certified wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves. Woodstove Program Info: http://bit.ly/mass-cec-woodstoves

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

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

ELECTRIC VEHICLES

This info may have been updated. Ck websit3: https://mor-ev.org/

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NYSERDA

Welcome to the New York solar incentive and rebate information: 169 programs and incentives at: http://dsireusa.org (enter your zipcode) Programs and Services from NYSERDA: For the latest NYSERDA solar, ground source and air source heat pumps, EV residential and commercial incentives and more visit: nyserda.ny.gov/All-Programs.

NYSERDA currently has a $1,500 per ton incentive on geothermal for residential systems (<10tons) and $1,200 per ton for commercial (>10 ton) systems.

More info available at: https://scoophvac.com/2019/11/01/rebates-ashp/

EV Incentive from National Grid

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

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

Heat Pumps

$1000 per ton NYSERDA incentive.

NYSEG/RG&E rebate program up to $1050. More info at http://bit.ly/NYSEG-Rebates.

Home Energy Waste

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

RENEWABLE ENERGY/NY-SUN

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

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

The Megawatt (MW) Block Dashboard provides real time infor on the status of block and current incentive levels by sector and region. Block status is updated as applications are submitted, so check for current status. http://bit.ly/MW-block

Residential and Small Business

• http://bit.ly/ny-sun-Solar-Res-sm-bus

Commercial and Industrial

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

Commercial Energy Storage

NYSERDA is providing $350/kWh of energy storage capacity in addition to the current NY-Sun solar incentive. https://on.ny.gov/2FvS6L1

Community Solar

• http://bit.ly/NY-sun-Community

Commercial/Industrial PV Installer

• http://ny-sun.ny.gov/For-Local-Government/Local-Government

Residential/Small Commercial Solar PV Installer

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

Financing Options

• http://bit.ly/NY-Sun-Financing

Clean Power Estimator

• http://bit.ly/NYSUN-power-estim

Geothermal

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

Electric car

• buyers in New York State can now get a rebate of up to $2,000 on qualifying EV models from participating dealers. See https://on.ny.gov/2Rd14zL

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

Utility sponsored incentives & tips:

http://bit.ly/utility_sponsored_incentives

Clean Energy on Farms

• $19 Million Available to Accelerate the Use of Clean Energy Technologies On Farms. Learn more at: http://bit.ly/NYSERDA-Farm-Clean-Energy.

National Grid

• National Grid savings for customers, http://bit.ly/Thanks-For-Saving-Energy

• *For more utility rebates google the utility name and search for rebates.*

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

The Woodlands Saves with Solar

Anonymous $500,000 Gift Funds 179kW Solar System for Alice Peck Day Lifecare

Alice Peck Day Lifecare (APD) is powered by their new solar system. Courtesy photo from Alice Peck Day Memorial Hospital.

Due to the generosity of an anonymous donor, Alice Peck Day (APD) Lifecare has installed a 179kW rooftop solar system at The Woodlands independent living community in Lebanon, New Hampshire.

"We're overjoyed by what this generous donor has made possible. This solar array will contribute to our electricity usage with power from the sun for years into the future," said Cindy Jerome, executive director of APD Lifecare, the parent organization for The Woodlands. "We expect to save about $25,000 a year on our electricity costs and our residents really enjoy knowing we are using renewable energy. It just feels great to be green; that's a real passion for many of our residents. The Woodlands is home to people who care about the environment and who make good things happen. Our anonymous donor feels the same way. As a tree-hugger myself, I'm delighted that Woodlands residents led the way in this important project," she added.

The grid-tied system was installed by ReVision Energy, an employee-owned, certified B Corp with locations in Maine, New Hampshire, and Massachusetts.

"Although our region is known as northern New England, it's worth noting that we are actually at the same latitude as sunny places like the French Riviera," said Phil Coupe, co-founder of ReVision Energy. "In fact, a solar array in Lebanon, New Hampshire, will generate roughly the same amount of electricity each year as an array in Houston, Texas. This means that APD Lifecare will derive a strong economic and environmental return on its solar investment by reducing utility costs and eliminating 110 tons of carbon pollution each year," he added.

Kimberley Quirk, Branch Manager for the Enfield office of ReVision Energy knows many of the residents of Woodlands and helped with the design of the solar array and provided information and question-and-answer sessions during the installation. "It was exciting to work on this project from early conception almost a year ago to final installation and commissioning. The Woodlands residents had great questions and good feedback along the way. They really appreciate this sustainable gift of locally generated electricity."

The solar array at The Woodlands:

- Consists of 511 photovoltaic panels with a maximum output of 350 watts per panel. They come with a 25-year warranty and an expected useful lifespan of 40-plus years.
- Is expected to generate more than 205,000 kilowatt hours of clean, renewable electricity per year for the next 40-plus years while offsetting more than 220,000 pounds of carbon pollution from regional fossil fuel power plants each year. This is equivalent to eliminating the carbon pollution from burning 159,700 pounds of coal or 14,200 gallons of gasoline each year for the next four decades.
- Will offset the equivalent of 360,000 miles driven in a combustion engine car. This is the same amount of CO_2 sequestered each year in 189 acres of our northern forest.

Alice Peck Day Memorial Hospital (APD) has been a non-profit, community-based health care organization since 1932. They joined the Dartmouth-Hitchcock Health system in 2016. APD also includes APD Lifecare, a non-profit senior living community with two facilities that support more than 150 residents in assisted and independent living. Visit AlicePeckDay.org and APDLifecare.org for more information. ♻

Energy 'Target Fixation'

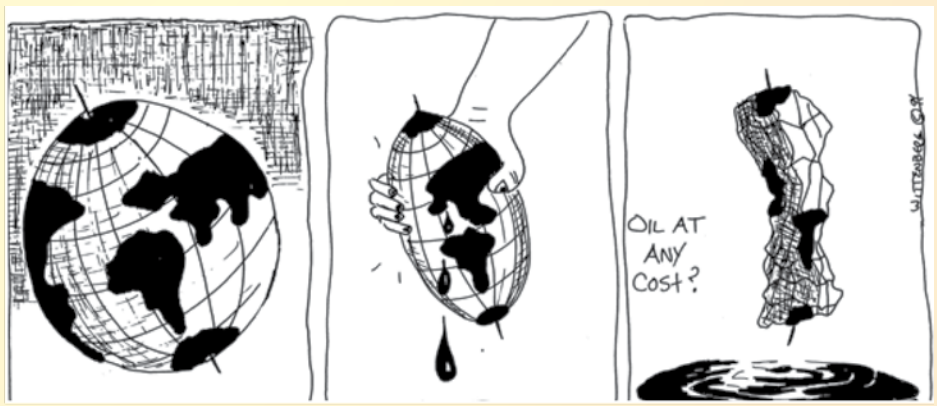
David Blittersdorf

This essay originally ran in* Green Energy Times *in October 2011. Not much has changed in nine years. But as I write this brief introductory paragraph in mid-March 2020, there is a massive change underway as the "Black Swan" event of COVID-19 crashes our bubble economy, forcing the shale oil and gas industry to go bankrupt. The CO_2 crisis increasingly threatens human survival, and we need to do better with our time and money going forward.

"I'm feeling sad today, although I am usually a happy and optimistic person. For many years, I have had a vision for humanity's future in a world with real, physical limits to growth and energy consumption. The problem is that getting there requires a paradigm shift, a major change in how we operate. The status quo has got to go. What has worked for the past few centuries no longer works, now that it has become clear that fossil and nuclear fuels are not sustainable. I occasionally feel that it will be impossible for our society to embrace change at the rate required to make this transition, but, nevertheless, I feel the need to keep on talking about it.

So, at the risk of sounding like a street-corner prophet of the apocalypse, I'm here to say: The end is near. Or at least the end of the status quo as we've come to know it. The era of incredibly cheap fossil fuels is over. They are expensive to mine and move, not only financially but environmentally. For hundreds of years, since the start of the coal-powered Industrial Revolution in the 1700s, these fuels have enabled us to create the most complex, energy-intensive society the world has ever experienced. But all of this is drawing to a close, or a big change. I know it in my gut, and I'm sure you feel it too – the future of energy is the defining issue of our age. Meanwhile, our leaders are mired in aging systems, floundering as they try to prop up our economic system by depleting our finite energy sources with imaginary money.

Our economic and financial system was conceived and runs on the assumption of infinite resources, but we are at a decision point regarding energy. Our #1 fossil fuel in usage and in practical value is oil. Over 40% of the world's energy usage is of extracted oil. Vermont's use of oil counts for more than 50% of our total energy consumption. Rather than thinking of how to reduce energy consumption and come up with other ways of living and working, it has been easier the past decade and more to go along with a flawed idea of how to fix our finances and spend more on meaningless stuff as a way to grow our way out of our economic problems. But, all of this is just happy hour, the last round of a carefree party before we hit the unyielding brick wall of resource limits.



WWW.LEAHWITTENBERG.COM

This cartoon by Leah Wittenberg from the original article in Green Energy Times in October, 2011.

It hurts when you run into an unyielding object at full speed. I discovered this when I was learning to hang glide on the sand dunes of Kitty Hawk, North Carolina. I took off and kept looking at a parked hang glider to my left in the landing zone with the intent to avoid it. I kept looking at that glider. Looking. Looking. I hoped to land away from it. But guess what? I ended up crash-landing right into it. The lesson in this case was to avoid mistakenly fixing on the wrong destination, because you always will go – or fly – right where you are looking. As a society, we're experiencing "target fixation" on a grand scale. We are looking at – and fixating on – fossil and nuclear energy as the *Cont'd on p.17*

21 Large-Scale Renewable Energy Projects Slated for NYS

Governor Cuomo announces details for 21 large-scale renewable energy projects to provide clean, affordable energy for New Yorkers

Governor Andrew M. Cuomo unveiled the details of the awards for 21 large-scale solar, wind, and energy storage projects in upstate New York, with a total capacity of 1,278 megawatts (MW). These projects will spur over $2.5 billion in investments and create over 2,000 short-term and long-term jobs. The awards accelerate progress towards Governor Cuomo's Green New Deal goal to have 70% of the state's electricity to be from renewable sources by 2030 and 100% carbon-free by 2040.

"New York continues to be a leader in developing large-scale renewable energy projects in a way that brings significant economic benefits and jobs to the state," Governor Cuomo said. "With these projects we will build on our aggressive strategy to combat climate change and lay a foundation for a more sustainable future for all New Yorkers."

Expected to generate over 2.5 million megawatt-hours (MWh) of renewable energy annually, the projects will provide enough electricity for over 350,000 homes and reduce carbon emissions by more than 1.3 million metric tons annually, equivalent to taking nearly 300,000 cars off the road. Awards went to projects that offered bids 23% lower than those received three years ago, highlighting the continuing significant cost declines of renewable energy.

Today's awards are the third in a series of annual land-based renewable procurements by the New York State Energy Research and Development Authority (NYSERDA). They are expected to enable dozens of large-scale renewable energy projects over the coming decade. In three consecutive years, NYSERDA has awarded over 67 projects since 2018, demonstrating the most significant State commitment to renewables in the nation.

All of the projects are expected to be operational by 2024. NYSERDA payments under these awards will not commence until projects are permitted, locally approved, and in commercial operation. As part of NYSERDA's solicitation, proposers underwent a rigorous review process to ensure that they have effective community outreach programs and responsible siting practices. NYSERDA will continue to work with developers, State agencies, and stakeholders to ensure that the State can achieve its clean energy goals while protecting important agricultural land and critical environmental resources.

Bliss wind farm in New York. Photo: Windtech at English Wikipedia. https://bit.ly/2JgIrIZ

As the state continues progress towards the 2030 renewable energy target, it will emphasize engagement with the communities where projects are being developed. In order to assist communities, NYSERDA will also continue to offer resources and no-cost technical assistance to the state's cities, towns, and villages.

Among the projects are 17 large-scale solar projects. Four wind projects received awards, including three upgrades to existing projects and one new project. Two solar projects will include energy storage to enhance grid integration, supporting the State's nation-leading goal to install 3,000 MW of storage by 2030. All 21 projects will be required to commit to ensuring that workers associated with the construction of projects are paid a prevailing wage, as required by the New York State Department of Labor.

The weighted average award price for this solicitation is $18.59 per MWh over the 20-year term of the contracts. It is the lowest average award price resulting from a NYSERDA large-scale renewables solicitation.

The 21 large-scale renewable energy projects (listed by region) are:

Capital Region

- Bald Mountain Solar: Boralex will build a 19.99-MW solar facility in Greenwich.
- West River Solar: Boralex will build a 19.99-MW solar facility in Moreau.
- SunEast Hilltop Solar: SunEast Development will build a 19.99-MW solar facility in Schaghticoke.

Central New York

- Garnet Energy Center: NextEra Energy Resources will build a 200-MW solar facility, accompanied by 20 MW of energy storage, in Conquest.

Finger Lakes

- Highview Solar Project: SunEast Development will build a 20-MW solar facility in Castile.

Mohawk Valley

- SunEast Flat Hill Solar: SunEast Development will build a 19.99-MW solar facility in Manheim.
- SunEast Grassy Knoll Solar: SunEast Development will build a 19.99-MW solar facility in Manheim.
- SunEast Limestone Solar: SunEast Development will build a 19.99-MW solar facility in Perth.
- SunEast Tabletop Solar: SunEast Development will build an 80-MW solar facility in Palatine.

North Country

- ELP Ticonderoga Solar: East Light Partners will build a 19.99-MW solar facility in Ticonderoga.
- North Side Energy Center: NextEra Energy Resources will build a 180-MW solar facility in Brasher, Massena, and Norfolk.
- Sandy Creek Solar: Boralex will build a 19.99-MW solar facility in Adams and Ellisburg.
- Greens Corners Solar: Boralex will build a 120-MW solar facility in Hounsfield and Watertown.
- SunEast Fairway Solar: SunEast Development will build a 19.99-MW solar facility in Oswegatchie.

Southern Tier

- Cohocton Wind Project: TerraForm Power will repower an existing wind farm, leading to an increase in new renewable capacity of 35.8 MW in Cohocton.
- Prattsburgh Wind Farm: Terra-Gen will build a 145-MW wind farm in Avoca, Cohocton, Prattsburgh, and Wheeler.
- SunEast Valley Solar: SunEast Development will build a 19.99-MW solar facility in Owego.

Western New York

- Martin Rd Solar: Empire Renewables, LLC will build a 19.99-MW solar facility in Machias and Yorkshire.
- South Ripley Solar and Storage: ConnectGen will build a 270-MW solar facility, accompanied by 20 MW of energy storage, in Ripley.
- Steel Winds Wind Farm: TerraForm Power will repower an existing wind farm, leading to an increase in new renewable capacity of 4.8 MW in Lackawanna.
- Steel Winds Wind Farm 2: TerraForm Power will repower an existing wind farm, leading to an increase in new renewable capacity of 2.6 MW in Lackawanna and Hamburg.

NYSERDA will issue the next solicitation for large-scale renewable energy under the Clean Energy Standard by Earth Day, 2020. Maintaining a predictable pace of annual solicitations for renewable energy will support continued development and investment interest in New York State.

In February, Governor Cuomo proposed the Accelerated Renewable Energy Growth and Community Benefit Act (the Act) to greatly speed up permitting and construction for renewable energy project. Under the Act, a new Office of Renewable Energy Permitting will be created to improve and streamline the process for environmentally responsible and cost-effective siting of large-scale renewable energy projects in New York. Additionally, the Act would also create NYSERDA's Clean Energy Resources Development and Incentives Program to rapidly advance development brownfields, landfills, former industrial sites, and abandoned or underutilized sites. NYSERDA, in consultation with the Empire State Development Corporation and other agencies, will immediately begin pursuing site control and pre-construction development activities for potential new renewable energy projects. Once sites are fully permitted and developed, NYSERDA will competitively auction the developed sites, bundled with contracts for renewable energy payments, for private developers to construct and operate projects. Under the Act, renewable energy project applications will be acted upon within one year, with certain exceptions. ♻

ENERGY 'TARGET FIXATION' – Cont'd from p.16

only viable energy sources. We are not scanning the horizon and seeing the big picture on energy.

The conventional wisdom in energy is the status quo, fossil fuels and nuclear power, and we keep trying to make these sources work because it's all we see. We need to look away from what we're familiar with, scan for other seriously viable possibilities and then move towards them, innovating along the way. In my opinion, our situation calls for serious and immediate efforts toward energy conservation, energy efficiency and renewables. It will not always be comfortable. By insisting on this need for serious change and trying to implement it, I and many others are upsetting a lot of people. Opponents to wind and solar, and supporters of oil, gas, coal and nuclear are mad as hell. But that's OK. We are almost at the tipping point of dramatic change. I have been saddened by the persistence of the status quo, but I am also heartened by the collective will of everyone who is becoming educated about energy issues and becoming connected with a movement to change the way our world runs, and the type of energy it runs on."

David Blittersdorf is an entrepreneur and engineer from Vermont with nearly four decades of experience as an innovative leader in the wind and solar energy industry. Blittersdorf founded NRG Systems in 1982 and AllEarth Renewables in 2004. AllEarth Renewables is dedicated to bringing clean, renewable energy to businesses, farms, municipalities and homeowners to help lessen our nation's dependence on fossil fuels and reduce greenhouse gas emissions. ♻

THE HIGH COST OF ICICLES

Lori Barg


Image: Flickr/The B's

Decades ago my friend Dana Meadows wrote: "Imagine the whole world with no one living in dire need. Think how it would feel to be part of a society that had taken on and solved, permanently, the problem of hunger". This can relate to other issues such as climate change, affordable housing; helping students learn marketable job skills through professional certification programs, saving energy and money and getting to know your neighbors.

Imagine over the next four years we certify, train and hire one out of twelve students (tenth grade to seniors in college, about 3,000 students in Vermont) to work in teams part-time, 750 hours a year, with a four-year commitment. Each team would insulate fifteen houses a year for a total of sixty houses per team over four years. This results in a grand total of 15,000 houses a year. Each house in Vermont burns an average of 650 gallons of fossil fuel a year and could save about 130 gallons each year!

Each gallon not burned keeps about twenty pounds of carbon out of the atmosphere and saves energy, money and the earth. Then, imagine the thirty-five million people living in New England and New York and the 14 million houses that they live in. Vermonters spend about a billion dollars a year on fossil fuels for heating. Imagine filling your gas tank on your car with 20% spilled on the ground. Crazy, right? But that is what we are doing with our buildings today!

Is this idea for an initiative perfect? Nope.

Is it realistic, affordable and proven? Yes. Weatherization brings a return of $1.83 for every $1 spent and a combined return of $2.69 including non-energy related benefits.

Basic weatherization is proven. Instead of walking around in your house with an extra sweater or a hat, it's "hat, slippers and a scarf" for your house: cellulose in attics, air-sealing, insulating band joists.

I hear people say "we don't have the workforce to do 70,000 houses in the next four years." The answer is training the workforce through a professional certification program.

The technical schools can certify and professionally train students with programs approved by the National Center for Construction Education and Research (NCCER) or Building Performance Institute (BPI) or similar certificate of proficiency. After four years of being paid to help their neighbors, offer students certification and opportunities for additional career paths in sustainable building performance, HVAC, windows and doors, building construction, wiring, plumbing, and welding.

Where does the money come from?

Luckily, there is a proven system called Pay as You Save (PAYS) in which every renter and homeowner can participate without needing a loan or taking on debt. To learn more watch "How your electric utility can improve your home's energy efficiency" at www.youtube.com/home-efficiency.be.

PAYS works because every month participants are saving money and energy and using some of those savings to pay for the work that was done. PAYS is a functional program that has been adopted in eight states and 18 utility districts. Rural, low-income communities have tripled weatherization rates using PAYS and 100% of low-income multi-family units use PAYS.

Two steps to reduce icicles and save the planet:

Step 1: Contact your utility and ask them to open a docket in front of the PUC to adopt a PAYS tariff which would set up a program that could apply to all utilities and ensure quality control. PAYS is recommended on page 47 of Vermont's report, "To the Vermont State Legislature Act 62– Preliminary Report on All-Fuels Energy Efficiency" which states we need $350 million to weatherize 50,000 of Vermont's 250,000 homes. No legislation is needed. The money comes from wasting less energy. No new taxes!

Step 2: Contact the technical schools and ask for programs for certification and training in weatherization. Vermont is already working to develop a certificate program to address climate change (see page 22 in this issue).

Source links available on the G.E.T. *website.*

Lori Barg is a builder, geologist and hydroelectric developer. Her new patent for a modular, environmentally- friendly hydroelectric system could power some of the 80,000 existing unpowered dams in the U.S. (The U.S. has only ~2,000 hydroelectric sites, about the same as tiny Sweden). ♻

NASA in

A Climate Pollution Resolution

Cont'd from p.3

pricing to help inform the public and enable legislators to use the most powerful lever available to reduce climate pollution. State Representative Robert Backus, chairman of the NH House Science, Technology, and Energy Committee, commended this grassroots effort:

We are strongly encouraged by efforts to bring the climate issue before town meeting voters this spring through petitioned warrant articles. As the public becomes more engaged in the climate crisis and more informed on the issue of carbon pricing, we are confident that approach will be recognized as the most effective way to reduce carbon pollution.

The energy market currently fails to account for the costs of using fossil fuels in their price. Economists favor leveling the playing field by putting the price of pollution into the cost of producing and importing fossil fuels to let efficient market forces reduce that pollution.

A bipartisan cash-back carbon pricing policy called Carbon Fee and Dividend was created ten years ago by leading economists, climate scientists, and politicians from both parties. This solution has three-parts:

1. Charge producers and importers of coal, oil, and natural gas a steadily increasing fee based on their climate pollution. The fee starts at $15/tCO2e emitted and increases by $10 each year;
2. Give all the money collected (net) back to all households on an equal basis each month by direct deposit, benefits card, or a check; and
3. Use border carbon adjustments in trade with other countries to protect US jobs and push our carbon price around the world.

Independent studies identify many co-benefits of returning all the money collected back to households. This is not an income redistribution scheme–there is no means-testing. Everyone pays for their own pollution, and everyone is compensated equally for the costs and harm done to them from all the pollution. This has a highly progressive effect: everyone with a smaller than average carbon footprint receives more money in their cash-back dividend than they pay in higher prices due to the fee, which includes most low-income households.

The delay in passing effective climate change legislation is due to a lack of political will. The New Hampshire resolution directly addresses that missing piece by giving voters an easy way to ask their elected representatives to address the main cause of the problem with an approach that benefits them.

Did not pass	Milford
Did not pass	Newbury
Did not pass 28-32	Rumney
Did not pass 538-749	Rindge
Did not pass 645-787	New Boston
Did not pass 85-88	Bow
Passed	Exeter
Passed	Wilton
Passed	Plymouth
Passed	Bartlett
Passed	Andover
Passed	Meredith
Passed	New London
Passed	Cornish
Passed	Sutton
Passed	Bridgewater
Passed	Mont Vernon
Passed (until today, 3/12, we did not know we had a C3 town champion here!)	Barrington
Passed 100-3	Jackson
Passed 1294-1185	Windham
Passed 1592-1187	Londonderry
Passed 200+ to 4	Holderness
Passed 39-33	Madbury
Passed 60-20	Marlborough
Passed 60% yes	Eaton
Passed 70% yes	Hillsborough
Passed, amended warrant	Campton

The select boards of towns that vote "yes" are directed to notify their State Legislators, Governor, Congressional Delegation, and the President that their town wants Carbon Fee and Dividend legislation to address the costs and environmental risks of climate pollution.

Economists say cash-back carbon pricing is an effective, fair, and beneficial way to reduce climate pollution. New Hampshire voters agree.

John Gage is the New Hampshire State Coordinator for Citizens' Climate Lobby and a member of the Steering Committee for the Carbon Cash-Back Coalition. ♻

SUSTAINABILITY-ORIENTED INVESTING

INFORMING MAINSTREAM INVESTMENT STRATEGIES, OR A DO-GOODER NICHE?

EarthTalk® From the Editors of E – The Environmental Magazine

It wasn't long ago that so-called "triple bottom line" investing—factoring in not just financial returns but also social and environmental impacts—was purely the domain of a small set of outliers willing to forego profits for the sake of proving that investing could be used as a tool to drive change. Just two decades ago, the only real way to have an eco-friendly investment portfolio would be to put your money with one of a handful of mutual funds focused on "socially responsible investing" (SRI)—or research and invest in often speculative individual "green" companies directly.

Al Gore's Generation Investment Management is one of the firms that has revolutionized investing by showing what good returns sustainability-oriented investments can yield. Credit: Katja Timm (VCU CNS), FlickrCC.

But in intervening years, many investors' perspectives have changed. It turns out that "green" investments are not only safer than their conventional counterparts given the actuarial risks of rampant climate change, but they also tend to perform better. Generation Investment Management (GIM), founded in 2004 by former Vice President Al Gore and ex-Goldman Sachs exec David Blood, was one of the first well-heeled firms devoted exclusively to sustainable investing—and shocked analysts 10 years in by how profitable they were. GIM's 12.1 percent annual average increase over its first decade ranked it second in profitability of over 200 competitors, including many of the biggest names in conventional investing. The lesson is that those companies prepared for and even poised to profit from a warmer future are most likely to succeed.

A 2019 report by BlackRock, the world's largest investment firm with more than $7 trillion under management, confirms what GIM's founders claimed all along: Going green pays. Not only has funding and investment in the environmental, social and governance (ESG) space almost doubled over the last five years, but these investments outperformed non-ESG bets overall. ESG-focused equity benchmarks in the U.S. yielded an annual return of 14.5 percent, compared with 14.4 percent for non-ESG investments. Meanwhile, globally ESG-based investments also bested non-ESG antes 8.1 percent to 7.7 percent.

Perhaps this new reality is why BlackRock recently announced a sweeping new set of policies aimed at making sustainability the "new standard for investing." The firm plans to launch new active and passively-managed SRI-based funds in the short term and will look into other ways to align the rest of its investments according to its investors' increasingly pro-environment values.

Environmental advocates are glad to hear about BlackRock's plans, especially given the need for the private sector to step in and take an active role in carbon drawdown in absence of federal action. Ben Cushing of the non-profit Sierra Club considers BlackRock's shift" a major step in the right direction and a testament to the power of public pressure calling for climate action."

But he would like to see BlackRock—still the world's largest investor in coal, oil, and gas—go a giant step further and disinvest entirely from fossil fuels. "BlackRock should expand on its commitments and other financial institutions should follow suit."

Contacts: GIM, generationim.com; BlackRock report, blackrock.com/corporate/insights/blackrock-investment-institute/publications/sustainability-the-future-of-investing.

EarthTalk® is produced by Roddy Scheer & Doug Moss for the 501(c)3 nonprofit EarthTalk. See more at https://emagazine.com. Send questions to: question@earthtalk.org. ♻

THE UNITED STATES' BIGGEST BANK, JPMORGAN CHASE, WILL NOT FUND ARCTIC REFUGE DRILLING

JPMorgan Chase, America's biggest bank, has committed to not fund drilling in the Arctic National Wildlife Refuge! The bank's updated energy policy rules out financing for new oil and gas drilling in the Arctic, including the refuge.

"The Trump administration is pulling out all the stops to sell off our homelands for drilling, so big banks have a critical role to play in either supporting the destruction of this sacred place or keeping it protected," said Bernadette Demientieff, Executive Director of the Gwich'in Steering Committee. "We're glad to see America's largest bank recognize that the Arctic Refuge is no place for drilling, and we hope that soon other banks and the oil companies they fund will follow along."

Polar bear in the Arctic. Image: oceantoday.noaa.gov.

This is just the latest major institution walking away from the bad business of drilling in the Arctic National Wildlife Refuge. Chase's announcement follows a similar move by Goldman Sachs in December, as well as more than a dozen global banks. Sadly, other major banks have yet to make a commitment to the Gwich'in and the Arctic Refuge. Let's get Citi Bank of America, Wells Fargo and Morgan Stanley to drop Arctic drilling, too!

On February 24, 2020, an article in *The Hill*, by John Bowden and Rachel Frazin stated, "This follows the bank's 2017 commitments to facilitate $200 billion in clean energy financing and source renewable energy for all of its needs by the end of this year.

It also plans to phase out all existing and future loans to companies that get the majority of their revenue from coal mining by 2024."

Some reviews have commented that this commitment does not restrict oil and gas financing outside the Arctic. *The Hill* article authors noted that, "Three of the top ten coal mines in the world, by annual production, could still be financed under this policy".

When the world's worst fossil-fuel banker will not fund the toxic Arctic Refuge drilling, it certainly puts pressure on other big banks and financial institutions like Wells Fargo, Citi, Morgan Stanley and Bank of America.

Read more and take action to keep the pressure up on other big banks to follow suit. Sign the petition, send a tweet, and refer your friends to get involved at https://thehill.com/jp-morgan-chase-stops-fossil-fuel-loans. ♻

Community Power New Hampshire

Cont'd from p.11

to the most effective operating model, and how CPNH may expand in-house expertise and operational functionality overtime.

Community Engagement

New Hampshire is home to roughly 70 local energy committees. Many of those communities, and many more still, are looking for a pathway to make use of Community Power. Through partners such as the NH Municipal Association and Clean Energy NH, we hope to maintain active communication with our counterparts across the state who may wish to stay informed and supportive of our efforts. Working with regional planning commissions, we will develop toolkits and templates to enable speedy adoption of Community Power programs across the state.

We will maintain information about progress of the CPNH on nhenergy.org, and will host a Community Power Summit on Friday, June 5, 2020 to prepare municipalities for implementation (save the date!).

The aspirational timeline we have set for ourselves envisions a launch of initial Community Power programs through CPNH later in 2020 or early in 2021.

The Community Power law presents an enormous opportunity for our local governments to take control of our energy futures. We believe that CPNH is the pathway to seizing that opportunity, and we invite other communities to join us and strengthen our efforts.

Community Power NH Members:

Town of Bristol: Paul Bemis, Bristol Energy Committee; Town of Harrisville: Mary Day Mordecai and Ned Hulbert, Planning Board Town of Hanover: Julia Griffin, Town Manager and April Salas, Sustainability Director City of Lebanon: Clifton Below, Assistant Mayor and Tad Montgomery, Energy and Facilities Manager; City of Nashua: Doria Brown, Energy Manager; Cheshire County: Rod Bouchard, Assistant County Administrator/ Special Projects and Strategic Initiatives.

Supporting Partners:

Monadnock Sustainability Hub: Dori Drachmann, Co-founder; Dartmouth College Thayer School of Engineering: Dr. Amro M. Farid; Community Choice Partners: Samuel Golding; Rockingham Planning Commission: Jill Longval; Clean Energy NH: Henry Herndon ♻

Celebrating Earth Day!

"We have met the enemy and he is us."

– From a Pogo cartoon that appeared on the first Earth Day.

George Harvey

The first Earth Day happened on April 22, 1970. It was originally viewed as a teach-in about environmental issues that would happen across college campuses in the United States. It quickly became much more than that.

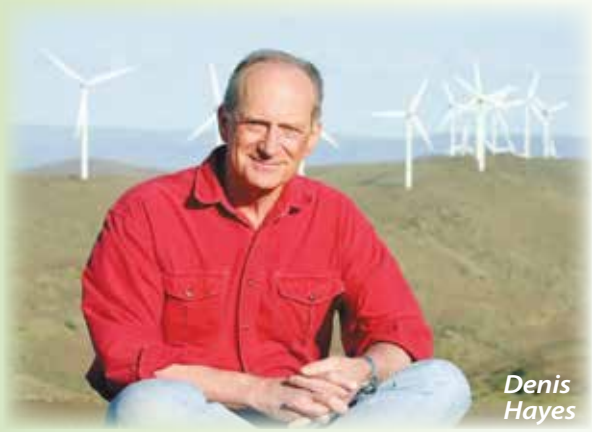
Senator Gaylord Nelson. Photo: Fritz Albert

To understand the history of the event, it is important to take context into account. This was not an issue of Right versus Left or Republican versus Democrat. It was an issue that appealed to people of all values and persuasions.

Up until that time, there was little control on pollution. Industry used the environment as their own dumping ground and effluents of all sorts were simply dumped into rivers and streams. It was not uncommon to see soap suds from laundromat wastewater floating on a river. What was out of sight could be much worse. A few years earlier, the waterways had been sources of drinking water and food. Air pollution was even worse than that.

The idea of a day devoted to issues of clean air and water was being floated by several people. Leaders in congress and in states looked into ways to protect the environment and human health and life. Among them was a long-time conservationist and United States Senator from Wisconsin, Gaylord Nelson, who first proposed the idea of Earth Day in 1969. To organize the day's events on college campuses, he hired a young law student and budding environmentalist, Denis Hayes.

When Richard Nixon gave the State of the Union Address in January of 1970, he devoted about a third of the speech to environmental issues. One thing he said was this: "Restoring nature to its natural state is a cause beyond party and beyond factions. It has become a common cause of all the people of this country. It is a cause of particular concern to young Americans, because they more than we will reap the grim consequences of our failure to act on programs which are needed now if we are to prevent disaster later."



Denis Hayes

Photo: crosscut.com

The first Earth Day came less than four months later, on April 22, 1970. It was originally conceived as a teach-in event for schools and colleges. With Hayes' organizational skills, it was observed at about two thousand colleges and universities, and possibly ten thousand other schools, in this country.

However Earth Day was not exclusively tied to schools. In fact, Richard and Pat Nixon celebrated the first Earth Day by planting a tree on the White House lawn. While the Nixons' yard work was reported by media, it was very much overshadowed in the news by large demonstrations pressing for action to protect the environment. In New York, Mayor Lindsay closed down Fifth Avenue. There were other large events in Philadelphia and elsewhere.

Work on both sides of the aisle in congress to protect the environment did not end after the first Earth Day. President Nixon proposed the establishment of the Environmental Protection Agency, and then created it by executive order in December of 1970. It was later ratified by congress.

Turning of the Tide

Richard Nixon continued to support environmental measures while he was in office. He signed the Occupational Safety and Health Act in December 1970, creating OSHA. While he vetoed the Clean Water Act in 1972, he did so because he objected to the amount of money allocated; his veto was overridden by both chambers of congress in October, 1972. He signed the Marine Mammal Protection Act in 1972 and the Endangered Species Act signed in 1973.

Senator Gaylord Nelson continued his environmental activities after the first Earth Day. He summed up his position on the environment, "The economy is a wholly owned subsidiary of the environment, not the other way around." After leaving the senate, he became counselor for The Wilderness Society. In 1995, he was awarded the Presidential Medal of Freedom by President Clinton. He died in 2005.

After the first Earth Day, Denis Hayes continued to spend time organizing it. He founded the Earth Day Network to coordinate activities internationally, and under his guidance, the event expanded to be observed in well over a hundred countries. Since 1992, Hayes has been president of the Bullitt Foundation in Seattle, Washington. He sponsored and oversaw the design and construction of The Bullitt Center, the world's first solar-powered, energy-positive, multi-story office building. The International Living Futures Institute certified it as a "Living Building." As we approach the fiftieth Earth Day, Hayes continues to be active in environmental and energy policy worldwide.

Earth Day is now celebrated in 193 countries each April 22. You can learn more at www.earthday.org.

Be sure to send in videos and pictures of how you are celebrating the earth with your local media outlets and the Earth Day organizers! ♻

Cont'd on p.21 >>

Planting a tree on the first Earth Day. White House photo office.

Green Up Day Celebrates 50 Years of Success - and More to Come!

Always the first Saturday in May, Green Up Vermont rallies thousands of volunteers across the state of Vermont to get outside and clean up roadsides and waterways. It is a statewide spring-cleaning of our beautiful environment. Green Up Vermont produces Green Up Day by providing 66,000 bright green trash bags that designate this civic day-of-service. Contests and promotions are also run in the months leading up to the Saturday event to remind people how important it is to take care of our environment and to participate on Green Up Day.

Vermont is believed to have the oldest statewide yearly clean-up event in the country. This year, Green Up Day is on Saturday, May 30, 2020 and will be Green Up's 50th anniversary. Over the years, Vermonters have picked up thousands of tons of trash and saved taxpayers millions of dollars that would have otherwise been spent on clean-up crews. It is an activity that all residents, businesses, and visitors can participate in as well as benefit from. This year, Green Up will be adding new ways to get involved including having a Green Up Scuba Team in Lake Champlain and by introducing the Swedish activity of plogging (picking up litter while jogging) to Vermont. There is also a Vermont app to track teams, coverage, and events.

Building on the success that the Green Up Vermont brand has developed, the future of Green Up is strong. "We will be implementing additional educational programs to keep our youth engaged by instilling a reinvigorated sense of pride in not littering and taking care of our state. We will also be getting out into the community to raise awareness about the various good environmental practices people can do year-round to really make an impact," stated Kate Alberghini, Executive Director of Green Up Vermont. She continued, "With a hyper-focus on climate change, Vermonters have really been grassroots leaders for environmental health. With 50 years of committed effort and more to come, I believe continuing to shift the mindset of our youth to make further environmental impacts is imperative and achievable."

Green Up Vermont is a private non-profit 501(c)(3), whose mission is to raise public awareness about a litter-free environment, culminating with a statewide clean up event called Green Up Day. Green Up Vermont relies on the generous support of businesses, grants, and individuals to fund the organization. Individuals can choose to donate to Green Up Vermont on line 23, Charitable Tax Contribution, on the Vermont State income tax return or donate online. To learn how to stay involved and connected with Green Up Vermont go to www.greenupvermont.org and follow us on Facebook and Instagram.

Mark your calendars for the 50th Green Up Day! Please note that the date has changed to Saturday, May 30, 2020. ♻

School activity of Greening Up in Chester, VT. Courtesy photo; bottom: Clean-up efforts in Springfield, VT. Photo by Caitlin Christiana.

Fighting Climate Change with Trees in Bennington, VT

Evan Lawrence

Image: Wikimedia Commons/Todd Hatch (U.S. Army Corps of Engineers)

As nature-based solutions to address climate change gain more and more attention, Climate Advocates Bennington 350VT has set itself the goal of planting at least 1,000 trees in and around the southwestern Vermont town this year.

"The plan was inspired by a report last July that found planting 2 billion trees could prevent the worst effects of climate change," said Climate Advocates member Naomi Miller. Reforestation groups have proposed planting 2 billion trees world-wide. Spurred by massive fires in the Brazilian rain forest and Australia, the World Economic Forum in Davos in January set a new goal of 1 trillion trees (1t.org), or 128 trees for every person on Earth.

How many trees go in the ground around Bennington this year will depend on how much money the group raises, Miller said. The first planting of six trees will be a ceremonial Earth Day kick-off at 2pm on Sunday April 19th at the Shaftsbury homestead of Jonas Galusha, the fifth governor of Vermont.

Other sites will probably be planted in the fall. A privately owned farm in North Bennington has committed one or two acres, Miller said. The site is being reviewed for how many trees it can support, but Miller said it could take "maybe 500." Volunteers will plant "a carefully chosen mix of hard and softwoods," guided by the succession of how the tree species sequester carbon, she said. Softwoods grow and fix carbon faster but have relatively short lives. Hardwoods grow more slowly but live longer and take up much more carbon over their lifetimes.

The Vermont Veterans Home in Bennington has expressed interest in being a site and is discussing details with the group, Miller said. They've heard from other landowners who are eager to participate.

Climate Advocates is working with the Bennington County Conservation District and the Vermont State Lands forester to determine which trees will grow best where, Miller said. The seedling trees will come from a local nursery, so that carbon emissions from transportation are minimized.

The project is not only about reforestation but also about building community and community resilience, Miller said. "You need no tree planting experience to volunteer," she said.

To raise funds, Climate Advocates; Bennington College; Queer Connect Inc., a local LGBTQ advocacy group; and Vermont Arts Exchange planned to sponsor a concert by folk singer and activist Holly Near on March 21 at Bennington College. Proceeds after expenses were to support the tree planting project, but the concert was canceled due to concerns about the coronavirus epidemic. Organizers hope to reschedule for some time next year.

For more information and to offer support, visit climateadvocatesbennington.org, Climate Advocates Bennington 350VT on Facebook, or contact project coordinator Barbara True-Weber at (802) 681-7236 or trueweber@gmail.com.

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

<< Cont'd from p20

Here are some interesting quotes from the roots of the Earth Day *fathers:*

"The fate of the living planet is the most important issue facing mankind" — Gaylord Nelson. (www.azquotes.com/author/23810)

"I feel more confident than ever that the power to save the planet rests with the individual consumer" — Denis Hayes. (www.azquotes.com/author/27085)

"We shouldn't fuel the future with the polluting methods of the past, ... We have the technology to power our future in ways that don't threaten our health or poison our planet. Let's choose to use it" — Denis Hayes. (www.azquotes.com/quote/718867)

The Bullitt Center in Seattle, Washington certified as a "Living Building." It was the world's first solar-powered, energy-positive, multi-story office building in the world.

EARTH DAY ECO-CHALLENGE

April 1 - April 30, 2020

EARTHDAY.ECOCHALLENGE.ORG

With our rapidly changing climate, we will be facing more, not fewer disruptions of all kinds. Individual and community resilience is the best defense. Let's do both together in April.

To celebrate the 50th anniversary of Earth Day and to take action together, even though we are apart, join the Upper Valley team and make your actions count.

This year, there a number of actions that are specifically related to our current crisis. There are also actions tailored to our region, with more being added soon.

Miller inserted, "Our family is going to focus on eating lower on the food chain and paying attention to our food waste and meal planning. What might your family focus on?"

Join the Upper Valley Climate Action 2020 team at earthday.ecochallenge.org and create community as we practice habits that are good for the climate and for our health.

Let's Take Action Together!

Sign in and sign up at:
earthday.ecochallenge.org.

Submitted by Lyn Swett Miller. Evelyn is a member of the Hanover Climate Action Group. Contact : evelynrswett@gmail.com.

Time to Go Fishin'

Cont'd from p.1

pollution problems have been around a long time. We can think back to the nineteenth century, when there was a thriving commercial fishing fleet in Lake Champlain. Overfishing and pollution did their work on that. But even here, the pollution is not as bad as it could be. PFAs are found in our food and water, but have not been shown to be bioaccumulating in our fish, as yet. Microplastics have also appeared in the news. But they have not appeared in any alarming way in our fresh water fish, as yet.

There are some contaminants anglers should be aware of. Historically, our waters were polluted by mercury emitted by coal fires, largely in the Midwest, and the methylmercury it produced is still in our waters. More modern pollutants include PCBs and others. Levels of these contaminants vary widely among species of fish and different bodies of water. Some pollutants tend to accumulate in fish that are higher on the food chain, and bigger fish are likely to have more contaminants than smaller ones. Also, effects of methylmercury are much worse problems for the youngest children, so extra care should be taken by those who are six or younger and by women of child-bearing age.

The states have advisories, and it is good to review these for your state. NH: http://bit.ly/eat-fish-safely-nh, NY: http://bit.ly/eat-fish-safely-ny, and VT: http://bit.ly/eat-fish-safely-vt.

Other pollutants are also of high concern today. One is PFAs, which seem to be everywhere. Another is from agricultural runoff, which often contains phosphates which can lead to algae blooms and large amounts of cyanobacteria in the water. And there are such toxins as glyphosate (the active ingredient in products like Roundup).

Having said all that, fishing is definitely alive and well in the region. And locally caught fish can be an important part of a healthy diet.

Eric Palmer, Vermont's Director of Fisheries, told us a few things we did not know about fish in Vermont waters, including Lake Champlain. "When folks think of climate change, they think of warming and the effects of warmer water on fish. It is true that warmer winters produce less ice cover and earlier ice-outs. But when I think of climate change, I think of higher precipitation, including its impacts."

While higher precipitation can produce devastating impacts, especially for such fish as brook trout, so can drought. These fish need cool water, where the levels of oxygen are high and their metabolisms are not unduly increased. With heavy rain, they can be washed down to water too warm for them. But in a drought situation, they may not be able to get to cool water at all. "Being able to move is one factor of climate change," Palmer said.

When we asked about dams, he said they are only part of the problem. "In Vermont, one of the main barriers to fish movement is road crossings and culverts. They have to be built correctly, with the right slope, orientation, and width, to accommodate sediment. Too steep or too shallow and they block fish movement entirely. Size, slope, and orientation are the issues."

He also put focus on an issue most people might not think about. A lot of the food fish eat actually comes from the forest. He said there is a saying, "Fish grow on trees." The trees are habitat-forming features, especially when they die and fall into the river. Having good habitat and especially good vegetative buffers make it easier for trout to survive. But with a decline in the health of forests and a changing climate, there will be effects that will be harder to predict on fishing.

As for the future of fresh water fishing in the Northeast, the changes brought about by a warming climate are far more obvious for land-dwelling animals, such as moose, than for fish. Climate change is here, and it is getting worse.

In the broader picture, salt water fishing is definitely changing as the seas warm. While declines in global catches of salmon may suffer from habitat destruction and cod may suffer from overfishing, there are definitely changes relating to carbon emissions and changing climate. Ocean acidification due to dissolved carbon dioxide is reducing the ability of shellfish to produce shells. Lobster harvests are reduced in southern areas as the location of densest population is moving farther north. Some ocean fish are also on the move, creating another set of environmental problems.

But fresh-water fishing is still a great opportunity to get outdoors, spend some time in nature – and maybe have a good meal. ♻

REDUCE, ADAPT, DRAWDOWN! GO RAD NOW!

Lori Barg

Image: lifelonglearningteachers.blogspot.com

Are you a student, teacher, or mentor with skills to share? Do you want to solve real-world problems while working together in teams using a lot of common sense and a little money? The Champlain Maker Faire (CMF) is developing two programs to help solve real-world climate problems, RAD and Scrounge-a-thon.

What is RAD? Reduce, Adapt, Drawdown. CMF has small grants available to help teams of Vermont students to solve the five problems outlined below.

1. Bio Launcher. Maybe your team wants to design an affordable (under $500) method to move wood pellets. CMF, with help from Bourne's Energy and Pellergy, will provide your team with a piece of flexible auger and a piece of grounded tubing if you want to vacuum the pellets. While $10,000 systems exist to move wood pellets, we need one that costs around $500 and that anyone with a pellet stove can afford.

2. Ride-share. Are you alone in your car driving from here to there and know a neighbor's kid is going in the same direction? Have you ever wondered why we all drive separately to team sports or conferences? There has got to be a better way. If your team wants to improve our existing transportation system, CMF has grants for your team to use open source software like libretaxi.org and others to solve the ride-share problem safely for rural communities or check out wheeli.com or carpools for kids.

3. Weatherizing. Does your team want to build a DIY blower door? Does your team want to develop a high-R sheetrock or develop a zero-carbon concrete? Apply and complete Certificates of Proficiency to weatherize tens of thousands of houses that need weatherization. We have some money for your team of students to propose good solutions. (see article on page 18 of this issue)

4. Water quality. "It would take a single tree 53.46 days – or almost two months – to offset the carbon emissions of a single six pack of beer". Another option is algae, when used in conjunction with artificial intelligence-powered bioreactors, is up to 400 times more efficient than a tree at removing CO2 from the atmosphere. Algae in lakes and seawater can be used to make organic, bio-degradable plastics, flip-flops, surfboards, food and other cool stuff. CMF is looking for water-quality funding for teams, but if your team wants to clean up lakes and get plastic out of the world, think about entering this RAD challenge!

5. Dirty Plastic into fuel. Take dirty, floatable plastic, melt it down in the absence of air and (depending on the temperature) pour the resulting diesel, kerosene or gasoline into your favorite internal combustion engine. This is not perfect, but since they predict four times more plastic will be used in 2050 than are used today, we have to do something with the amount of plastic we have created over the last decades.

CMF is looking for funding to develop Certificates of Proficiency in RAD projects for whatever you can do or dream you can do. We need students, teachers, mentors.

Help make a difference with real world solutions! Contact: www.goradnow.com.

Links available on G.E.T.*'s website.*

Lori Barg is a builder, geologist and hydroelectric developer. Her new patent for a modular, environmentally- friendly hydroelectric system could power some of the 80,000 existing unpowered dams in the U.S. (The U.S. has only about 2,000 hydroelectric sites, about the same as Sweden). ♻

Cool You, Cool Planet!

Jessie Haas

Cooling will become a greater necessity and create a greater environmental burden as our planet heats. As we swing into the season when cooling, rather than warming, is the issue, it's time to consider the great two-for-one deal of a mini-split heat pump or geo-thermal system. Both can be used to chill as well as warm your home and are as clean as the grid from which you draw your electricity.

There are federal, state and utility incentives for installing them. Check them out in the Incentives section on pages 14 and 15.

Perhaps heat pumps are a little too expensive for you, or you're off-grid; or you don't own the home you live in. You can still stay cool this summer, and summers to come, in an environmentally sound way. You can use these techniques and save your air conditioner for true emergencies.

Trees provide free natural shading to keep your home cool. Image: livingrootless.blogspot.com. Heat pump. Image: Wikipedia.

For homeowners, think trees. Trees in the right places both shade your house and cool the ambient air through transpiration. According to the Wilcox Tree Nursery, evapotranspiration can reduce summer temperatures near a large tree by two to nine degrees. Shaded walls are cooler by between nine and 36 degrees. Shade on a roof can cool a house eight to ten degrees. To accomplish these goals, plant deciduous trees on the south and west sides of the house. Shading the lawn and driveway also help cool the ambient air.

It's also helpful to shade an outside air-conditioner or heat pump unit by planting low native shrubs or using trellised vines. The DOE estimates this can reduce energy use by 10%. It's also helpful to place the air conditioner on the north side of the house.

While cooling the air, trees perform many other environmental services; cycling nutrients, building carbon into the soil, and sending up microscopic particles that seed clouds to produce rain. But a large tree starts as a small tree, and a small tree will take awhile to grow into its job. Plant trees now, and while you wait for them to mature, take other steps to stay cool while not overheating the planet.

If you have a dark-colored roof, paint it white to reflect heat. Shade south and west-facing windows with awnings or shade cloth to keep the sun out. Draw interior shades on sunny days. Window Quilts and other insulating shades that keep the heat in during the winter can keep heat out during the summer.

Even if you are a renter, there are plenty of other approaches to staying cool without contributing to climate change. For instance, create a natural breeze through your home. Open a lower window at one end of the house and one that is higher at the other end. Warm air will exit through the upper window and cool air will flow in the lower one. The movement of air will also help you feel cooler.

Change lightbulbs to LEDs, which generate much less heat. Cook outdoors as much as possible. Use fans. A fan blowing across a bowl of ice acts like an air-conditioner. You can also hang a wet sheet over an open window or in front of a fan. The moving air will act as a swamp cooler. Damp-mopping a floor can also contribute to evaporative cooling.

If that isn't cutting it, consider creating a 'cooling shelter' in your own home. Install an Energy-Star window-mounted air-conditioner in a room with a door you can close. Cool that room only, and only when you need to. You can retreat to it when the rest of the house is uncomfortably warm. A bedroom on the north side of the house is a good choice, especially if you can shift some office and entertainment functions into that room for a while. Create a 'grotto' there, or in your cellar, like the Italians, with snacks, chilled drinks, good books and music.

Finally, focus on cooling yourself, and you won't have to burn fuel and spend money trying to get your house cool. Living off-grid, I've found that frequent cold showers, wearing a damp bathing suit for much of the day, wetting my hair, and using a hand-held misting fan can keep me comfortable. Sport clothing featuring cooling fabric can wick away moisture and cool the body by several degrees.

Some herbs, particularly hibiscus, help the body cool itself. You can make herbal sodas by steeping a tea bag or loose-leaf tea in a jar of sparkling water in the refrigerator. Make ice-cubes of herbal teas as well, so the melting doesn't weaken the drink. Staying hydrated is an important element of healthy self-cooling. So is a little extra salt. Sweating is how the body cools itself, but the salts you lose need to be replaced. Here's a case where potato chips and popcorn are arguably a healthful snack!

Hot nights can be made more comfortable by freezing a hot water bottle to cool the bed down, using a buckwheat-filled pillow, which doesn't absorb body heat, putting your sheets in the freezer before bedtime, or even using a damp sheet. Sleep in a hammock for better air circulation. Sleep in the basement, or outdoors on a deck or porch. And just before bed, read a story of arctic exploration or sailing on the North Sea, to chill you mind and help you appreciate the warmth.

Links available on G.E.T.*'s website.*

Jessie Haas has written 40 books, mainly for children, and has lived in an off-grid cabin in Vermont. ♻

HEAT PUMP INCENTIVES
New Hampshire/New York

NEW HAMPSHIRE:

NHEC's ENERGY STAR Heat Pump incentive structure for 2020 is as follows:

Heating and Cooling *(Must meet or exceed the minimum efficiency requirements -SEER 18/EER 12.5/ HSPF 10)* $500/ton.

Geothermal *(Must meet or exceed the minimum efficiency requirements - EER 16/3 COP)* $500/ton.

Cooling only *(Must meet or exceed the minimum efficiency requirements - SEER 15/EER 12.5/)* $70/ton.

Wi-Fi thermostats *(Must be installed with a heat pump also receiving an incentive)* $100 rebate/T-stat.

Weatherization Bonus *(Available for members participating in the Home Performance with ENERGY STAR Program)* $250/ton.

Whole House Bonus *(Available for qualified heat pump applications that offset 80% or more of the total heat load. Two years of fuel use history required)* $250/ton.

ENERGY STAR Heat Pump Water Heater *(Must meet or exceed 2.3 energy factor)* $750 rebate on 50 gallon or greater.

Load Buy down – NHEC provides interest subsides through participating banks and credit unions for the installation of qualified heat pump installations. Must get pre-qualified. Loans up to $15,000 after rebate.

Learn more at: www.nhec.com.

NEW YORK:

NYSERDA currently has a $1,500/ton incentive on geothermal for residential systems (<10 tons) and $1,200/ton for commercial (>10 ton) systems.

Air Source Heat Pumps (ASHP) info for New York State: https://bit.ly/3425wc4.

Please note: *Incentives can be modified as utilities will take over the incentive programs in the near future.* ♻

CHOOSING INSULATION FOR CARBON VALUE

– Why More is Not Always Better (Part 1)

Catherine Paplin,
R.A. AIA, Steven Winter Associates, Inc.

Insulation is the single most important material choice to maximize an enclosure's thermal resistance. Combined with a good continuous air seal, the highest insulation value makes the greenest enclosure – reducing a structure's carbon footprint. It may come as a surprise, then, that some of the most commonly used insulation materials are so carbon-heavy to manufacture and install that they wipe away the carbon savings they are supposed to provide.

Embodied Carbon, Operational Carbon, and Climate Change

Almost 40% of the total carbon dumped into the planet's atmosphere each year is attributed to buildings. We have overwhelmingly focused on operational carbon – the carbon that buildings emit as they are being used, but embodied carbon – the carbon that goes into constructing buildings - is typically far greater than the energy saved in the first decades of operation. However, if a building stands for decades or centuries, its operational carbon will eclipse its embodied carbon over its lifetime. Therefore, when the building's carbon Life Cycle Assessment (LCA) is calculated, operational carbon savings will be more important than embodied carbon saved and spent in the long run.

Why does embodied carbon deserve equal weight with operational carbon? Because 28% of global carbon emissions from buildings is pegged to embodied carbon--50% in the first 30 years of a building's life. In effect, every new building is in "carbon debt" upon completion due to the huge amount of carbon emitted in order to construct it. So, for the climate to benefit from the energy savings provided by a well-insulated and sealed enclosure and a high efficiency energy system, the building needs to be durable and last for a very long time. The problem is, we cannot afford to make choices that have us paying off a carbon debt decades into the future.

All this is not to suggest shifting focus away from reducing operational carbon and primarily (or exclusively) to embodied carbon. On the contrary, the lower the operational carbon emissions, the quicker the carbon debt is paid off. Thermal insulation is therefore critical. Conversely, the lower a building's embodied carbon, the more effective its operational efficiency really is. The two values are inseparable. When design seeks to minimize both types of emissions, the resulting building can radically reduce carbon emissions.

HFC blown-in SPF insulation. Courtesy images: SWA.

Thermal Value of Insulation

The primary purpose of thermal insulation is to provide resistance to heat transfer through the building enclosure, typically quantified as R-value. The higher the R-value, the better the insulating property. With respect to commercial construction in the NYC area, the three most common materials are:

1. Plastic foam (highest R-value) – sprayed or board, expanded or extruded;
2. Mineral fiber – board, batt or sprayed;
3. Organic fiber – batt or sprayed.

Embodied Carbon Value of Insulation

Unfortunately, two of the plastic foams that provide the highest R-value – closed-cell polyurethane spray (SPF-HFC type) and extruded polystyrene board (XPS) – also have the highest embodied carbon (by a lot). This is because they're both made with a hydrofluorocarbon (HFC) blowing agent that has over 1000 times the global warming potential (GWP) of CO_2.

Considering this, it's easy to conclude that HFC blown plastics should be phased out and taken off the market, but we've become so dependent upon SPF and XPS, because they do so many things in addition to providing high R-value.

Insulation's Other Values

XPS board is waterproof, serves as a vapor barrier, and if taped and sealed, is an air barrier. Therefore, this insulation type can take the place of a vapor barrier or an air barrier in a wall assembly. And, with various levels of compressive strength, it has real structural value as well. Moreover, XPS board is often used as a protection board for membranes and is the go-to insulation for foundation waterproofing due to its long-term ability to stand up to hydrostatic pressure. And, it is dimensionally stable with good R-value retention over time.

Closed-cell SPF is also highly water resistant and is an even better air barrier. When installed at a minimum 1.5" thickness, it is also a Class I vapor retarder. Sprayed on SPF can provide structural rigidity in some wall systems. It is also dimensionally and thermally stable.

None of the other insulations, even the non-HFC blown plastics, completely replicates all the characteristics of HFC blown SPF and XPS. Furthermore, plastic foams generally are highly flammable and are not the best fit for every application. So, how can we make up for the loss of the combination of helpful qualities that has made us so broadly dependent on them?

Stay tuned for Part 2 to find out. ♻

XPS Insulation Boards >>

AeroBarrier™ Case Study:

MULTI-FAMILY RENOVATION *w/o* MECHANICAL VENTILATION

Nate Gusakov

This is the fifth article in this series highlighting our experiences installing AeroBarrier™ around New England. Here's a quick refresher on the technology.

AeroBarrier® is a patented building envelope sealing technology that simultaneously measures and seals building envelope air leaks. In a nutshell, the system involves pressurizing the building (to +100 Pascals) with a blower door, setting up a series of tripods with spray nozzles on them (similar to mini snowmaking guns) and introducing a fine mist of aerosolized water-based acrylic sealant. From there, the pressure drives the sealant to all the small cracks in the building and seals them up. During installation, we monitor the air leakage on our computer and watch as the various holes and cracks throughout the house are sealed. When we reach our leakage target, we turn off the machine, clear the air with a few fans and open windows and clean up. The space can be worked in again within about thirty minutes, and once cured, the sealant is a non-toxic, low-VOC substance that is GreenGuard Gold certified for use in schools and hospitals.

Preparation of living room for AeroBarrier® installation showing the application set-up.

In this article we share our experiences air-sealing three connected units in Bristol, VT. The units were being completely renovated to serve as low-income housing, and the scope of the project included weatherization to maximize comfort and minimize heating and cooling utility bills. An interesting challenge for the project team was that because mechanical ventilation had not been specified for the renovations to the units, there was a risk of sealing them too tight—this would potentially have left the occupants without adequate fresh air, and also might have risked excessive humidity buildup during winter months when all the windows would be shut tight for the season. After performing ASHRAE calculations for required fresh air and factoring in some passive air inlets that were being installed, the team called for the units to be sealed to an airtightness measurement of 2.0 ACH50 – no more, no less. Because we are monitoring air leakage in real-time as we install, we were able to guarantee that we could bring the units to that target, without surpassing it and over-tightening the building envelopes.

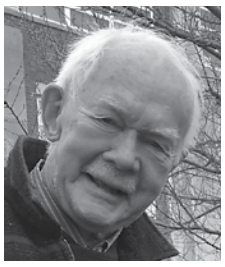
When installation time came for AeroBarrier™, another challenge presented to us was that the units had been finished and carpeted ahead of schedule; this meant we would have to do an exacting and thorough job of covering horizontal finished surfaces to protect them from accumulating a thin film of AeroBarrier™ sealant. (The sealant leaves no lasting damage, but if that thin film cures on finished surfaces, it takes a fair amount of elbow grease to get them clean again.) Our crew took care to protect each unit thoroughly; wrapping appliances, laying adhesive carpet protection or rosin paper on finished floors, and covering fixtures. Once preparation was done, we set up and began our install. After one day of sealing, we had brought the three units to airtightness measurements of 1.95, 1.91, and 1.96 ACH50 respectively. Our ability to monitor leakage in real-time as we install enabled us to stop installation right at the target, ensuring maximum possible air-tightness for the units without over-sealing them.

Nate Gusakov is a lead installer for Zone 6 Energy. Zone 6 Energy is a home-grown Vermont company specializing in air leakage diagnostics and consulting. They offer commercial and residential blower-door testing, home energy audits, and AeroBarrier™ installations throughout New England and upstate New York. www.zone6energy.com. ♻

Zone 6 onsite at Hunt Farm for AeroBarrier installation. Courtesy photos.

A TRILLION TREES

"It was the Africa I dreamed of when I was ten and fell in love with Tarzan," said primatologist and anthropologist Jane Goodall in a recent interview with CNN's Becky Anderson. "I left Gombe, my chimpanzee study, in 1986, having realized that chimpanzees and forests were vanishing across Africa and realizing I needed to do something. And part of that was going around the planet, talking about those problems and learning more at the same time about what we've done to harm this planet. The crazy thing," Goodall said, "is the biggest difference between us, chimps and other creatures is the explosive development of the intellect. So how come the most intellectual creature ever to walk the planet is destroying its only home?"



John Bos

There's a renewed sense of urgency to her activism at age 86. Her days are packed with meetings with world leaders, visiting conservation projects, supporting her Roots & Shoots movement and sharing her message with anyone who will listen.

"We're going through very dark times," Goodall said, "socially, politically and especially environmentally. And lots of people are kind of losing hope, because you get this message, think globally, act locally. But if you think globally, you get really depressed. So, the message is about acting locally. And the main message is that each one of us makes some impact on the planet every single day."

Which brings me to the number one trillion. Do you have any idea how big a trillion is? One trillion is a thousand billions, or a million millions.

In an effort to wriggle out of the climate denial conundrum they're finding themselves in, Republican leaders in Congress and their climate-denying president that they have sworn fealty to, have found their way (drum roll) to a "climate plan." A central plank of the plan is the planting of one trillion trees. Sound like a step in the right direction? No. This may be an even more dangerous pro-fossil fuel strategy than the outright denial that has pervaded the party for more than a decade.

U.S. Rep. Bruce Westerman (R-Ark.) introduced the Trillion Trees Act, legislation that would plant one trillion trees globally by 2050 and incentivize the use of wood products as carbon sequestration devices. "Trees are the ultimate carbon sequestration device," Westerman said. "Every day, countless billions of plant cells are pulling carbon from the atmosphere and permanently storing it in wood. That's why this legislation is so important. We're taking proven science and turning it into practical solutions. Not only are we setting an ambitious goal of planting one trillion new trees by 2050, but we're also reinvesting resources into managing forests and using wood products."

Conservatives are slowly being boxed into a corner by the unbending physics of carbon dioxide heating our planet and the daily increasing news about climate-related weather, flooding and drought events that can no longer be denied.

The Trillion Trees Act is based on a July 2019 Swiss report featured by the American Academy for the Advancement of Science that concluded planting one trillion trees across the world could sequester 205 gigatons of carbon. That's roughly the equivalent of two-thirds of all manmade carbon since the Industrial Revolution.

So, what, you may ask, is so bad about planting a vast number of trees over the next 30 years? The answer is that "proven science" demands that we need to cut emissions by nearly 80 percent this decade if we want to preserve a habitable planet. Achieving partial emission reductions by 2050 won't do it. To achieve an 80% reduction in ten years would upend the fortunes of Republican donors and require government intervention on a scale that's anathema to a Republican Party hell-bent on privatization. Witness the Republicans who announced the trillion-tree bill saying they don't support a carbon tax, a timeline for emissions reductions, or even a realistic vision for what their jumping onto the trillion trees act would look like.

Young climate activist Greta Thunberg and eighty-four-year-old primatologist and anthropologist Jane Goodall at Davos, Switzerland in January 2019. Image: pinterest.com.

The trillion trees proposal does have many merits, but only if implemented in concert with the immediate reduction of our dependence on fossil fuels. Jane Goodall's observation that by acting locally each one of us can make some impact on the planet every single day comes into play here. There are a fast-growing number of organizations and agencies that have mounted tree-growing campaigns demonstrating that individuals as well as governments can plant trees. Google "tree-planting organizations" for a long list of these efforts.

That said, the amount of suitable land area for reforestation diminishes as global temperatures rise. Even if global warming is limited to 1.5 degrees Celsius (which will not be achieved), the area available for forest restoration could be reduced by a fifth by 2050, because it would be too warm for some tropical forests.

It could take more than a hundred years to add enough mature forest to get sufficient levels of carbon reduction. Meanwhile, 40 billion tons of carbon dioxide (CO_2) from burning fossil fuels are being added to the atmosphere every year, said Glen Peters, research director at Norway's Center for International Climate Research.

In the hands of adults crafting responsible climate policy, trees absolutely have an important role to play. But congressional Republicans are not responsible adults. They've been terrible stewards of the land, ocean, and atmosphere for decades now, and their new climate proposals are simply a smokescreen crafted to allow pollution profiteers to continue burning down the planet.

"I challenge anyone to find a better climate solution than taking care of our forests." Representative Westerman said in announcing his trillion-tree bill.

For Jane Goodall, one solution is always the same. "I'll try and leave as light a footprint as I can each day. I know I fly a lot. I actually said to Greta [Thunberg], "You know, I have to fly." And she said, "Yes you do. It's OK." And last year our Roots & Shoots groups around the world planted 5½ million trees and saved forests and woodlands. So, that doesn't make me totally satisfied, but at least it's more than absorbing my bit of carbon. But what I hope people will do is to think about the consequences of the small choices they make each day. What do you buy? Where was it made? Did it harm the environment? Did it result in cruelty to animals like eating meat? Is it cheap because of child slave labor? So, if everybody makes these ethical choices, we start moving towards a better world.

John Bos is a contributing writer to Green Energy Times *and* CitizenTruth.org. *He has written about his growing concerns about our endangered environment for the past ten years. Your comments and questions are invited at john01370@gmail.com.* ♻

Book Review - *On Fire:The (Burning) Case for a Green New Deal*

by Naomi Klein, published by Simon & Schuster (2019), 322 pages

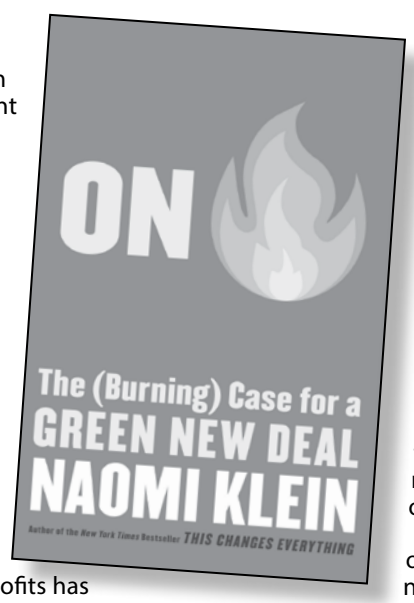
Review by Roger Lohr

Naomi Klein's newest book, On Fire: The Burning Case for a Green New Deal, makes a persuasive case for the world to come together on climate change.

Klein ties together the notion that climate action is one of a list of worthy causes vying for progressive attention at the same time. The Green New Deal provides direction for transformation as an alternative to the perils of unrestrained greed.

Klein calls for uniting "silos" of movements and organizations engaged on apparently separate causes. They can stand together to put an end to a wasteful style of living. They can put public funds and efforts into such public good as environmental protection, health, and education.

Klein states that the expansionist and extractive mind-set of capitalism has brought civilization to a point where we need to be grounded in respect for natural cycles of renewal. This will require strong government action. The unbiased truth is that the free-market ideology cannot continue.



Individual action is no longer an adequate response to the climate crisis. It is a collective problem that demands a collective action. We are in a crisis with its roots in over-consumption of natural resources, and this can only be addressed by reducing the amount of stuff we consume. That part of the corporate sector that demands growth of sales and profits has to undergo contraction. At the same time, a managed transition to another economic system based on non-profits, cooperatives, and local businesses could increase availability of goods for those who need to rise out of poverty.

The benefits of such an economic system should include teaching, care-giving, and leisure activities, along with many others. This is a profound transformation of social and ecological proportions. Regulation can no longer be a dirty word. The collective sphere would become paramount. A longer-term perspective is very different from the immediate gratification that is currently ruling our actions. Reparation to those who have been harmed (domestically and internationally) by capitalism is a significant aspect of the Green New Deal according to Klein.

In simple terms Klein suggests a transformation from the "gig and dig" world to a "care and repair" collective with a common purpose. Fundamental changes are needed in transportation, housing, energy, agriculture, forestry and more.

Cont'd on p.33

Resolve to Save the Earth

Dr. Alan K. Betts

OK, it is time to resolve to step away from our consumer stupor and save the Earth. Think of this as the last decade to wake up and stop destroying our planet and our children's future. First stop and listen to the inner hubbub of familiar rationalizations for business as usual, our inalienable human rights, and our treasured freedom to exploit everything for profit.

Then take a deep breath, put on a coat and step outside into the splendor of the natural world that embraces and cherishes us. Listen and look around, and up and down, as if you were an indigenous person whose ancestors had been living on this land for a thousand years. Oral tradition has taught you about every plant and creature. As you listen, you can see into everything in the entire living world of the creation. You are simply part of the web of the living biosphere. You know where your food comes from, you know the call sounds of danger, and you are both alert and at peace.

Stay as long as you can and resolve to return to this living world every day. Promise to teach your children the knowledge they need to face the future. But before you step back into the warmth and comfort of your home, hold close to your heart the fact that our society intends to destroy this interconnected living world rather than create a sustainable future. Is this your choice also, or will you join with friends and colleagues and confront the powerful interests, corporations and politicians?

Creating a viable future will not be easy, as the shift we need is a threat to so many deeply held beliefs. Many came from a century of cheap energy from burning the fossil fuels which has driven rapid climate change and the extinction of species. In fact, all the waste streams from nearly eight billion people must be brought under careful management.

But there are deeper issues of our concepts of human power and authority that are more than a thousand years old. You may have glimpsed this when you stepped outside into the mindset of the indigenous people of your land, where the concept of human power over nature did not exist. In our world, the rise of science and the industrial revolution has given humanity immense knowledge and power on the mechanistic level, but a rather limited grasp of the web of life. I know this well as I trained as a scientist. But without direction from Earth-centered moral values, the unguided use of our science and technology has led to the disaster of climate change. To our horror, we find the Earth system is clearly out of human control. All we can do, unless we choose to be utterly stupid, is slam on the brakes.

Every year I give many talks to schools, citizen and business groups and churches. For many years I half understood why science and religion had been kept apart for centuries. I could see this was comfortable for institutional power. Scientists were also taught not to challenge political authority, but I challenged this forty years ago. However, the clash between the scientific and indigenous worldviews raised deeper issues. I was troubled for years why the Christian churches collaborated with the colonial powers to crush indigenous people on a global scale. Yes, indigenous traditions were a threat to church authority and doctrine. Yet the founder of Christianity was clearly deeply connected to the natural world. So being a scientist, I started looking for the truth. What I found was revolutionary to me but obvious in retrospect.

The Aramaic name of Jesus was Yeshua. He spoke Aramaic, an indigenous language where every story has several levels of meaning (The Hidden Gospel by Douglas-Klotz). Yeshua's world was the indigenous world, and one of his core teachings was "Come with me into my world, the world of the Creator, where you will see the truth of the living web of the Creation; and that truth will set you free to act on behalf of the Creator." This truth is one more key to the deep global issues we face, hiding in plain sight. How did Christianity lose its way?

When the Roman emperor Constantine converted to Christianity, he realized this religion could benefit the imperial Roman Empire. He summoned the bishops to the Council of Nicea in 325 AD and offered a deal. Define Christianity in clear doctrinal form and choose the Greek gospels with their dualism and understanding of human power; and suppress the holistic and mystical Aramaic gospels. So, Christianity became an institutional religion with a dualistic framework that later influenced both the rise of science and the separation of science and religion; but it lost its indigenous roots. Sadly, many Aramaic speaking Jewish and Assyrian Christians, who understood what Yeshua had actually taught, became the heretics who perished over the next century or two.

To save the Earth, we now face the beautiful but challenging task of reconciling our scientific worldview with the indigenous understanding of Jesus. So, step outside into the real natural world for a second time: it is closer than you think.

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

Carbon Dioxide (CO_2), the Greenhouse Gas

Let's get down to the basics: what is CO2 and why should we even care?

Worth Gretter

We all know, unless we are in climate-change denial, that the Earth is warming, and it won't be good for us. We also know that burning fossil fuels produces carbon dioxide (CO2), which is a greenhouse gas that traps heat. But how does that all work, anyway?

When you read that your car produces several tons of CO2 each year, that sounds quite unreasonable. After all, CO2 is a gas, and gases are light in weight, so "tons of CO2" does not seem to make sense. Let's look at the chemistry.

Gasoline is a mixture of hydrocarbons. If we look at a very simple hydrocarbon, ethane, it has a formula of C2H6, i.e. two carbon atoms and six hydrogen atoms. This would seem like mostly hydrogen, but it's not. Hydrogen only has an atomic weight of one and carbon has an atomic weight of 12. So, ethane weighs in at 30, but only 6 of that is hydrogen and the other 24 is carbon.

Things get worse when we burn the ethane. One atom of carbon, with a weight of 12, combines with two oxygen atoms, each weighing 16. This yields CO2, weighing 44. And ethane has two carbon atoms, so we get two times 44, or 88. This example can be scaled up from atomic weight to any units you like, such as pounds. So, burning 30 pounds of ethane produces 88 pounds of carbon dioxide – almost three times as much. (If you are wondering what happens to the hydrogen, it combines with oxygen to form H2O – water.)

The gasoline you put in your car weighs about 6 pounds per gallon. If you fill up with 10 gallons, or 60 pounds, that will turn into about 150 pounds of CO2 when burned. If you use 10 gallons a week, then every week you are putting 150 pounds of CO2 into the atmosphere. (You may notice that 150 pounds of CO2 is only 2-1/2 times the 60 pounds of gasoline, not 3 times, because gasoline is not ethane but rather a mix of hydrocarbons.)

Ball-and-stick model of the carbon dioxide molecule, one of the most important chemical compounds in the world. It is vital for life as we know it but catastrophic at excess levels. Color code: carbon, C is black; oxygen, O is red. Image from Creative Commons.

But we know that the atmosphere is enormous. Even if every human adds 150 pounds of CO2 each week, how can that affect the climate? This gets even more perplexing when you consider that the atmosphere is (approximately) 78% nitrogen, 21% oxygen, and 1% argon. That adds up to 100%, so where is the CO2?

It turns out there are trace gases, and CO2 is one. It is present in the atmosphere at 0.04%, which is 400 parts per million. (This is where the environmental group 350.org gets its name, from the desire to keep CO2 below that level.) But how can 0.04% of the atmosphere even matter?

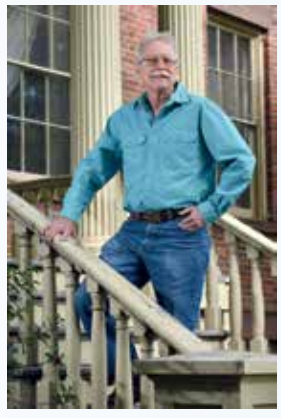
When sunlight strikes the earth it warms all surfaces, and some of that warmth is re-radiated outward as infrared light, i.e. heat energy. Some of the heat is lost to space, but some is captured by molecules in the atmosphere and re-radiated back to Earth again.

It turns out that most molecules in the atmosphere can't re-radiate energy. Nitrogen and oxygen are diatomic gases (N2 and O2) made of two identical atoms. Argon is monatomic, a single atom. These forms can't store infrared energy and re-radiate it. CO2, however, is made of two different kinds of atoms and can store energy temporarily within its molecular structure. That energy is re-radiated, some to space and some back to Earth. Methane and water vapor are also involved in re-radiating energy, making them greenhouse gases as well.

Greenhouse gases help keep the earth warm, which is a good thing. But Earth is getting too warm (as we are learning) simply because greenhouse gas concentrations are much higher now than in recent history. Humans are causing it by burning fossil fuels and creating carbon dioxide.

So, we see that there are two factors at work here: 1) we are all putting more CO2 in the atmosphere than we realize; and 2) most of the atmosphere is not greenhouse gases, so a small change in CO2 makes a big difference.

And why does this even matter? Because there are now almost eight billion people releasing CO2. That is a problem! Earth's climate is very complicated, and no one can predict exactly what changes will occur. But we have already had a taste of the future with intensifying tropical storms, floods, and wildfires. I think even some of the climate- change deniers are starting to agree that we need to make some changes if we want to survive.



Worth Gretter is a retired electrical engineer for Knolls Atomic Power Laboratory. He lives in Menands, New York and volunteers at Ten Broeck Mansion, a historic house museum. ♻

LEDdynamics' New Home: Above and Beyond Efficiency

George Harvey

Green Energy Times has run a number of articles on light emitting diodes (LEDs). Their cost keeps declining, and their efficiency keeps improving. Unquestionably, in our minds, they are the best investment in general lighting around.

Over the years, one company has dominated our stories on LEDs. That company is LEDdynamics, of Randolph, Vermont. Now, it is back on our pages, with a story we find rather exciting. LEDdynamics has moved to a new building, and what a building it is! It was specially designed to meet the needs of LEDdynamics, a company with an acute interest in things that are good for the environment. We talked to Bill McGrath, chief technology officer, about their new home.

The old LEDdynamics building had previously been a furniture factory. It was not really suited for the environmental controls needed for the technology used in LED lighting. In fact, sawdust from a neighboring enterprise was still getting into the building.

LEDdynamics' new super-efficient facility on Beanville Road in Randolph, Vermont. All photos are courtesy of LEDdynamics.

The building was put up for an organization that is on the leading edge of manufacturing for a better environment, so unsurprisingly, the building has really superior insulation. The slab is insulated, so heat is not lost into the ground beneath it.

Heating is done primarily with heat pumps. There are five Daikin heat pumps on the roof, installed by Peak Mechanical of Waterbury, Vermont. The heating system is unusual in some ways, one of which is that heat can be moved from warmer areas of the building, which can overheat even in cold weather, into cooler areas.

LEDdynamics' server room and (above) mini-split heat pump that reclaims heat from the servers and distributes it to the loading dock area.

Another unusual feature is that tubes for radiant heating were installed into the floor of the shipping area, in anticipation of a need that could develop later on. A machine called the "pizza oven" is used to for soldering, allowing components to cool down slowly to avoid stresses. When manufacture goes into multiple shifts, a point is very likely to come when it will be cost-effective to trap the waste heat and distribute it through the heating tubes.

A transformer was placed in the utility room. Its heat is pumped to the water heater.

Rooms used by the company's IT systems also are a source of waste heat, and this can also be delivered to the shipping area as needed. Some of LEDdynamics' computers are of significant size. They are used for engineering calculations, and these can produce a fair amount of heat.

Interestingly, McGrath told us control systems for products were provided by Raspberry Pi computers and Arduino microcontrolers. These little machines are unbelievably powerful, compared to what was around not that long ago, but they are inexpensive and add very little to the power needs of the devices they control.

Phones are powered over the internet. This a very efficient way to keep them going and reduces electricity demand.

The building was especially designed and oriented to have a solar system. It was built on a site where there were no trees that would get in the way of sunshine. McGrath told us that the plan was to have about 150 kilowatts of solar photovoltaics at the site. Since the building is 27,000 square feet and the site has seven acres, it is easy to imagine this being done.

There are four level-two charging ports for electric vehicles, and two more of level one. Employees are encouraged to use these, and a number of them already do.

McGrath said, "We have an aggressive recycling policy for shipping materials. Whatever comes in, we reuse."

One of the exciting things we were able to learn about is LEDdynamics research. When we asked, McGrath said there were a few things he could tell us about. One of these was an experimental device that looks like a tanning bed, which provides infrared light to the user. Such a device does not tan people, but NASA had suggested that light in that part of the spectrum might have health benefits, which might be good to use in spacecraft. Now, LEDdynamics employees are allowed to test the device, and at this early stage in development, some report possible benefits.

LEDdynamics's web site is leddynamics.com. ♻

Better environmental control was needed, and the old building made that practically unachievable. This informed a decision for LEDdynamics to have a building designed specifically for its needs. The company built just such a plant, a bit less than two miles away.

Naturally, there was attention put to the building's lighting. LEDs are the only source of electric lighting. Interestingly, the sun is given every opportunity to reduce the electricity load through a combination of well-placed windows and smart controllers.

Do-It-Yourself Energy Upgrades: Attics

David Keefe

#5 in our new DIY Series, kindly brought to you through Efficiency Vermont.


Image: U.S. EPA

Attics are often miserable places. They're cramped and dark, dusty and dirty. They're hard to get into and hard to get out of. Most of the time they are either too hot or too cold. There's usually nothing to stand on, even if there is room to stand, which there often isn't. Often there isn't even room to sit, even if there is something to sit on, which there isn't. If you step in the wrong place you fall through. The air quality is awful. There's a bunch of old nasty insulation in the way. There are hornets up there. And mice and bats. And the feces thereof.

This series of articles is about doing it yourself. As energy upgrades go, tackling your attic is a challenge to do right. Mind you, it's not as challenging to do it badly, and lots of people, both homeowners and pros, do that. But you shouldn't.

Insulating your attic isn't really about insulation. It's about air sealing. Your typical attic floor has lots of air leaks in it. Tops of the walls, electrical penetrations, around the chimney, plumbing vent stack, ceiling light fixtures, exhaust fan, hatch, etc. Warm air migrates to your attic all winter long through these leaks. Sealing them is more important and more cost-effective than installing insulation. Adding insulation without air sealing is probably doing more harm than good. It makes any further attempt at air sealing harder, more expensive, and less likely to happen. If anyone wants to add insulation to your attic without doing the air sealing, you shouldn't let them, whether they are pros, well-meaning friends, or you yourself.

When warm air rises into the attic, it takes household moisture with it. This is the main reason for moisture problems in cold-climate attics. The moisture comes from the house. The best way to prevent your roof from rotting is to keep the house air in the house.

If you have bathroom exhaust fans in the attic floor, make sure the ducting is good (smooth-walled pipe, airtight, minimum angles, insulated). If the fan is old or noisy it's a good idea to replace it before you do the attic work, since it will be harder and more expensive after everything is buried in the new insulation.

Chimneys need clearance to combust materials. They often have big air leaks around them, so they first need a horizontal layer of metal sealed to the chimney and to the surrounding framing so that the chase around the chimney is closed off at the level of the attic floor. Don't install any combustible insulation too close to the chimney. Masonry chimneys should have three inches of clearance.

If you have older recessed lights, it may be unsafe to seal and insulate them. If they are not Insulation Contact (IC)-rated, you should replace them with LEDs.

The area at the bottom edge of the roof where the roof comes down close to the exterior wall (the eave) is hard to get to. This is often done badly. It's best to provide a thin vertical barrier above the OUTSIDE EDGE of the wall to get good coverage over the top plate. You should air-seal the top plate of the wall also. This is a pain to do.

We have lots of houses that could use an attic upgrade, but it's harder to do correctly than most people think. And it's better to not do it (yet) than to do it badly. If you've read this far and haven't been scared off, maybe you have enough determination to do it. You'll need more info than I can provide here, so do your homework. Or you can work with a contractor who knows what he or she is doing, use your sweat equity for set-up, clean-up, and the parts you might be good at, and let the pros get down and dirty for the rest.

Dave Keefe is a fifth-generation Vermonter who has worked for over 35 years as a contractor, consultant and teacher to improve the performance of existing homes. ♻

A DIY BLOWER DOOR TEST

Lori Barg


The furnace blower mounted in a window. Four speeds and a meter read the differing pressures. Image: https://bit.ly/3dKZKA1.

The first time I saw a blower door test I thought a freight train was running through my house from the basement and out the attic. Unfortunately, this train was running after I tried hard to insulate this 200-year-old farmhouse.

I searched online for videos of blower door tests that used theatrical smoke machines. It looks like Halloween gone crazy. The smoke doesn't just sneak out of the house, it pours out of the house and shows you just where you need to seal.

Unfortunately, equipment for a blower door test costs around $3,500. A blower door is basically a ½ to 1 horsepower fan (it should move 300 to 5,000 cfm) placed in a tarp and sealed into a door frame.

I set out to do my own testing. I scrounged a couple adjustable poles and taped a carpet drying fan (bought for under $100, an old furnace blower works, too) into an old tarp to seal the fan in the doorway. Face the fan to blow the air out of the house. Turn off pilot lights and don't have your woodstove burning when you do this!

If you want to do the math, then the simple, affordable way to measure your progress is with free barometric pressure phone apps. See sources below for some links on how to DIY air-seal your house.

When you are done with a DIY blower door, consider donating it to the local library and let others caulk and foam and seal the air leaks in their homes. With a bunch more air-sealing, maybe, one day, my bathroom will be warm.

Wouldn't it be great if everyone did this? How about this? If each of the fifteen technical schools in Vermont built twelve DIY blower doors and donated them to the 180 libraries, then for only $18,000, every library in Vermont could have a blower door to lend to any resident in the state. Maybe the utilities could subsidize the cost of spray foam and caulk ($300 per house).

DIY blower door links: *bit.ly/Project_BlowerDoor and bit.ly/Project_BuildingBlowerDoor.*

Free Pressure Apps: *bit.ly/BarometricPressureApps and bit.ly/BarometricPressure-Apps_iphone*

Lori Barg is a builder, geologist and hydroelectric developer. Learn more at www.communityhydro.biz. ♻

Indoor Air Quality: Some Things to Know

Michael Canavan

This article is a follow-up to "Understanding the Blower Door Test" published in the January 2020 issue of Green Energy Times.

Now that you have sealed your house as recommended from your blower door test results and verified that your house has an air changes per hour (ACH) rating of three or less, you are feeling warm in your draft- free home. But the indoor air quality of your home may not be as good as it was in your drafty house. You can take the next step to improve the indoor air quality by installing a controlled ventilation system.

Indoor air quality is influenced by environmental and mechanical factors. Environmental factors in the home include trapped moisture levels, off-gassing of building materials, paints, furnishings, cleaning products, smoke, and human bodily functions. Mechanical factors can include combustion byproducts and fuel storage.

Combustion byproducts are generated inside your home from heating equipment and cooking. Your heating equipment should be serviced and inspected on a yearly basis for proper combustion, ventilation, and overall condition. The heat exchanger in the furnace may begin to deteriorate and develop a hole. When you are cooking food on your stove or in your oven, you may be burning gas which has carbon monoxide as a byproduct and, on the rare occasion that you burn the food, you may be releasing other unwanted products into the air of you home. This is why you should have an exhaust hood over your stove that vents to the exterior of the home.

Moisture levels in the home come from washing, cooking, breathing and ground conditions. The relative humidity of a home should be between 30% and 50%, so moisture does not create breeding grounds for mold. When you buy new materials and bring them into your home, they have different chemicals on them that you can smell. This process of releasing chemicals in the home is called "off-gassing" and can lead to health issues. The plywood used in building your home and some furniture can take two years to outgas the formaldehyde in it. Some paint products have volatile organic compounds (VOC) in them; look for low or zero VOC painting products whenever possible. Cleaning products have ammonia, chlorine bleach, vinegar and petroleum products, as the basic cleaning materials with added aromas to make them more pleasant smelling. These materials, in enclosed unvented spaces, can become overwhelming to the point of making you sick quickly. Smoking indoors puts tar and carbon monoxide into the air along with other pollutants.

The way you control the moisture and pollutants in the air of your sealed home is to install proper ventilation, local exhaust fans, and a whole-house ventilator system. The three basic whole house ventilator system types are air exchangers, ERVs - energy recovery ventilators, and HRVs heat recovery ventilators. The air exchanger is a fan unit that filters and mixes indoor air and outdoor air, and then expels some of the indoor air out of the house. This system runs slowly, at 60 cubic feet per minute (cfm), and though less efficient at removing stale air, it is the least expensive system.

ERVs are recommended for climates where the main concern is cooling, such as the Gulf coast region of the country. They are a moisture and heat recovery unit. ERVs have a moisture-permeable membrane to allow moisture to be removed from the air stream.

HRVs are used in heat-requiring climates like ours. The unit works by passing air through an air exchanger which allows for the warm indoor air to give up its heat as it exits to the cooler incoming air in the heating season and does the opposite during the cooling season. The outgoing air and incoming air are blown through separate air channels to allow this exchange to take place. There are two types of exchangers: flat-panel (vertical or horizontal) with 50% and up to 80% efficiency, respectively, and cellular which can be up to 80% efficient, with cost increasing with efficiency.

These systems can be installed in a home with or without a central air furnace system, as long as there is space to install small duct runs. With the installation of a ventilator system you will breathe easier knowing that the air in your home is cleaner and you are saving on your energy costs.

Michael Canavan is the owner of Eagle Home Inspection Solutions of Norwich, Vermont. Learn more at www.EagleHomeInspectionSolutions.com, or (802)526-2642. ♻

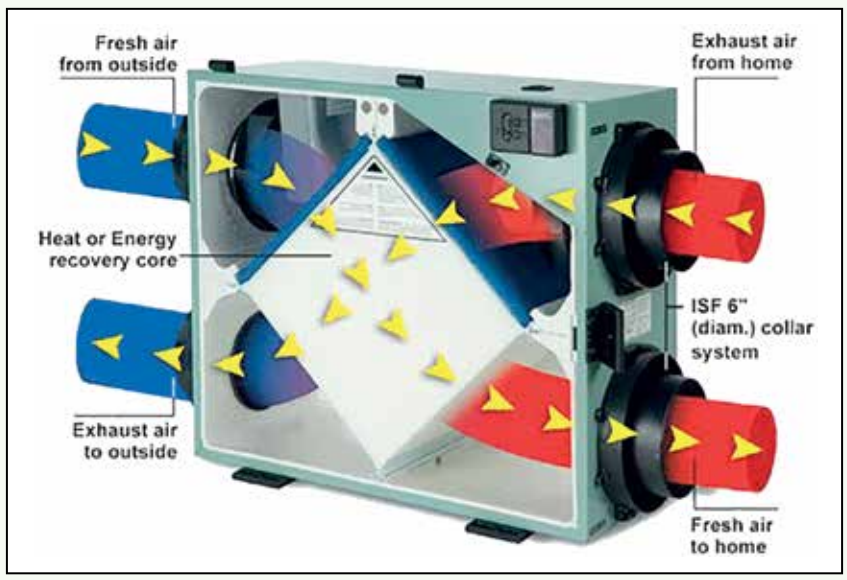


Diagram explaining how a heat recovery ventilator works. Image: Greentek

Efficiency Vermont's EEN Contractor Spotlight: Solar Harvester

Interview with Bill Chidsey, Clean Energy Navigator

Green Energy Times Staff

Bill Childsey - Solar Harvester

What is your area of expertise?

The interesting thing about buildings in Vermont is that there isn't a one-size-fits-all solution. I recommend taking the time to look at a home holistically. At an appointment, I usually spend a whole day analyzing my client's entire energy consumption. I merge several areas of expertise: directly measured BPI analysis, blower door cfm 50, CAZ safety standards, inch-by-inch HVAC / ACCA heat loss calculations, building science, and decades of practical construction experience. I create an integrated, clear path towards their unique clean-energy future, creating a specific cost-benefit action plan. We then center our focus on tangible opportunities while acknowledging existing safety hazards, pollution and fuel waste challenges in a non-judgmental manner. I also have a unique hands-on insight into how fossil fuels are used. I've worked on thousands of dirty fuel guzzlers since the mid 1960's.

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

Energy consumption accounting is time-consuming and very tedious. Learning the numerous energy units, calculations, and terminology can feel overwhelming. Too often this most important first step is by-passed for a quick, satisfying purchase. Every clean energy action has a specific cost and benefit. Knowledge first provides confidence, clarity, and getting it right the first time. Hire a professional who can produce a no-nonsense, practical plan. There are likely several DIY projects that fit perfectly helping a homeowner save installation costs.

If you could only choose one type of project to reduce your carbon footprint, what would it be and why?

Many of our members have special access to exclusive Efficiency Vermont incentives and low or no interest financing on your projects. They are plugged in to our programs and offers and can guide you to the right solutions and rebates. They also have access to exclusive support from Efficiency Vermont – at any step in a project, a member can reach out and get support from us to assure project success.

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

My familiarity with design-built, balanced, whole-house heat recovery ventilation integrated with central air ducted cold climate heat pump systems provides exceptional indoor air quality and value. Air to Water heat pump installations fit perfectly with high performance homes. My business is growing not in volume, but in depth. Leadership. I'm ready to add an educational component for the next generation. I want to reach out to engage young people. Beginning with 4-H / UVM Extension and Randolph Technical High School. I believe we need a qualified "energy master" embedded in every neighborhood and every farm.

Why should people use an Efficiency Excellence Network (EEN) contractor over another contractor?

I like that Efficiency Vermont has the Efficiency Excellence Network, that there's a bar to meet, where people are well vetted. Being part of the Efficiency Excellence Network means that I have access to educational opportunities that others in my field don't have, and exposure to how leaders in my field are tackling these big issues.

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

Simply open the Efficiency Vermont website. The financing, services and rebates menu are found at the top. Call customer service at 888-921-5990 or any EEN member for a friendly referral. My customers usually qualify for $2000 to $8000 rebates and 100% project financing.

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

Request a written work scope and itemized materials and installation budget. Discuss how you can be available to communicate daily during the project. Contractors need to know communication is welcome, easy and OK to stay current with challenges and accomplishments.

Schedule and make time for hands-on system training during commissioning. Review and document life safety and control settings. Schedule a follow-up site visit within the first four weeks. Schedule and post annual and seasonal preventive maintenance appointments. Keep all system documentation in a binder handy for reference.

Celebrate your clean energy future with friends, neighbors, and energy committee members. ♻

Cow Power: Renewable Energy from Manure

Anna Chaffee

As a society, maintaining our current standard of living necessitates large-scale farming. This comes at a cost however, as the industrial agriculture system is a major contributor to global warming largely through greenhouse-gas (GHG) emissions, such as methane. As a result, the current agricultural system has much progress to be made in terms of sustainability.

Image: en.permaculturescience.org

The United States Environmental Protection Agency (EPA) found that livestock represents nine percent of all GHG emissions in the United States1. The world's 1.3 billion cattle population is responsible for one fourth of the world's methane levels, which have doubled over the past three centuries2. With the amount of food required to sustain the world's population, it's inevitable that the cattle population will continue increasing. Therefore, mitigation efforts to decrease methane emissions from livestock should move towards managing the manure produced from cattle.

Thinking about using manure as an energy source may cause some people to shudder. However, I think the idea of capturing methane from manure and using it as electricity is brilliant. Methane losses from manure are responsible for 41 percent of total agricultural methane emissions for most countries around the world3. By converting this methane into electricity through anaerobic digesters, the amount of methane emissions to the atmosphere would decrease drastically.

Anaerobic digesters consist of a large covered concrete tank that is installed in the ground with heating pipes to heat the manure inside the digester. The heat promotes the bacterial decomposition of manure, creating methane. An engine-generator will also be installed that is fueled by the methane captured from the digester. The digested liquid waste left over in the concrete tank can be used as natural fertilizer on crop fields.

Vermont has been leading the way in using manure as an electricity source for over a decade. Green Mountain Power (GMP), which is used by nearly three-quarters of Vermonters for electricity, offers a Cow Power program using anaerobic digesters that provides renewable energy while supporting local farmers. The profits earned from Cow Power are given back to farmers as incentives to be involved with the program.

Biogas holder and flare. Image: Wikipedia

Cow Power currently powers more than 3,000 homes and businesses, including Killington Resort and other large companies. The residents using Cow Power have reduced the amount of GHG emissions equivalent to taking 9,000 cars off of the road each year, which would have burned 5.3 million gallons of gas.

Farmers coupling with the GMP Cow Power program also help reduce agricultural runoff going into Lake Champlain. On hot days in the summer, blue-green algae blooms take over our beautiful lake, mainly due to the excess nutrients in the water from run off. If more manure is going to anaerobic digesters, it will prevent harmful run off from dirtying our waters.

Overall, I believe that reducing the methane emissions produced from agriculture will help mitigate the effects of climate change while benefiting farmers. Any Vermonter using GMP has the possibility of using renewable energy sources. In the future, the Cow Power program could be opened up to any Vermonter, not just those using GMP. Additionally, other states around the country could take Vermont's lead and start similar programs for their residents. Let's work together to save our planet!

Links available on G.E.T.*'s website.*

Anna Chaffee is a Vermont native, currently living in Burlington. She is a senior at the University of Vermont and will be graduating in the spring of 2020 with a Bachelor of Science degree in Environmental Science. Protecting our environment is Chaffee's passion and why she hopes more people will learn about methane digesters and consider implementing them on their farms. ♻

'Drawdown'

Cont'd from p.1

shows that we must replace our fossil fuel and industrial food and agricultural systems with new solutions. The top solutions span many sectors and include:

- Greatly improving energy efficiency and rapidly deploying renewable electricity generation (especially onshore wind and utility-scale solar photovoltaics).
- Reducing food waste and shifting to more plant-rich diets.
- Reducing deforestation and restoring healthy forests and other ecosystems.
- Improving management of refrigerants and shifting to alternatives.
- Dramatically improving the energy performance of our buildings and cities.
- Shifting our transportation system to highly efficient, low-carbon alternatives.
- Improving access to education and health care for women and girls in developing nations.

"Together, these solutions show us that we can address a seemingly impossible challenge," Dr. Jonathan Foley, the Executive Director of Project Drawdown, said. "The tools we need are here, today, and can be deployed at scale. But we need to use them all – dozens and dozens of solutions in different sectors, working in parallel. Only then does [sic] the physics and economics work. All that is lacking is the political will and leadership to make it happen. While climate change can often feel hopeless, this work shows us a better world is truly possible, with solutions we have in hand today. But we need to get started as soon as possible, and dramatically step up our efforts."

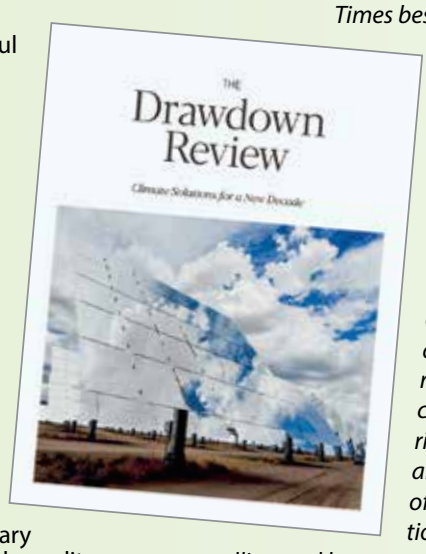
> 'To reach Drawdown, and thereby bring us to a climate-safe world, the research shows that we must replace our fossil fuel and industrial food and agricultural systems with new solutions.'

"Synthesis and translation are hallmarks of Project Drawdown's work. Our hope is that The Drawdown Review provides a resource for anyone looking to understand and act on solutions for the climate crisis," said Dr. Katharine Wilkinson, Vice President for Communication and Engagement at Project Drawdown. "By making this work freely available, we hope that it inspires more discussion and more determined action by policymakers, business leaders, investors, philanthropists, and all the people stepping up to the challenge of climate change around the world."

"What these results show is the utmost importance of all solutions implemented in parallel," said Chad Frischmann, Vice President and Research Director at Project Drawdown. "The impacts of these technologies and practices occur only as part of an interconnected, integrated system. It is the implementation of this system of solutions that is the real solution to climate change."

The breadth of solutions indicates that individuals and institutions at all levels have agency and influence when it comes to implementing and scaling up the necessary climate solutions. Notably, The Drawdown Review finds that beyond the need to shift away from fossil fuels, some of the most powerful climate solutions receive comparably little attention on the global stage. These include:

- Food waste reduction and plant-rich diets, which together curb demand, deforestation, and associated emissions;
- Preventing leaks and improving disposal of chemical refrigerants, which are potent greenhouse gases, the use of which is projected to grow significantly;
- Restoration of temperate and tropical forests, which are powerful, vast carbon sinks;
- Access to high-quality, voluntary reproductive healthcare and high-quality, inclusive education, the many ripple effects of which include climate benefits.



Project Drawdown intends to publish The Drawdown Review on a regular basis going forward, in order to supply the most up-to-date research in a constantly evolving field. In the coming months, Project Drawdown will also offer a variety of programs including Drawdown Learn™ and Drawdown Labs™ to equip educators and business leaders, respectively, with practicable information about climate solutions for implementation in their classrooms, businesses, and communities.

About Project Drawdown: Since the 2017 publication of the New York Times best-seller, Drawdown, the organization has emerged as a leading resource for information and insight about climate solutions. We continue to develop that resource by conducting rigorous review and assessment of climate solutions, creating compelling and human communication across mediums, and partnering with efforts to accelerate climate solutions globally.

Read the review at www.drawdown.org/review-2020 ♻

Book Review: ON FIRE -- Cont'd from p.26

Klein states that we have to move from a fear-stricken society with obsessive technologies to a place where real grounds for hope can be cultivated. Klein suggests a good place to start is with the arts, to bring joy and beauty, and optimism.

The closing of On Fire highlights key areas associated with the Green New Deal including:

1. Job Creation – the investment statistics involved with such a transformation will yield millions of jobs beyond what currently exists.

2. Fair Economy – Where does the funding for the transformation come from? The "Carbon Majors" are 100 corporate and state giants that represent responsibility for 71% of Greenhouse gas emissions since 1988.

3. Emergency – the warming of the climate is already on a path to the point-of-no-return meaning that the current emissions are approaching the danger level.

4. According to Klein, a ten-year deadline is needed and achievable, but the 2050 goal dates are way too late and not helpful to stop the Earth warming at dangerous levels.

5. Recession-worry is off base and the opposite analytical reality is that the Green New Deal would be a stimulus for new jobs.

6. Klein argues that taking on the socio-economic issues at the same time as climate change is not too much change. A mass movement must be mobilized.

7. Progressive goals will polarize conservatives - there are lessons from the New Deal that suggest that downtrodden communities could help to heal ideological divides.

8. Hoplessness – Klein cites a new vision of humanity that could willingly dissolve the free-market economy. Can her examples of organizations and movements take hold with millions more people?

Naomi Klein, author of On Fire. Image: bookpeople.com

An overriding question was raised in Thomas More's Utopia, published in 1516. Is it legitimate to conquer neighbors who would not voluntarily join your regime? The progressive and related movements are such a small contingent of society and the powers-that-be are so substantial, that it does not seem that the Green New Deal can happen as proposed, and those who are assertively hopeful about it might consider preparing for battle. Is it realistic to think that those so bonded to capitalism and the totalitarian states will voluntarily agree to join?

Roger Lohr of Lebanon, NH, who owns and edits XCSkiResorts.com, has published articles and promotional topics on snow sports, sustainability, and trails in regional and national media. He is also the Recreational Editor for Green Energy Times. ♻

PUBLIC EVENT SERIES FOCUSES ON CLIMATE RESILIENCE AND SOIL HEALTH

Events Open to All Who Want to Build a More Livable, Resilient Region & Planet

What is good for the soil is good for our communities. That's the theory behind a six-event discussion series, Climate and Community Resilience: Lessons from the Soil. The events will be held on six dates from late March through mid-May. Details are available at vitalcommunities.org/soil.

Attendees will collaborate with presenters and facilitators to explore information about the land and inhabitants of the Upper Valley at different periods throughout time—the past, present and future. Ideas about soil health and how to take action in a time of climate, ecological, social and economic transformation will be shared. This six-event series will unpack the science of whole systems landscape function, explore how land and society change together and offer practical ways to engage with the landscape for community resilience and social justice.

"Our soil, and the web of life within our soils, keeps our landscapes whole, letting life thrive," said Cat Buxton, co-founder of Vermont Healthy Soils Coalition. "If humans can mimic this brilliance, we may be able to build upon the social mycelium that holds our communities together."

Due to the unfolding public health concerns regarding coronavirus disease 2019 (COVID-19), the Climate and Community Resilience series will be modified to a webinar format using Zoom until such time as it becomes safe to gather in public again. All of the events are free, open to all and offer childcare for any events able to be held in person. Registration is encouraged at https://bit.ly/38ktks6.

- Sunday, March 22, 3:30 to 6 p.m.: Earth's Cycles: Foundations of Energy and Matter
- Sunday, April 5, 3:30 to 6 p.m.: Historical Landscape: Learning from the Past
- Monday, April 13, 5:30-8 p.m.: Here and Now: Human Impacts
- Sunday, April 26, 3:30 to 6 p.m.: Systems Collapse: Climate and Ecological Crisis
- Monday, May 4 5:30 to 8 p.m.: Revolutionary Resilience: Creating a Different Future
- Sunday, May 17, 2 to 6 p.m.: Fertile Ground: Reclaiming Power and Possibility. This culminating event will bring us together at Sunrise Farm to reflect on the power of natural systems and community collaboration. It is the hope that this event can be held in person.

The Climate and Community Resilience: Lessons from the Soil event series is a collaboration of Vital Communities, Vermont Healthy Soils Coalition, Hanover Co-op Food Stores, Upper Valley Food Co-op, BALE, XRVT and Grow More Waste Less. More information is available at vitalcommunities.org/soil. ♻

Many thanks to our sponsor:

Elmore Roots' Permaculture Know-How

Come into the Garden

David Fried

Original painting by Gabriel Tempesta.

This time of year brings out the dreamer in all of us who have a connection to the land. Let's face it, we have not seen or walked on anything green for about six months. Under the snow, under the mud, under everything there are grasses waiting to sprout. Under the grasses are the roots of berry plants and fruit trees. They are so patient all winter and now they are getting fidgety. The buds that have escaped the deer's nibbling are swelling with promise. A bird jumps off the end of a branch seeing if it still remembers how to do it.

We are more connected to the fruit trees, birds and berries than we know. They evolved along the edges of forests and streams and so did we. Like us, they inhabit the middle range of life on earth. Not so tall and not so small, they have been planted and cared for by us people and the animals that live among us. They are around our height. We can reach their fruit, and they can survive because their fruit tastes good to us. We mow around them. We plant their seeds and propagate our favorites.

A berry saved is a berry earned,
make sure your berry bed is well turned.
Toss those berries right into your mouth,
that's what we do in the great old south.
Grow some for Grandma, grow some for Pete,
make sure you, too, get enough to eat.
Try some new ones, plant some old,
make sure they can take the cold.
Vermont's the place where they taste best,
cold nights, blue skies give them their zest.
Freeze 'em, jam 'em, get 'em picked,
before the chipmunks have each one licked.
Come to the garden, friend and foe,
you'll see why it's such a great place to go.
We won't make you dig or rake or weed,
we promise to let you plant a seed
Spring is coming over the hill,
It's been a while but I can see it still.
Drip drap plunk in the bucket or on my hat,
maple syrup sure makes up for that.
So, grow some berries, grapes and nuts,
notice the bunnies in their little earth huts.
Healthy lives are made each day,
we find ourselves the time to play.

– David Fried

Come into the garden. It's good here. Step away from what you need to be doing. Give in to the lushness and colors and smells of the berry patch and fruit grove. Eat deeply from the bounty where everything exists together and all are one.

What really nourishes us? Fresh water flowing to us and through us. Things that grow in the earth that are so fresh and good that when we taste them, they melt in our mouth and fill us with simple joy.

Springtime is coming. Wildflowers are blooming. There is plenty to eat, extra to share. As our world turns slowly but with a lot of weight, remember. There is always time for the garden. Birds can fly, because they take themselves lightly.

David Fried started Elmore Roots Fruit Tree Nursery forty years ago. He also plays guitar and writes songs, including an elderberry rap song. ♻

Larry Plesent

Ingredient of the Month

March's Ingredient of the Month is Hope!

Ubari Oasis in Libya. Image: Wikipedia/Sfivat

Maybe you're like me and your head is exploding from the onslaught of relentless negative media bombardment. The world is warming! Species are dying off! Atmospheric CO2 is the highest it's been in three million years! Isn't there anything good happening in the world anymore?

You bet there is, and, yes, there is something you can do to help turn this civilization of ours around. Each of us, all 7 billion blessed humans, creates a sphere of influence around our lives just by burning calories and being aware that we are in the world. The question of course is, what type of influence do YOU want to be in the world? If you were a metaphor, what would you want your life to stand for?

The truth is that you and your family, your friends and neighbors, all of us can do what the politicos and CEOs apparently cannot or will not do. You can be part of the solution.

I call it the Oasis Effect and each of us can be part of this growing movement to bring humanity into a more natural and sustainable civilization, one that meets our needs without eating up what is left of the natural resources of the planet that begat and sustains us.

Just as enough individual drops of rain can burst a dam, the Oasis Effect starts out as drops on the ocean of our petroleum fueled and extraction-built economy. The Oasis Effect is like a raging current sweeping away the damming limits of our ecologically disastrous ways of conducting the daily business of being human.

The Oasis Effect starts with each person making the best and most sustainable choices that can reasonably be made in that moment. One drop at a time creating a mighty river of change. An Oasis of Change in a desert of greedy habits programmed into us by nonstop media onslaught.

If you live your life as an oasis of increasingly natural and sustainable decisions, the best possible outcomes will inevitably follow. Do it for yourself, and do it for the generations to come after. But also, do it because it is fun and delicious to feel a part of nature and the enormity of creation rather than an isolated bubble-being.

Here's to the resilience and ingenuity of Sapiens! We are not extinct yet. And where there is life, there is always hope.

Larry Plesent is a writer, philosopher and natural products formulator living and working in the Green Mountains of central Vermont. Read more at www.vermontsoap.com/category/blog/. ♻

Compost, Corn and Deep Caring

Evelyn R. Swett

My fingertips turn black as I sift. Three times a year, I manage the compost. It is a messy, smelly job, but as I gently put the worms back into the middle bin and sort the grit from their castings, I think, I love this.

There are three square compartments in our compost system separated by heavy wire mesh. In April, July and November, I harvest the fully 'cook' batch in the left compartment, blending it into our raised beds or using it to nourish a struggling shrub or tree. The middle "in process" batch gets sifted and turned into the 'ready to use' pile. And finally, the third compartment, filled with the heaviest mass of recently discarded vegetable matter, gets aerated and turned into the middle compartment. I made this bin ten years ago from scratch, milling the lumber from old cedar logs and using a power drill for the first time to assemble it.

Compost system divided into three compartments. Below: Corn cobs being composted with other green and brown waste. Courtesy photos.

A pile of soil slowly accumulates in the gray plastic wheelbarrow beneath the wire screen that I use to sift and separate the almost completed compost. Where did all those corn cobs, pepper seeds and pomegranate skins go? They can't just disappear, and yet they do, every time. If I just put a bunch of discarded corn in a pile in the sun, that wouldn't do much, except perhaps feed some squirrels.

Here though, among the slimy cucumbers, onion peels, and paper towel rolls, they become something entirely new. It all works, this mess, this mix of green and brown stuff. The worms eat it all and transform everything, decomposing the carbon, oxygen and nitrogen into "black gold." No longer garbage, it is a source of energy. When spread among the garden beds, the decomposed matter provides needed nutrients for the tomatoes and cucumbers that will surge from the soil in a few months.

When I turn these piles of worms and rotting orange peels, a pungent odor emerges. No matter how many leaves and other materials I add, this smell lingers. My children and husband can't stand it and say it lasts for days. They understand, though, that for me it is here with the worms and this scent that I feel connected to life. Each bucket of processed compost that emerges provides nutrients for the beans, kale and peas we will eat during the summer.

My children and husband also know that I grow beans, kale and peas because I love them and want them to be well. This whole process occurs from a place of deep caring for people and the planet. There's a dynamic give and take that fills my heart and brings peace.

My fingers continue to work the soil through the wire screen, bumping into an avocado peel. I think compost is like people and ideas, needing to be turned over once in a while, mixed up and mingled with others. I dump what is left on the screen back into the final bin and grab another pile. A few more sifts and my black gold is ready for the garden.

Evelyn R. Swett is a photographer, speaker and longtime climate activist who celebrates how creativity and climate action converge to inspire transformation and joy. She is happiest when mucking around with compost and photographing the beauty she sees. ♻

Regenerative Agriculture:

There's No Tilling How Much CO_2 We Can Save

Doug Moss and Roddy Scheer

Regenerative Agriculture (RA) describes farming and grazing practices that help reverse climate change by rebuilding the organic matter in soil and restoring degraded soil biodiversity.

"Specifically, Regenerative Agriculture is a holistic land-management practice that leverages the power of photosynthesis in plants to close the carbon cycle and build soil health, crop resilience and nutrient density," reports California State University's Regenerative Agriculture Initiative (RAI). "Regenerative agriculture improves soil health, primarily through the practices that increase soil organic matter. This not only aids in increasing soil biota diversity and health, but increases biodiversity both above and below the soil surface, while increasing both water holding capacity and sequestering carbon at greater depths." The net result is a drawdown of atmospheric carbon dioxide, and the improvement of soil structure to reverse human-caused soil loss.

According to Terra Genesis International, which helps businesses integrate sustainable farming practices into their everyday operations, key principles guiding the implementation of RA include: progressively improving whole agroecosystems (soil, water and biodiversity); creating context-specific designs and making holistic decisions expressing the essence of each farm; ensuring and developing fair and reciprocal relationships among all stakeholders; and continually growing and evolving individuals, farms and communities to express their innate potential.

How these lofty goals are achieved also involves the implementation of many of the practices that are now commonplace in organic agriculture, including permaculture design (utilizing the patterns and features observed in natural ecosystems), agroforestry (incorporating the cultivation and conservation of trees), keyline sub-soiling (to loosen compacted soils), no- or low-till farming (leaving it alone

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RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: **http://350vermont.org**
American Council for an Energy-Efficient Economy: Consumer guide to home energy savings - **aceee.org/consumer**
American Solar Energy Society (ASES): www.ases.org
Backwoods Solar: Specialty: solar, off-grid - **www.backwoodssolar.com**
Buildings Energy Data Book: buildingsdatabook.eren.doe.gov
Carbon Tax: carbontax.org
Clean Power Estimator: www.consumerenergycenter.org/renewables/estimator
CO2.Earth: See emissions harms, scientific advice, and pathways to follow. www.co2.earth
Consumer Guide to Home Energy Savings, Heating, Appliances, Refrigerator Guide, Building Envelope, Driving: http://aceee.org/consumer
Dept. Public Svc. (CEDF): publicservice.VT.gov/energy/ee_cleanenergyfund.html
Dsireusa.com: www.dsireusa.com Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.
Efficiency VT: This is a must-go-to site for immeasurable amounts of info. **www.efficiencyVT.com**
Energy Efficiency & R/E Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html
Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov
Energy Guide: Unbiased advice about today's energy choices. Find ways to save, lower your bills & help the earth's environment - **www.energyguide.com**
Energy Star Federal Tax Credits: www.energystar.gov/tax credits.
Federal Energy Regulatory Commission (FERC): www.ferc.gov
Federal Energy Regulatory Commission(FERC): www.ferc.gov
Find Solar: www.findsolar.com
Fossil Fuel Freedom: Group working to make Vermont's energy plan 100% free of fossil fuels:
To join this group go to: **groups.google.com/group/fossil-fuel-freedom-**
Greywater Info: www.oasisdesign.net/greywater
Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - **hes.lbl.gov**
Home Power Magazine: www.homepower.com
IREC/ Interstate Renewable Energy Council: RE educational info. **www.irecusa.org**
NABCEP/ North American Board of Certified Energy Practitioners: This organization that tests & certifies PV system installers. Individuals are Certified, companies are not. **www.nabcep.org**
NESEA/ Northeast Sustainable Energy Assoc.: www.nesea.org
National Association of Energy Service Co. (NAESCO): www.naesco.org
National Renewable Energy Laboratory (NREL): www.nrel.gov
National Solar Institute: www.nationalsolarinstitute.com
NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.org**
New Hampshire Sustainable Energy Assoc. NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. **www.nhsea.org**
New York Solar Energy Industries Association/NYSEIA www.nyseia.org
New York Solar Energy Society (NYSES): www. nyses.org
NFRC independent rating & labeling system for the windows, doors, skylights **www.nfrc.org/**
NH Office of Energy and Planning: www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm
Renewable Energy World: www.renewableenergyworld.com
Renewable Energy Vermont: www.revermont.org
SEIA/ Solar Energy Industries Association: The SEIA Tax Manual to answer your solar related tax questions. **www.seia.org**
SmartPower: www.smartpower.org
Solar Components: www.solar-components.com
Solar Jobs: Listed by city, state, and district, **SolarStates.org**
Solar Living Source Book: realgoods.com/solar-living-sourcebook
Solar Power Rocks: Impressive data and info ,including per state. www.solarpowerrocks.com/
Solar Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. **SolarStoreofGreenfield.com**
Tax Incentives Assistance Project (TIAP): www.energytaxincentives.org
The Energy Grid: www.pvwatts.org
The Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - **www.eere.energy.gov**
Track the Stimulus Money: www.recovery.gov/Pages/home.aspx
Vermont Energy and Climate Action Network (VECAN): works to start and support town energy committees as a powerful, people-powered response to realizing a clean energy future. www.vecan.net.
Vermont Tar Sands Action: Group working to stop the XL Pipeline and any other developments stemming from the Alberta Tar Sands. To join this group go to: **groups.google.com/group/vt-tar-sands-action**
VPIRG: understand the clean energy resources available to VT - **www.vpirg.org/cleanenergyguide**
VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - **www.veic.org**
Weatherization, Energy Star & Refrigerator Guide: www.waptac.org
www.susdesign.com Online info for solar benefit with house design: overhangs, sun angle & path…

Regenerative Agriculture

Cont'd from p. 35

to do its thing), pasture cropping (growing annual crops in dormant perennial pastures), multi-species cover cropping and crop rotations (to introduce genetic diversity), the use of animal manure (to build up the resilience of the soil biota), encouragement of bees and other beneficial insects (for fertilization), the use of organic soil amendments such as biochar or terra preta (to enhance yield while sequestering carbon dioxide), ecological aquaculture (using water not land to grow food), perennial crops (they live on beyond one growing season) and silvopasture (integrating trees with forage and livestock production).

"Over the centuries, agriculture has caused the loss and degradation of fertile soil, leading to the downfall of civilizations worldwide," points out John Roulac, founder and CEO of the organic superfoods brand Nutiva, and an outspoken advocate for RA. "Modern industrial agriculture is doing it even faster."

More and more farmers are starting to realize that their survival may well depend on whether they can pivot toward RA as the world warms. "Regenerative agriculture is an approach to food and farming systems that works with nature's rhythms and technology to feed our growing population, regenerate topsoil and enhance biodiversity now and long into the future," concludes RAI, cautioning that it's critical to change synthetic nutrient-dependent monocultures, low-biodiversity and soil degrading practices. Indeed, our very existence may depend on it.

EarthTalk® is produced by Roddy Scheer & Doug Moss for the 501(c)3 nonprofit EarthTalk. https://emagazine.com. ♻

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GUIDE TO ADVERTISERS

Don't Flush That! How to Keep Toxics Out of the Water Supply

Cassandra Hemenway

We don't think of our homes as part of a water cycle. Water goes in. Water comes out. We wash dishes, shampoo, flush the toilet, and without really thinking about it, contribute chemicals that directly affect water quality in our neighborhoods.

Everything from the pills we take, to the cleaners we choose has an impact on water quality. Here are a few strategies to help minimize negative impacts on the water systems in your area.

Cleaning agents: Cleaners with labels containing the word "Danger," "Poison" or "Caution/Warning" are considered household hazardous waste at disposal. These are dangerous substances -- the chemists who work at household hazardous waste collections show up in hazmat suits and gas masks to handle them. Keep that in mind the next time you make a choice about a new cleaner.

Additionally, overuse of sanitizers and disinfectants can kill "good" microorganisms in municipal water supplies and residential septic systems, disrupting the water treatment process. Follow these guidelines to reduce your impact:

- Clean only to the level required. Typically wiping off surfaces is enough.
- Much household cleaning does not require disinfection or sanitization (except in special circumstances of illness, diaper changing, or compromised immune systems).
- Less is more: to destroy common foodborne germs, only one tablespoon of bleach per gallon of water is needed.2
- Purchase environmentally-preferable products certified by EPA Safer Choice or Green Seal.
- Read labels! Follow instructions on amount and concentration.
- Download the Safer Cleaning Guide by the Central Vermont Solid Waste Management District for more information and DIY cleaner recipes. (http://www.cvswmd.org/reducing-toxics.html)

If replacing a cleaner, store harmful unused products in a safe, dry area until the next household hazardous waste collection day. Never pour these down the drain or throw in the trash. Vermont, Massachusetts and New York all have regular collections, and, in some cases, permanent drop- off sites. Go to your state's Department of Environmental Conservation for details.

Body Care Products: Many self-care and cosmetic products contain toxins and are harmful to environmental and personal health. The Campaign for Safe Cosmetics and Skin Deep (Environmental Working Group), and Think Dirty all work to help you make safer and more informed choices. Look for their third-party certifications on body care products.

Swimming and showering can cause traces of body care products to enter the water system and may have a devastating effect on marine life. Typical sun screens and hand sanitizers contain endocrine disruptors, which, even in imperceptible amounts, kill coral and adversely impact fish.

Recipes abound for easy DIY body care products, such as these ten recipes from No Fuss Naturals: https://nofussnatural.com/10-easy-body-care-products-anyone-can-make/.

Prescription Pills: Never flush pills down the toilet. Pharmaceuticals end up in the water supply through human excretion, flushing, and even landfilling old pills, where they contribute to toxic leachate. Pharmaceuticals pass through waste water treatment and go directly back into the water supply.

According to the United States Geological Survey, prescription medications "… pollute directly from pharmaceutical manufacturing plants or from humans and animals. As these chemicals make their way into terrestrial and aquatic environments, they can affect the health and behavior of wildlife, including insects, fish, birds, and more."

If you have unused prescription pills, bring them to a Permanent Collection Location, or Drug Take Back Day location near you. Contact the FDA to find a site near you, or go to https://www.getsmartaboutdrugs.gov/content/national-take-back-day for details about National Drug Take Back Day on April 25.

To summarize: choose carefully what you purchase and minimize toxic products going down your drain or into your trash. If toxic products get into the water or solid waste systems, they can have a negative impact the environment, animals, and humans.

Links available on G.E.T.*'s website.*

Cassandra Hemenway is the Outreach Manager at the Central Vermont Solid Waste Management District. ♻

Is COVID-19 a Precursor to Climate Change? *Cont'd from p. 1*

your habits.

On both COVID-19 and climate change, there's been an alarming lack of action on a crisis that's killing people. Europe experienced many extra deaths last summer due to heat: 892 in Britain and 1,435 in France in a two-month period. By 2100, climate change will kill as many people as die of cancer and infectious diseases, according to a study by the University of Chicago. And yet we do practically nothing. (Case in point; the excellent climate change articles put out by *The New York Times* are pockmarked with SUV ads, including one reading, "These small 2020 SUVs will take your breath away." Ya think?)

But could this crisis show us a way forward?

"It's really up to us," says Brad Plumer, writing in the New York Times. If we surge the old, dirty industries in the old, dirty way to bring about economic recovery, the improvements in air quality will be only temporary. But what if we don't do the same old things we've always done? There's some reason for hope.

Low gas prices brought about by the apparent collapse of the fossil fuel industry would typically lead to increased emissions. But momentum toward electric cars is already baked into regulations in China, California, and the EU, and battery prices are way down. The rebound may not go the way they usually do.

Another big change may come in telepresence, identified by Project Drawdown as Global Warming Solution #63: estimated emission reductions by 2050 could be two gigatons, with a savings to businesses and organizations of $1.3 trillion and to individuals, 82 billion fewer travel hours.

Society is taking a crash course in these technologies right now, and the idea of spending two hellish hours a day (or more) on the freeway may be dying a natural death. That could be huge in the U.S. where transportation accounts for 29% of our emissions. Cities that shut down for big events like the Olympics typically enjoy three weeks of blue skies and cooler temperatures. That is now being experienced worldwide. Are we going to want to give that up, now that we've had a glimpse of how things could be? Now we know that all those business meetings don't require everyone to be in the same room or city. So, climb back in the SUV and waste hours of your life on the road, or dress formally from the waist up and activate your computer, refreshed from that extra hour of sleep you got? Do you really want to go back?

The planet is taking a deep breath, just in time for Earth Day. We, who are part of the earth, are in some distress right now and big gatherings are unlikely to be part of the celebration. But we are experiencing unprecedented solidarity as a society, curtailing activity to help the most vulnerable among us. Among the oldest of our loved-ones is this earth itself, and we can act to help her too. Michael OsterHolm, director of the Center for Infectious Disease Research and Prevention at the University of Minnesota, hopes the COVID-19 crisis can teach important lessons about "what we do, how we do it, and where we do it." That applies equally to COVID-19 and climate. As Osterholm says, "Never waste even a tragic crisis."

Sources are available on G.E.T.*'s website.*

Jessie Haas has written 40 books, mainly for children, and has lived in an off-grid cabin in Vermont. ♻

The Plastics Production Surge

George Harvey

Looking through the news on energy recently, I came across an article at CNN with the title, "Exxon's Market Value Has Crumbled By $184 Billion." (https://cnn.it/37JUisS) It said ExxonMobil stock was down 41% from its high in 2014.

This was interesting, but focusing on one company never tells a complete story. With that in mind, I took a look at the Dow Jones Oil & Gas Index to see whether Exxon was really all that much worse than the rest of the companies in the sector. I was a little surprised to find that a 41% decline was actually a little better than average. Regardless of what many people may think, most petroleum producers seem to be in trouble.

Refinery in Anancortes, Washington. Mt Baker is in the background. Photo: Walter Siegmund, Wikimedia Commons http://bit.ly/2uhVLJu.

The situation is partly a product of their success with fracking and mining oil shale. Operations in those two areas have been so successful, in terms of volume, that oil and gas prices are at very low levels. Unfortunately for the oil and gas people, neither fracking nor shale mining is all that cheap, and the low prices are often below production costs. The more oil and gas they produce, the faster they lose money.

This situation is getting even more complicated because of climate change. Whole major corporations and whole countries are committing to ending use of fossil fuels. And as a result, in the midst of a supply glut and low prices, ExxonMobil and its competitors are operating in a market that is being reduced in size intentionally.

There are a number of ways for them to deal with this. A company called Danish Oil and Natural Gas, once commonly called "DONG," provided us with one example of a solution. DONG rebranded itself as Ørsted, sold off its assets relating to fossil fuels, and started specializing in developing offshore wind farms. Today, Ørsted is one of the most successful offshore wind developers in the world and has made itself pretty much impervious to fossil fuel downturns, because it has no petroleum assets at all.

Many companies, however, lack that kind of foresight. A completely changed business plan is beyond their capacities, so they try to find the next best out. In many cases, they have decided that the best approach to a contracting market is to create a new market. If they cannot sell oil or natural gas, they will sell chemicals made from oil or natural gas. The most obvious large market for those chemicals is probably plastics.

An article on an expected increase in plastics production, "The Plastics Pipeline: A Surge of New Production Is on the Way," was published by Yale Environment 360. (http://bit.ly/2HAvFUY) It explains why the world will soon be "awash in plastic."

Your reaction to this might be something like, "Wait a minute! The world is already awash in plastics!" If so, then I would say your feelings on the subject may be healthy. But please understand that while things are getting really bad, they could get much, much worse. And while the fossil fuel giants might not actually wish the world to be a worse place, they are acting as though having too much plastic junk in the world might be an acceptable price to pay for maintaining their own profits.

The Yale Environment 360 article makes a point that is worth passing on. It is clearly stated in a quote from Judith Enck of Beyond Plastics, commenting on the fact that many plastics facilities are still in early development. "That's why 2020 is so crucial," she said. "There are a lot of these facilities that are in the permitting process. We're pretty close to it all being too late."

It is also worth noting that the large oil and gas companies are trying to build a market in a world that already has resistance, and the resistance is growing rapidly. These companies may have a lot of money to spend, but it is not as extensive as it might appear. They are in trouble for a reason, and the reason will not just go away because they can sell ethylene for making plastics in addition to the fuels they have traditionally pushed. They are, I believe, taking a far greater chance than Ørsted took in leaving the industry altogether.

The plastics solution to the fossil fuels problem has some likelihood of complete failure. Furthermore, it is important that it fail completely for the good of the planet. And interestingly, we actually can make that happen by refusing to buy or use plastics wherever we can. ♻

Let's Get Serious About Electric Lawnmowers

George Harvey

If you mow your lawn, or even if you hire someone, you probably don't think of a gas-powered mower as your best friend. But let's face it, it's a task that most of us spend a lot of time and money on to keep our yards mown all spring and summer. But the noise, vibration, and fumes of a small internal combustion machine are not among the great attractions of yard work. With most gas-powered engines, exhaust emissions are much worse than those of a car. And then there is the time and cost for maintenance and trips to the gas station.

Fortunately, there is a better way. It eliminates a lot of noise and all the fumes of an internal combustion engine. It reduces maintenance and operating costs, and can reduce the operator's carbon footprint by over 95%. For some people, it can turn mowing a lawn from a chore into something enjoyable. Neighbors appreciate the relative quiet. And in a best case, it turns maintaining a perfect lawn into something you don't even have to think about. That better way is, of course, an electric lawn mower (e-mower).

As it turns out, more and more people and institutions are making the switch to e-mowers. In Charlotte, Vermont, The Ten Stones Village Association replaced a 21 hp diesel zero-turn mower to maintain its six acres with a Mean Green CRX-52, avoiding 125 hours of diesel racket each year. Zero-turn electric lawn mowers have also recently been purchased by the Burlington Electric and Parks and Rec Departments, the NW Region of the Vermont Department of Parks, and Dartmouth College.

Lawn care customers usually prefer e-mowers when they are available, because of reduced noise and pollution. In response, some lawn care businesses are now offering electric mowing services. There are at least four e-mowing services in Vermont, and a few in New Hampshire and Maine. One example is Green Bee Lawn & Garden, in Chester, Vermont. Taking the transition away from oil and gas as part of its business plan, not only are the mowers electric but so is just about everything else. That includes the blowers, the chain saws, and even the truck will be in the near future. Even the electricity that powers all this is green, as it comes from the owner's own 9.72kW solar array. Need we add that lawn products are organic? Green Bee Lawn & Garden can be contacted at 802-289-1968. Their Facebook page is http://bit.ly/Green-Bee-on-FB.

Chris Cook of Top Notch Property Maintenance uses Mean Green electric mowers. These mowers save him $3000 a year in fuel. Chris also commented on how electric mowers are a great time-saver, as they require less maintenance.

It happens that as the season for lawn care is just starting, there is some good news about electric lawn mowers for anyone who might want to buy one. First off, walk-behind electric mowers for homeowners are comparable in price to traditional models, and given reductions in operating costs, they can be less expensive over their lifetimes. And second, there are incentives and rebates available for those who want to switch to electric. A number of municipalities offer them. Also, a number of local electric utilities provide incentives for them. If you want to find the incentives for the area where you live, the best thing to do is to contact both your municipal government and your local utility to see what they offer.

Top: Mean Green Mower at Dartmouth College. Photo: Steve Wisbaum, Eco-Equipment Supply. Center: Mean Green electric mower used by Green Bee Lawn & Garden. Courtesy photo. Bottom: Robowmow® robotic mower keeps two country acres pristinely mowed all by itself. Photo courtesy of Green-E-Mowers.

For example, in Vermont there are sixteen utilities that offer incentives for electric mowers:

Green Mountain Power offers $50 for residential mowers and $700 for commercial mowers. (Call 802-342-3808 or email Emily.eckert@greenmountainpower.com)

The Burlington Electric Department offers $100 for residential mowers and $3,500 for commercial mowers. (Contact Mike Kanarick at mkanarick@burlingtonelectric.com)

The Vermont Electric Co-op also has a $100 incentive for residential mowers and $1,000 for commercial mowers. (Contact Lisa Morris at 802-635-4222 or lmorris@vermontelectric.coop.)

The Washington Electric Co-op also has a residential incentive of $100 and $1,000 for commercial mowers.

The Vermont Public Power Supply Association offers $25 for residential e-mowers and more for commercial. (Contact Julia Leopold jleopold@vppsa.com)

All together, these Vermont utilities offer e-mower incentives to 95% of the state's residents.

The news on e-mowers keeps getting better. Some time ago, *Green Energy Times* started looking into robotic mowers. These impressive little machines never have any desire to play hooky or go to the zoo, all they want to do is keep the grass down. And since they work every chance they get, they keep a lawn that is about as close to perfect as you can get. Our latest article on these machines was "Get a Robotic Mower and Take Back Your Time," which appeared in May, 2019 (http://bit.ly/it-mows-you-dont).

Our publisher, N.R. Mallery, was so impressed by robotic mowers that she purchased two Robomow® brand mowers herself. She was so impressed by her Robomow® that she decided to sell them and make sure they were available locally. You can learn all about it by calling her at 802-439-6675. ♻

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