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Green Gifts for the Holidays

Jessie Haas

One of the ways to trim your carbon footprint is to buy less—but is that any fun during the holidays? This isn't Lent! Can't we say 'I love you to the moon and back' while still loving the planet?

Well, sure, and here are a few ideas. Farm-Way in Bradford VT, a solar-powered emporium of everything country, sells clothing and gear from Patagonia, a highly ethical company. Another Farm-Way option could be a solar-powered lantern. These inflatable lights can charge up on a window sill and act as an emergency light, flashlight, or just a gentle way to illuminate early-morning coffee making. Some brands, such as the Luci Light, donate lanterns to people in developing nations for each light bought here, so this is a double gift.

Also, in the spirit of the season of darkness, how about a box of LED lightbulbs to help a loved-one transition their household in a sustainable direction? Be sure to include a colored string. Not just for Christmas trees, these make festive night lights and add a welcome twinkle to the house.

Need something in a bottle? Choices from Appalachian Gap, the solar-powered distiller of fine spirits, including Mythic Gin and Ridgeline Whiskey. The bottles and

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Donna Carpenter (L), co-CEO of Burton, joined in the climate strike in the UK. Photo courtesy of Burton.

Burton Team rider Danny Davis in Stowe, Vermont. Credit: Blotto Photo.

BURTON TAKES A STAND FOR THE PLANET

George Harvey

It might be fair to say that Burton Snowboards (Burton) is the leader in its field, worldwide. Jake Burton Carpenter, one of the first developers of the snowboard itself, founded the company in his barn in Londonderry, Vermont, in 1977. Today, it is still a Vermont company, though it moved to Burlington and has grown a bit. It has approximately 400 employees in the Burlington area, a total of 650 in the United States, and about 1,000 globally. In addition to the headquarters in Burlington, there are offices in Austria, Japan, Australia, Canada, and China.

Burton has firsthand knowledge of climate change. It has already been having a serious impact on the winter sports business. A recent press release said, "There are clear signs of climate change seen through the lens of a snowboarder – extreme weather, decreased snow accumulation, and melting glaciers are among them. In the northeast U.S., the number of days with snow cover has decreased by one to two weeks since 1970." The change reduces activity and sales, especially in Burton's home state of Vermont.

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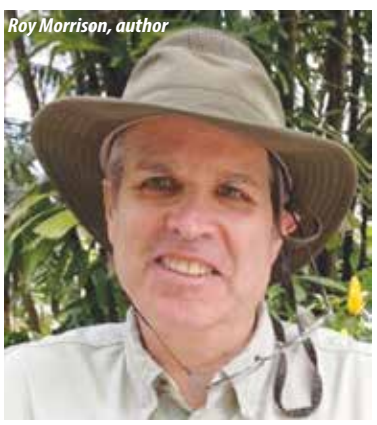
An Ecological Reformation


Roy Morrison, author

Business and pollution as usual have unleashed a rapidly worsening global ecological crisis. We must choose quickly between accepting the dire consequences of global climate disruption, or the embrace of a global ecological reformation.

At bottom, an ecological reformation is expressed by two themes that will define the ecological turn of civilization. First is the pursuit of sustainability. Second is making economic growth result in ecological improvement. That is our central challenge. The goal is to restore the health of the biosphere while building a prosperous and just ecological civilization that will long endure.

This is not utopianism. It is a matter of politics, economics, eco-technology, the nurturance of both freedom and community and therefore justice and fairness as a common human right and responsibility. It is a task consonant with economic growth in accord with ecological market rules and the pursuit of social and ecological justice.

Business and markets and politics are leading us to the brink of ecological catastrophe. Now is the time for business and markets and politics to lead us instead to a just and sustainable ecological future.

Sustainability

Sustainability is more than renewable energy and a quick global transformation from fossil fuels and nuclear power. This is necessary and desperately needed. But, by itself, 100% renewable energy is not sufficient.

Sustainability is life and ecosphere responding to all influences and co-evolving in a matter that maximizes the prospects for all life, not for any particular species. Sustainability is the process that has allowed life to withstand periodic mass extinctions and once again thrive.

What is different as the mass extinction of the Anthropocene unfolds is that it has been both unleashed by humanity, and must be remedied by humanity. Humanity has become a self-conscious participant

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Green Energy Times is produced by 100% solar power, off-grid with a 3.8 kW PV system. We live and know that Energy Independence is indeed possible – with clean, sustainable renewable energy along with reducing your needs. We walk the talk!

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

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

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

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Going Green On a Budget

Jessie Haas

Image: www.ccPixs.com

We can't all afford a heat pump, EV, or solar panels, but we can still cut our carbon footprints and save money at the same time, through changing a few habits.

Nega-watts (the electricity we don't use) are the cleanest and greenest, and there are many affordable ways to cut electricity use. Change lightbulbs to LEDs. Turn them off when leaving a room. Don't let the computer go into 'sleep' mode; turn it off instead. Use a "smart strip" that can be turned off to prevent appliance vampires from sucking up energy while not in use.

Using a clothes dryer uses ten times the energy that washing does, and is very hard on clothing. Hang clothes to dry; spot-clean instead of washing a whole garment; spritz stale-smelling items with a vodka-water mix to freshen them; use a steamer to get out wrinkles. It all saves energy and money, and keeps clothes looking new longer.

For the electricity you do use, use the renewable energy checkoff available from your utility on your power bill. The cost increase is slight, and supports local farmers (in the case of GMP's Cow Power). It also helps drive the Northeast's Renewable Energy Credit (REC) program, which has steadily increased the availability of renewable electricity on the grid.

Eliminating waste in home heating is equally important. Retrofitting an old house can be costly, but don't assume you can't afford it. My neighbor got a new refrigerator, a pellet stove, and free weatherization this summer through Southeast Vermont Community Action (SEVCA), one of the excellent agencies performing weatherization among other services in our greater region. For ideas, look through the incentives section of Green Energy Times. And don't feel uncomfortable asking for help. This isn't just for you; it's important help for the planet.

People should be comfortable in their homes, but not t-shirt and shorts comfortable. This is the Northeast! Put on a sweater! We don't all have to look like Jimmy Carter (though he is one of the cooler ex-presidents). There are terrific sweaters available from many thrift stores; rock that look. Once you've got a great sweater, nudge the thermostat down – not a lot, just a degree or two. Gradually training ourselves to enjoy 65° rather than 70° can save a significant amount of fuel and money.

The IEC has identified SUVs as the second largest factor in the recent rise of CO2 emissions. Don't buy one. A fuel-efficient vehicle will save money and prevent "carbon guilt" on every trip. A rear-mounted luggage rack, more aerodynamic than top-mounted racks, can make up for the reduced carrying space.

Ride-sharing cuts one's carbon footprint significantly. It's not always possible, but even once a week, or for special trips, it's worth making that bit of effort to have one vehicle on the road rather than two.

Don't idle. Turn your engine off before you check your phone. A car gets zero miles per gallon while idling. ZERO. Everyone around gets a double-lungful of dirty emissions, the engine gets damaged, and CO2 pumps straight into the atmosphere, without even getting the benefit of moving. Let's make idling the new smoking, something dirty and vaguely shameful that a lot of us used to do but don't anymore. Check your phone before you start your car. Phone off, car on. Car off, phone on.

Driving smarter can save a lot of energy. Go the speed limit or less. Brake and accelerate gently, as if there's an egg under the pedals. Make sure tires are properly inflated. Take your snow tires off when they are not needed (which will happen!).

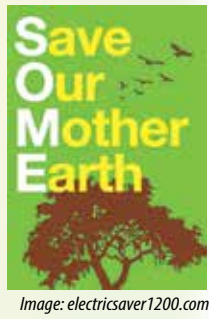
Flying is the biggest CO2 contribution most people make. We can try to attend meetings by teleconferencing, and vacation close to home. (Again, we live in the Northeast. It's amazing here!) Many people who can't cut out air travel buy carbon offsets. It's relatively easy to go on-line, find a site with a calculator, and off-set a trip, or a year's worth of home-heating or driving. Make sure the off-set incorporates renewable energy and that it actually makes a difference – in other words, it is not something that is already happening without help from offsets.

Most experts agree that we will not solve global warming without a worldwide movement. All around us are people who care deeply about this issue. We might not know them yet, but that's easily solved by joining a group, or starting one. Extinction Rebellion grew from a dozen people in a small English village, to a global movement.

Finally, vote if you can. We must vote our climate principles, and tell candidates why they got, or didn't get, our support. We need change at a systems level. Advances in technology, and our understanding of soil as a carbon sink, put the solution to climate change tantalizingly within reach. It's really up to us whether we preserve the climate we evolved to live in, or not.

Links available online where this article is posted: greenenergytimes.org.

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



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Concentration of CO2 in the Atmosphere

408.53
parts per million (ppm)
November 5, 2019

Learn more at www.co2.earth.

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THE SUN DAY CAMPAIGN NEWS

FERC'S Latest "Infrastructure" Report

MAJOR CHANGES IN ITS THREE-YEAR FORECAST

✓ No New Coal Capacity; Net Reduction in Fossil Fuels; Significant Decline for Nuclear Power

✓ Net New Wind and Solar Capacity More Than Doubles Natural Gas

Ken Bossong

According to a review by the SUN DAY Campaign of data released in the beginning of November - belatedly - by the Federal Energy Regulatory Commission (FERC), the agency has once again revised its three-year forecast for changes in the U.S. electrical generating capacity mix. Sharp declines are foreseen for fossil fuels and nuclear power while renewable energy (e.g., biomass, geothermal, hydropower, solar, wind) is forecast to experience even stronger growth than previously projected.

FERC's latest monthly "Energy Infrastructure Update" report (with data through August 31, 2019) indicates that "proposed additions under construction" and "proposed retirements" combined could result in a net decrease in the generating capacity of fossil fuels (i.e., coal, natural gas, oil) as well as a net decline of nearly five percent (4.56%) in nuclear capacity by August 2022. Meanwhile, led by wind and solar, the generating capacity of renewable energy sources is foreseen to grow by more than 47 gigawatts (GW).

While net new natural gas generating capacity is projected to increase by 19,757 megawatts (MW), that is more than offset by a drop of 18,957 MW in coal's net generating capacity and a decline of 3,016 MW in that of oil. Further, nuclear power is foreseen as dropping by 4,851 MW.

Meanwhile, wind capacity is projected to grow by 27,659 MW and utility-scale solar by 17,857 MW. The other renewable sources would also increase: hydropower by 1,282 MW, biomass by 333 MW, and geothermal by 280 MW. Collectively, they would add 47,411 MW over the next three years. That is significantly more than double the projected growth in natural gas generating capacity. In fact, net new wind capacity alone is greater than that of natural gas.

While earlier FERC data had documented this general trend, the agency's latest numbers seem to be particularly noteworthy because a modification in how FERC now presents its data, compared to six months earlier, suggests changes in the nation's energy mix may be accelerating. [1]

Specifically, FERC's most recent three-year forecast for net new generating capacity by wind is 3,099 MW higher than a comparable forecast in its "Energy Infrastructure Report for February 2019" while that for utility-scale solar has grown by 5,809 MW. Including hydropower, biomass, and geothermal, the cumulative result is an increase over the past six months in FERC's three-year forecast for net new generating capacity by renewable energy sources from 37,622 MW to 47,411 (i.e., 26.0% higher).

On the other hand, in its February 2019 report, FERC anticipated net cumulative growth by fossil fuels of 5,087 MW over the next three years. Now FERC foresees a net decline in fossil fuel generating capacity of 2,216 MW. Notably, net new additions to natural gas capacity are 3,753 MW lower than they were forecast to be six months ago.

FERC also projects that the capacity of new coal plants over the next three years will be zero because none are under construction. In fact, if FERC's latest projections prove accurate, in three years, coal's share of the nation's total available installed generating capacity would drop from 21.37% today to 19.14% three years hence.

Meanwhile, renewable energy sources will continue to expand. They would provide nearly one-quarter (i.e., 24.80%) of the nation's total available installed generating capacity [2] by August 2022 (compared to 21.69% today) with wind alone accounting for over a tenth (10.29%) and utility-scale solar at 4.63%. [3] The balance will be provided by hydropower (8.23%), biomass (1.32%), and geothermal (0.33%).

"FERC's latest three-year projections continue to underscore the dramatic changes taking place in the nation's electrical generating mix," noted Ken Bossong, executive director of the SUN DAY Campaign. "Renewable energy sources are rapidly displacing uneconomic and environmentally dangerous fossil fuels and nuclear power - even faster than FERC had anticipated just a half-year ago."

The SUN DAY Campaign is a non-profit research and educational organization founded in 1992 to support a rapid transition to 100% reliance on sustainable energy technologies as a cost-effective alternative to nuclear power and fossil fuels and as a solution to climate change. Contact info: sun-day-campaign@hotmail.com, Ken Bossong, 301-270-6477 x6.

[1] In FERC's "Energy Infrastructure Update for February 2019," a table entitled "Proposed Generation Additions and Retirements by March 2022" included two columns: "High Probability Additions" and "Retirements." However, FERC's "Energy Infrastructure Update for August 2019"changed this table to "Generation Capacity Additions and Retirements (September 2019 - August 2022" and replaced the earlier columns with "Proposed Additions Under Construction" and "Proposed Retirements." FERC adds that "Under Construction" includes units that have started site preparation or construction. It also includes units that are in the testing phase. The SUN DAY Campaign is interpreting FERC's new format, while comparable to the earlier one, to be a more accurate forecast of likely additions and retirements.

[2] Capacity is not the same as actual generation. Capacity factors for nuclear power and fossil fuels tend to be higher than those for most renewables. For the first eight months of 2019, the U.S. Energy Information Administration (EIA) reports that renewables accounted for almost 18.5% of the nation's total electrical generation - that is, somewhat less than their share of installed generating capacity (almost 21.7%) for the same period. Conversely, coal's share of generating capacity in the first two-thirds of 2019 was 21.4% while its share of electrical generation was 23.7%.

[3] FERC only reports data for utility-scale facilities (i.e., those rated 1-MW or greater) and therefore its data do not reflect the capacity of distributed renewables, notably rooftop solar PV which - according to the EIA - accounts for nearly a third of the nation's electrical generation by solar. That would suggest that total distributed and utility-scale solar capacity may be as much as 50% higher than reported by FERC both for today and for three years hence.

All sources will be posted on the posting of this article on the Green Energy Times *website: greenenergytimes.org.* ♻

Trouble Ahead for Natural Gas?

George Harvey

Each month, I look forward to posts on energy that come from the Sun Day Campaign (SDC). These posts have chronicled a story of the rise of renewable energy, analyzing reports from the Federal Energy Regulatory Commission (FERC) on energy infrastructure in the U.S. For those who are interested, the Sun Day Campaign's analysis is very readable source for ordinary people.

The most recent of these SDC reports has some very informative content (http://bit.ly/FERC-Aug-2019). Addressing the issue of changes in the capacity in the coming three years, it says that not only is our nuclear capacity declining, but the overall capacity of fossil fuels is not increasing. And meanwhile, we can expect to see a huge increase in capacities of solar and wind power.

The SDC post is clear on the issue of fossil fuels not increasing. There is an expectation that new natural gas plants will come online in the coming three years, and the total capacity of new natural gas plants will greatly exceed the total capacity of old natural gas plants that are retiring. Nevertheless, the increases in natural gas capacity will be offset by declines in capacity in coal and oil generating capacity.

Once in a while, I get the idea that deeper issues tied to a story may be worth examining. The SDC post inspired me to poke around in the FERC databases to see what might be worth a closer examination. What I found suggests to me that natural gas in the U.S. may be in considerably more trouble than most of us realize (http://bit.ly/FERC-reports – Energy Infrastructure tab).

Back in August of 2017, FERC started including proposed capacity additions and retirements, by energy source or fuel type, in its monthly "Energy Infrastructure Update." The capacity changes it posts are for changes over the coming three years. In August of 2017, proposals for additions for natural gas came to a total capacity of 93,290 megawatts (MW) over the period ending in August of 2020. In August of 2019, the amount of capacity proposed for natural gas generating plants was 58,907 MW for the period to August of 2022. This is a reduction of 37%. During that time, proposed retirements actually increased very slightly, and the reduction in the proposed net change of capacity was about 43.4%.

The figures for proposed new capacity indicates a decrease of new capacity of

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New! Transportation Climate Initiative

Twelve States and DC Stand Ready to Fight Climate Change

Transportation and heating emissions found to cause the 94.3% rise in VT's GHG increase over 1990 levels

Tim Ashe, VT State Senator

Many Vermonters were surprised and rightly concerned when the Department of Environmental Conservation issued its Greenhouse Gas (GHG) Emissions Inventory last June, and they learned that Vermont's combined GHG emissions had increased 16% since1990 levels.

How could this have happened? Hasn't Vermont been a national leader in electrical efficiency and in the deployment of renewable electric power generation?

Vermont has indeed made tremendous inroads in terms of addressing the GHG emissions from the generation and use of electricity, with 2015 levels more than 8% below 1990 levels. But while most climate change discussions in Montpelier and beyond the last twenty years centered on the electric sector, that is not where most of our emissions are occurring. As of 2015, the electric sector accounts for just 10% of Vermont's GHG emissions.

So, what is causing Vermont's emissions to rise?

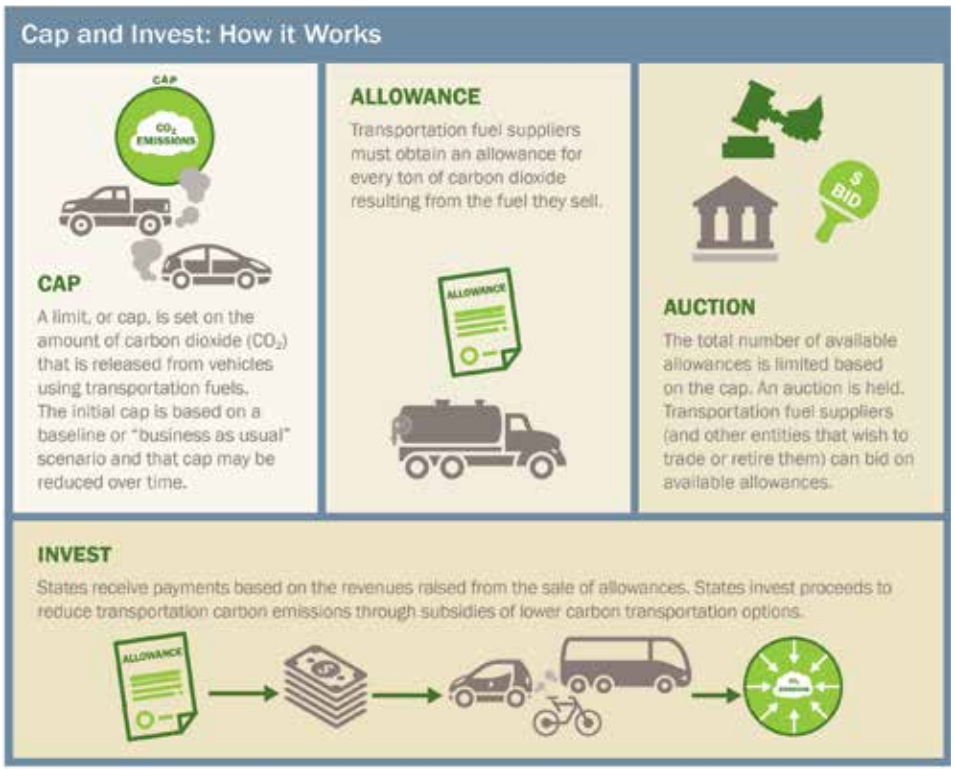
Transportation and heating emissions are Vermont's two most significant sources of GHG emissions, representing 43.3% and 27.8% respectively of Vermont's total emissions. And more troubling, they account for 94.3% of the increase in Vermont's emissions over 1990 levels!

Put simply, to fight climate change, the most important areas in which Vermont must act are transportation and heating. This doesn't mean we cease efforts to promote electric efficiency and to deploy more renewable power. Those continue to be essential since addressing transportation and heating emissions will require us to use more electricity, and we must insist that the electric power be clean. But transportation and heating emissions must receive priority emphasis. For the rest of this piece, I'll address the most promising development on the transportation front.

How will Vermont reduce transportation emissions?

Many strategies will need to be deployed, but the most significant opportunity before us is the Transportation and Climate Initiative.

The Transportation and Climate Initiative (TCI) is a regional compact being designed by twelve states and the District of Columbia to create a "cap-and-invest" transportation emissions program. In the simplest terms, this regional compact would (1) set a cap on the amount of transportation emissions that will be allowed, (2) auction the rights to sell the fuel that causes the allowed level of emissions, and then (3) distribute funds from the auction to each state to re-invest in a cleaner transportation system. The funds could be used to improve public transit options, build out electric vehicle charging infrastructure and incentivize electric vehicle purchases, develop pedestrian and bike corridors, and other uses that reduce GHG emissions.



Under TCI, each year the allowable emissions amount would decrease, effectively guaranteeing that transportation emissions will go down in Vermont and all the signatory states.

TCI is being negotiated as I write this. Vermont is represented at the table by officials from our Agencies of Transportation and Natural Resources. They're joined by officials from Connecticut, D.C., Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

The best place to learn more details about how TCI would work and which terms are being negotiated is the "Framework for a Draft Regional Policy Proposal" that was released a month ago. It can be found at https://www.transportationandclimate.org/TCI_10-01-2019.pdf

Major elements being discussed at the negotiating table include:

1. Equity – TCI must be designed in a way that supports rural and urban communities and benefits people of all income levels.

2. Applicability – The states must agree upon which transportation fuels will be subject to the emissions cap.

3. Compliance, enforcement, and monitoring – Once an emissions cap is set, TCI's administration must be transparent and straightforward.

4. Auction process and distribution of proceeds – Vermont will not receive the same distribution as, say, New York, but the formula for distributing funds must be fair and provide Vermont with sufficient funds to re-invest in cleaner transportation.

Once these details are finalized in December, they'll be made public. Each state will then make a decision in February or March regarding whether to join the TCI compact.

It would obviously be premature to say "let's sign" until we see the agreement that comes forward, but I am optimistic.

I am optimistic because this is a systemic emissions reduction which exceeds any one individual's ability to effect change.

I am optimistic because TCI is modeled after the Regional Greenhouse Gas Initiative, entered into by Governor Douglas more than a decade ago, that has successfully reduced CO2 emissions from electric generation.

And finally, I'm optimistic because the TCI regional cap-and-invest model means that as Vermont adopts a tool to guarantee transportation emissions reductions, so also will some of the most populous states in America.

Tim Ashe is the President of the Vermont State Senate and resides in Burlington. During his career in affordable housing, he developed two solar projects, coordinated weatherization projects for 152 apartments, and achieved Enterprise Green Communities certification for two new senior housing facilities. He can be reached at tashe@leg.state.vt.us. ♻

Transportation and Climate Initiative (TCI) Jurisdictions. Twelve states and the District of Columbia are developing a regional policy proposal to address transportation-related GHG emissions as part of TCI. Nine states (including Vermont, indicated in dark green) and D.C. signed onto the Declaration of Intent in 2018 that provides a starting point for the regional policy proposal. The other three (light green) continue to participate in the policy development. Images courtesy of the State of Vermont.

Electric Pickup Trucks Are on the Rise!

A Demo of the Ford F-250 Three-quarter-ton Plug-In Hybrid Electric Truck Held in Burlington, Vermont

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

On October 30th, Vermont Clean Cities Coalition (VTCCC) hosted a demonstration of XL Fleet's Ford F-250 Plug-In Hybrid Electric truck upfit for interested stakeholders.

Fleet managers, utilities, and mechanics gathered at Burlington's Department of Public Works garage to learn about XL Fleet, and the GHG emissions reduction and fuel savings of their plug-in hybrid electric upfit systems. Attendees had the opportunity to check out XL's plug-in hybrid upfit system up close, ask an XL sales representative questions, and test-drive the truck.

Image source: VTCCC Newsletter

Upfit systems are vehicle drive-train additions that give the vehicle plug-in hybrid electric or regular hybrid capability while leaving the drive-train and its warranty intact. This technology serves as an intermediary step for medium-duty fleets that want to reduce GHGs and save money on fuel and maintenance.

Burlington DPW and Claude Raineault hosted the XL demo and allowed the use of their lift to see the upfit system up close!

The XLP Plug-in Hybrid Electric Upfit is a class-leading three-quarter-ton pickup and boasts a 50% mpg improvement and a 33% CO2 reduction! Models include 4x2 and 4x4 models. Learn more about the world's first PHEV Super Duty Ford F-250 pickup at https://www.xlfleet.com/Ford XL PHEV.

The all-electric Ford F-150 has also been in the news and may be available as early as 2021. The F-150 Hybrid full sized pickup truck is due to be introduced soon, as a 2020 model.

Do be assured that *Green Energy Times* will be following the production and availability of the upcoming all-electric Ford F-150 and the XLP™ plug-in Hybrid Electric Ford F-250 as they are ready to be released for purchase. This represents a huge solution for our transportation emissions in our rural states and everywhere. It is indeed a solution we have been hoping and waiting for — a real game changer for the work force and the planet. Kudos to Ford for stepping up to the task! We can't wait to report to you that the electric pickup truck is to the rescue and not just on the rise! ♻

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**

AUTOMAKERS FORSAKE THE FUTURE BY CAVING TO TRUMP'S EMISSIONS PUSH

Carl Pope

The first comment that came across my screen after the news that General Motors Co. and Fiat Chrysler Automobiles NV, along with Toyota Motor Corp. and some smaller foreign automakers, had signed on to President Donald Trump's legal assault on technological progress in the auto industry was this: "Wimps." The administration aims to strip California and other states of their ability to regulate vehicle emissions in their fight against global warming. It has split the global auto industry into two camps, with U.S. manufacturers on both sides. The stakes are nothing less than the technological and geographical future of auto making.

Fear of presidential retribution, particularly in the form of tariff discrimination, is the obvious and perhaps only logical explanation for the move by GM, which has bet its future on electric vehicles (EV), to join Trump's jihad against EVs. Fiat Chrysler, on the other hand, is behaving predictably. It remains far behind its competitors in preparing for a world without internal combustion cars and trucks. Toyota's case is more complicated; the company believes in fuel cells, not batteries, but fear of Trump retaliating against the company seems likely a major factor for its backing as well.

GM President Mary Barra met with Trump a few weeks ago, so the president had ample private opportunity to signal to her that if GM didn't join Fiat Chrysler in supporting him against California, there might be unpleasant consequences.

These fears of retribution are well-founded. The Justice Department launched an antitrust investigation into the four auto companies, Ford Motor Co., Volkswagen AG, BMW and Honda Motor Co. Ltd., that struck a deal with California to produce cleaner cars in upcoming model years than Trump's Environmental Protection Agency proposed. Calling a company's decision to improve its products an antitrust violation because consumers will no longer be able to buy inferior products is a stretch, but the threat remains. When Microsoft Corp. beat out Amazon.com Inc. for a new $10 billion federal cloud-computing contract, it soon was revealed that Trump had instructed the secretary of defense to "screw Amazon" out of getting the work, making public what every major company fears: cross Trump and the government comes after you, however weak its case.

Image: scitecheuropa.eu

Assuming they are "wimps," and that fear of Trump explains why GM and Toyota have chosen to side in court with the president, their secret hope may be that either Trump loses this lawsuit (highly likely), fails to be re-elected (also better than 50%) or both. It's hard to believe they relish a situation in which the federal government uses tariffs, taxes and antitrust policy to punish any company that challenges it. But a domestic U.S. auto market that falls steadily further behind global technology is even worse. Trump's "offer" to California to consider allowing a 1.5% annual improvement in emission standards would reach the current 2025 goals only in 2040, putting American automakers more than 15 years behind Japanese and European ones in their respective home markets and marking the end of competitiveness for domestic auto factories.

Indeed, for GM and Ford, an outcome in which Trump is re-elected and the courts permit him to freeze pollution and efficiency standards is catastrophic. European and Chinese regulators will continue their urgent push to shift their markets from consuming polluting and imported gasoline and diesel to clean, domestic electricity. Japan and India will be close behind, because they are also facing air pollution and energy security threats from oil imports and seek access to Chinese and European customers.

In this world, the U.S. market would become a dumping ground for inferior, outmoded combustion drive trains, and Trump's policies will ensure continued stagnation. Making such combustion vehicles on cheaper assembly lines in Mexico won't solve this problem. GM needs a way to sell competitive cars in the U.S., not obsolete ones.

Trump is committed to ensuring that the oil industry doesn't lose its U.S. gasoline and diesel markets. A second Trump term will mean that GM's electric fleet, on which GM's Barra has bet the company's prospects, will be unable to achieve competitive market share. Just as Trump has intervened with federal regulators to try to keep uncompetitive coal plants in operation, his second term will enable him to strangle market share for EVs. If GM is to have a future, it will have to take on government-supported Chinese, Japanese and European manufacturers in their home markets. It won't work.

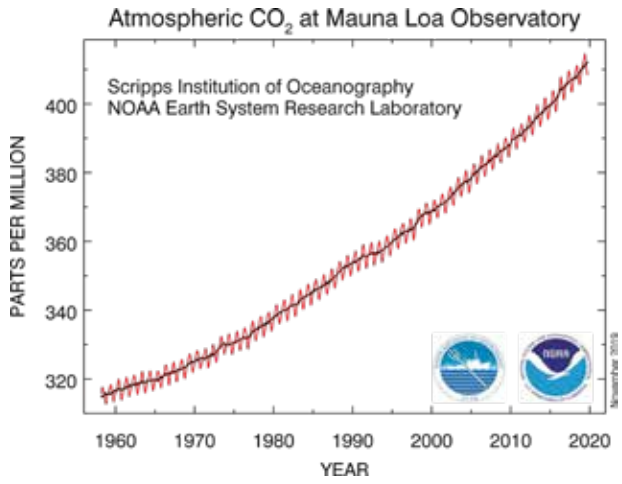
Chairman Bill Ford has figured this out, which is why, even though his company has not progressed as far as GM in developing its own EV models, Ford signed up for the California agreement. Once again it appears that two major automakers seem determined to ignore that domestic markets will eventually demand cleaner, more efficient vehicles that will reduce pollution, climate risk and reliance on oil.

To learn more about Carl's views on the environment, energy and climate, read Climate of Hope, *which he has co-authored with former NYC Mayor Mike Bloomberg. The link is https://www.climateofhope.com.*

A veteran leader in the environmental movement, Carl Pope is the former executive director and chairman of the Sierra Club. *He's now the principal advisor at* Inside Straight Strategies, *looking for the underlying economics that link sustainability and economic development. Pope serves as a Senior Climate Advisor to former NYC Mayor Michael Bloomberg. He has served on the Boards of the California League of Conservation Voters, Public Voice, National Clean Air Coalition, California Common Cause, Public Interest Economics Inc, and Zero Population Growth.* ♻

Are People a Cancer or a Parasite?

Randy Bryan



The monthly average CO2 concentration at Mauna Loa Observatory for Oct. 2019 was 408.53 ppm compared with 406.00 ppm for Oct. 2018. https://www.esrl.noaa.gov/gmd/ccgg/trends/.

"Homo Sapiens" means smart human, right? Most would say, "Yes." Look at all we have figured out and accomplished on this earth. It's incredible. Big Bang Theory (on TV) puts it all into 20 seconds. But an alternative metric for our species is offered here for your consideration.

Question: Are we a cancer or a parasite on this earth? Neither cancers nor parasites are viewed as especially intelligent, but human behavior and activity, in the aggregate, might be viewed from 40,000 feet in this same light. A cancer will spread until it uses up all its food source resulting in a massive die-off of the cancer and host. A parasite also feeds off its host but usually stops short of killing the host (and itself).

How do humans fare in this comparison? There is no answer yet, as we haven't reached the feeding and exploitation limits of our host. But, consider our societal psychology. In this newly coined "Anthropocene" epoch, we are using 1.7 times the earth's sustainable resources each year, we have driven CO2 to a 3 million year high, and we are causing the sixth mass biological extinction event in the billions of years history of our planet, all without commensurate stabilizing reaction or regulation.

A lot of this resource use and extinction process is due to our compounded population growth. No end is in sight to that problem. China and India each tried various measures and were vilified by the world and their own populations for their "inhumanity." How would you react if you were told you had to, or were made to, curtail your reproduction for the common good? Are we as a species so programmed to reproduce that we would do so until we collapse into resource wars? Remember, disasters often hit the less fortunate first and hardest.

Look at wars as another case in point. Wars are started as responses to existential threats. We feel absolutely entitled to do whatever is needed to survive (beat the enemy). What populations or battlegrounds have emerged better than they started? And wars won't help the efficient use of resources. I am guessing the Pentagon agrees, unless our existence is threatened.

Cont'd on p.32

An Investment in Solar Systems Impact on Communities

George Harvey

Norwich Solar Technologies (NST) recently built a solar installation to provide renewable electricity at reduced prices to sixteen customers, including fourteen single-family homeowners on Starlake Lane in Norwich, Vermont. The system was built on land owned by Twin Pines Housing, a non-profit specializing in affordable housing.

Completed Tracy Community net-zero housing, located in West Lebanon, New Hampshire.

The project has three solar arrays, each of 15 kilowatts, AC. Each array has is about the size of a small school bus.

This system may sound pretty common nowadays. In fact, some might call it unremarkable. But there is one thing about it that makes it a powerful example of what can be done locally to solve big problems. The Community Impact Investment, a concept pioneered by NST, works to invest in our communities with an intentional, positive outcome for all parties.

In addition to the other work Norwich Solar Technologies does, which includes all aspects of design through installation, NST has been working to get solar power to those who struggle to otherwise afford it, often because they are excluded from participating in federal incentive programs. The challenge with the programs is that the incentives they offer for solar installations come in the form of tax credits. Non-profit organizations, such as churches and schools, do not pay taxes, so tax credits are not of much use. Similarly, many people do not earn enough money to owe much in taxes, so credits don't do them any good either. Many of these electricity customers would like to get solar power, but the system is not designed to directly support their solar purchase.

What NST does is play matchmaker for these people and organizations, finding local impact investors (LII) who wish to put money into local solar systems as an investment. These impact investors initially own the systems, make a modest return with tax credits, charge a discounted price for the solar electricity, and may sell the systems to those who use the electricity at a reduced price when the tax benefit period ends.

The NST Community Impact Investment program has supported the development of several solar systems, including the array on Starlake Lane. Norm Levy, who lives in Norwich and is the LII for the Starlake Lane project, has seen possibilities in the program that he would like to share with others.

Levy is a retired physician who worked at Dartmouth Hitchcock Medical Center. Serving on the Norwich Energy Committee, he saw the possibilities of how local, small investments could make a big difference. He developed a goal of having an investment that could recoup his money in seven years while reducing electric bills for moderate-income participants by 25%.

He worked with NST, Twin Pines Housing, and the Starlake Housing Association, a group of moderate-income homeowners. The project was able to provide solar energy to the fourteen homeowners, one other adjacent homeowner, and Cover Home Repair, a non-profit providing no-cost home repairs to low income Vermonters.

Norwich Solar Technologies CEO Jim Merriam says, "The Community Impact Investors like Norm have already made a big impact. What I find most encouraging is that the success is completely sustainable and within our community's control."

According to Levy, there are many progressive individuals of sufficient financial means who would like to step up to finance such projects, if only they knew how. He told us, "Many are hungering for socially responsible impact investments, now a multi-trillion-dollar business for the investment community but most offerings do not get down to the community level or to low-income populations."

He provided a list of his reasons for an investor to be a local impact investor. (We present that in slightly modified form to accommodate presentation in print.) The local impact investor:

1. Can take advantage of the numerous tax benefits available to private ownership but unavailable to non-profits and public institutions, including the 30% Federal rebate, state

Cont'd on p.19

Starlake Lane solar array. Courtesy photos: Norwich Solar Technologies.

Burton Snowboards Goes Big with Solar

Catamount Solar Installs 964 Solar Modules to produce 45% of Annual Electricity

Roger Lohr

Burton Senior Sustainability Manager, Jenn Swain, amid the solar array at Burton headquarters. Photo by Jesse Dawson.

After a year of energy from a rooftop solar array, Burton Snowboards announced in an annual sustainability report that it produced 318,220 kWh of electricity from April 2018 -April 2019. This energy was sent from Burton's 964 solar modules back to the electric grid (net metered) from the company's Burlington, Vermont location. Burton reported that the kWh amount represented about 45% of the building's annual electricity consumption and about 40% of the costs for the electricity in form of a credit to the electric bills.

Catamount Solar installed the solar project at the Burton facility. Kevin McCollister is a founder and managing partner of the company. When asked about the project using net metering, McCollister commented, "It makes sense to do net metering and stay on the electric grid compared to going off grid unless you are much more rural and far from utility lines." The utility companies greatly benefit from solar-produced energy particularly in the summer when it reduces the need for the utility to buy higher priced power during peak demand.

Catamount, based in Randolph, Vermont, is a member-owned cooperative company. Eight of the eighteen Catamount Solar employees are owners who receive a share of profit compensation based on the number of hours worked during the year. The theory of the cooperative company structure is "an acknowledgment that the company's success is based on people who work for and own the company." According to the International Coop Alliance, there are about 300 such cooperatives in the U.S. Catamount Solar also donates 5% of its profits to a community fund in Randolph that contributes to local community and environmental programs and initiatives.

Catamount has also been involved with 133 installations associated with the Solarize the Upper Valley program producing 811kWh in the region. The Vital Communities organization conducted the Solarize program to make photovoltaic (PV) energy more accessible across the Upper Valley (Connecticut River Valley region of New Hampshire and Vermont). The public campaign has been responsible for more than doubling the number of residences that installed solar projects in the Upper Valley.

In October 2019, Burton Snowboards officially joined the ranks of companies with similar values that meet B Corp™ certification standards for sustainability, social responsibility, transparency, and holding themselves accountable. While about 3,000 companies worldwide (and 34 in Vermont) are certified, Burton is the first

Cont'd on p.36

Guilford Community Church: 100% Carbon-Neutral Goals

George Harvey

Guilford, Vermont, has a fascinating history. Today, the population is just over 2,100. This is not much changed from the 2,400 or so it had in 1790, when it was one of the largest towns in the Vermont Republic. Another thing that remains from an earlier age is the Guilford Community Church (GCC), which was founded in 1767 or 1768. To be clear, the original church building burned down, and a new one had to be built in 1847, but the congregation kept going through that difficult time.

Solar installation underway. Photo: Lise Sparrow, Guilford Community Church

Changes do happen, of course, even in things that seem to last forever. Though stewardship of our environment is something that has its foundation in the Bible itself, its position in the life of the church is changing. It is becoming a focal point for a number of church groups in the 21st century. Members of the GCC congregation have been growing much more interested in the environment and climate change.

Country churches are not known for being especially wealthy, and the GCC is hardly an exception. Plans and expenditures have to be revisited periodically, just to keep staff paid and maintenance up to date. Recently, GCC decided that it would set goals of getting to 100% carbon-neutral energy and net-zero waste.

Activity after that point included everything from installing LED lighting and heat pumps to improving insulation and sealing windows. (Pastor Lise Sparrow said offhandedly, "We replaced the insulation in a very virtuous way." I could not help being much amused.) This is especially difficult for a small church because of a financial restriction that might seem rather severe. Any expenditure of $500 or more has to be reviewed by the whole congregation. Nevertheless, work has gone forward at a satisfying pace.

Of course having their own solar array was a goal, but under the circumstances it probably seemed rather far off to many church members. The size of the investment was not the only thing holding back a solar project. The federal government applies its incentives for solar power in the form of a tax break. This is fine for people who pay enough in income tax to make it worth while, but people or organizations without taxable income get no benefit from tax breaks.

In a small church, a lot of things get done by networking and using connections. And connections helped GCC get a solar array of its own. A member of the congregation is a relative of a couple, Victoria Roberts and Simon Piluski, who own and operate Southern Vermont Solar (SVS).

Pastor Sparrow said that Roberts and Piluski were very excited about the idea of putting a solar array on the roof of GCC. SVS is a rather new organization, formed in 2017, but Piluski was already an electrician when he took interest in solar photovoltaics, which was in 2000. Roberts, the business manager, has a master's degree in education. Both owners had been aware of the fact that federal aid was not readily available to non-profit organizations, and being presented with a chance to build one gave them the opportunity to develop their own approach to dealing with the problem. Roberts said that SVS had worked with an attorney experienced in solar projects to find the best solution to getting the array up.

The system was designed to have 37 Hanwha modules with enphase microinverters, for a total capacity of 12 kW, on the roof of the church. The work Roberts and Piluski did with their lawyer made it affordable. It was presented to the congregation for approval, and it was approved unanimously.

Now, Guilford Community Church has its solar array in place, and every member of the congregation has reason to feel a sense of accomplishment. ♻

The New Hampshire Sustainable Energy Association (NHSEA)

An Interview with Co-Founder Laura Richardson

Henry Herndon

Laura Richardson co-founded the New Hampshire Sustainable Energy Association (NHSEA) in 2003. Since that time, NHSEA has existed as a resource to help Granite State citizens, businesses, communities, and policymakers implement sustainable, New Hampshire-based energy solutions. With gratitude and admiration, NHSEA, recently re-branded as Clean Energy NH, reflects upon our history with this interview with the organization's founder.

Henry Herndon: Can you talk a little bit about the origins of NHSEA?

Laura Richardson: My husband, Gil, and I built our home in 2001 as an off-grid 'as-sustainable-as-possible', super-insulated, very energy-efficient home. We wanted people to understand that you don't have to be an engineer to live an efficient, sustainable life. You can be a regular person. So, we designed our home to be attractive and comfortable to attract everyday people. There was no support from the state at that time, no incentives, no educational resources. As a result, we had to do a lot of research and a lot of learning ourselves. Remember, that was before the internet was really a thing.

In 2002, people started coming to visit us, to tour our home and to learn about what it meant to have a sustainable home. We'd get up to 50 people coming to our house at a time, and before long, we were hosting tours every other weekend. It was exhausting! And everyone had really deep, technical questions and we weren't always equipped to answer them. So, in 2003 we said, "We need to turn this into an organization," and incorporated NHSEA as a 501(c)3 nonprofit.

HH: Can you talk about the role NHSEA played in New Hampshire's nascent clean-energy community?

LR: NHSEA has always been a mix of social and technical. We hosted social events so people could get to know each other, and we hosted workshops so we could learn about more technical concepts. Our first workshop was in November 2003, and it was about solar hot water. We hosted the workshop at a winery in Lee that makes really good vodka. The winery had a brand new solar hot water system for the distillation process to cool the water before it went back into the Lamprey River, while heating the building at the same time. They let us do a vodka tasting.

At the first workshop we had about 50 people, they all paid $50, we had handouts and evaluations – it was all about educating people and getting feedback. Then we started hosting more. Photovoltaic (PV) for electricians was very popular. We had 50-60 people at those. We had workshops on biomass. We had PV 101 for homeowners. My focus was from the homeowner perspective, because there were hardly any installers at that time! The workshops eventually grew into conferences with multiple tracks and topics.

HH: Who were the other individuals, organizations, and partners that were advancing clean energy and energy efficiency alongside NHSEA?

LR: PAREI, the Plymouth Area Renewable Energy Initiative, got started in 2004 – that was Peter Adams and Sandra Jones and a handful of others. Their goal was to help local people install solar hot water, and they branched into efficiency and solar PV. They started with energy raisers and energy exchanges, neighbors teaching neighbors how to install solar. They took that model and created a toolkit so that other communities and regions could do the same, like HAREI in the Hillsborough area. They made a huge difference then, and they continue to make a huge difference now.

Around the same time, Julia Dundorf at New England Grassroots Environment Fund and Denise Blaha were working on Local Energy Solutions, trying to come up with different ways to have municipalities embrace energy efficiency and clean energy. They started rolling out the Local Energy Solutions Conference around 2008, the administration of which has since passed to Clean Energy NH. They also developed various toolkits on how to implement energy solutions with a focus on local governments and communities.

HH: What is one accomplishment you are particularly proud of?

LR: Getting the Renewable Portfolio Standard (RPS) through the legislature with a carve-out for solar – that was the most exciting success that we had. It was really hard, there were only a handful of dedicated supporters and lots of opposition, many of whom are now supportive of solar, but at the time they were really against that concept. Our goal was to create a[n] RPS carve-out for solar that would generate funds for rebate programs and incentivize more solar adoption, but also recognize solar's value as a resource that can be adopted by any individual, any homeowner, any business. That was the thread that connected everything. I remember I was testifying at the legislature and one Representative leaned over the table, he looked at me with these steely eyes, and he said, "There will never be 50 solar projects in NH." It makes me smirk a little now. *[In 2019 there are more than 9,000 net-metered solar PV installations in NH. - Ed.]*

HH: What do you think has changed most since NHSEA's beginnings?

LR: The prices for solar have dropped significantly. It cost $15 per watt when we bought our system. When we added to our system this year, we paid $0.65 per watt for the panels. And solar has become normalized. That was one of our big goals – that when you drive by normal houses on every-day streets you would see roofs with solar on them. That was always our dream.

[This interview has been lightly edited for continuity. – Ed.]

Henry Herndon is the Director of Local Energy Solutions for Clean Energy NH. ♻

Clean Energy NH current Board of Directors. L-R: Susan Geiger, Orr & Reno; Jack Ruderman; Jeff Haydock, EcoCFO; Ted Vansant, New England Commercial Solar Services; Sherrie Trefry, VHB; Madeleine Mineau, CENH Executive Director; Tom Burack, Sheehan, Phinney, Bass & Green; Charlie Niebling, Innovative Natural Resources Solutions; Kevin Porter, ROC USA. (Absent, April Salas, Dartmouth & Town of Hanover). Photo: Brianna Brand, Clean Energy NH.

Solarize Kearsarge Nears Completion

George Harvey

As *Green Energy Times* goes to press, Granite State Solar (GSS) is finishing the last installations of the Solarize Kearsarge Campaign, in the area of Kearsarge, New Hampshire. This is timely, as it means customers are able to take advantage of higher federal tax incentives that will be reduced with the new year.

GSS, which is based in Bow, N.H., started the campaign in April of this year. This was covered by a post on the GET website, "Solarize Kearsarge Kicks Off April 13." (http://bit.ly/GET-Kearsarge) Solarize Kearsarge was a cooperative effort of Kearsarge Climate Action and Vital Communities to help residents in Andover, Newbury, New London, Sutton, Warner, and Wilmot get solar photovoltaic systems installed at their homes. GSS was chosen as the preferred installer by Solarize Kearsarge from among several in the area.

The campaign got quite a lot of attention. In the end, 189 people contacted GSS, 130 of these scheduled site visits, and these led to 41 contracts being signed. Installations came to a little over 358 kilowatts (kW) and a total of 1047 solar panels.

GSS did not take a cookie-cutter approach to individual installations, with the idea that some were roof mounts, some ground mounts, and everything else the same. In truth, every system was designed based on its own needs. There were roof mounted systems and ground-mounted systems, but the latter were divided into those that were stationary and those with AllEarth trackers. Solar panels for systems ranged not only in size, but in type, with some made by Panasonic and most Hanwa Q-Cells.

For anyone who would like to know what it is like to participate in a Solarize campaign, we could describe the experience of Nancy Teach, a homeowner from Andover, N.H. She was one of those people who had studied the situation thoroughly. She already appreciated the benefits of solar power, having had her own system at an earlier residence. She was still undecided about installers when she heard about the Solarize Kearsarge Campaign.

"To me, solar is the responsible thing to do," Teach said. "I had solar in my previous home, and I knew I really wanted to do it again. When I heard about Solarize Kearsarge, I decided it was time."

"I contacted a total of five solar installers even though Granite State Solar was the preferred Solarize Kearsage vendor," Teach said. "I wanted to be part of the process. The other companies I met with were comparable, but Granite State Solar was different. I was impressed with Eric, a solar advisor with GSS, who came to my home and did a free site evaluation. His knowledge and overall thoughtfulness was impressive."

Teach's solar system is expected to produce 7,420kWh of electricity in a good year. It has nineteen Q-Cell 325 watt panels, each with its own Enphase IQ7 inverter. The total system size is 6.175kW.

"Installation went very quickly," Teach said. "The entire Granite State Solar install team that came to my home was very dog friendly, which is very important to me. I trusted them here when I wasn't in. After installation was completed, Jaimie in the Granite State Solar office was excellent and kept me informed about the entire approval process with the town. She even helped with paperwork for the state rebate, and I've already received my check from the PUC."

Because Teach's system was done in 2019, it is eligible for the 30% Federal Tax Credit. That tax credit drops to 26% in 2020, which is still a respectable incentive. There is also a rebate available from the State of New Hampshire.

Granite State Solar's web site is www.granitestatesolar.com. ♻

Nancy Teach and friend at home with the 6.175kW rooftop solar. Courtesy photo from Granite State Solar.

The Development of a Community Solar Project
Clifton Park, New York

George Harvey

Clifton Park, New York, is a town with a population of nearly 38,000, about twelve miles north of Albany. Its first community solar project, the Sugar Hill Solar Farm, opened in October.

It was not all that long ago that permitting and financial structures for community solar projects were not in place for the State of New York. That being the case, Clifton Park's first project could not be said to have been slow in coming. Mark Richardson, the CEO of U.S. Light Energy, one of the developers, told us he had been hard at work to get the state to allow community development for years before it finally became possible. The problem is not just getting the state on board. Utilities, transmission companies, towns, and groups of people with common interests all have to be ready to do their part.

Clifton Park could not have gotten started much before it did on the community solar project, but now that project is complete. The Sugar Hill Solar Farm is a seven-megawatt system that covers about forty acres of land. Its 20,000 solar panels will produce enough electricity to power about 600 local homes, and the community solar structure makes the panels available to power the homes of residents and businesses.

Richardson said, "We are very proud of our project. It looks fantastic. Everybody did a great job. The place where it is sited is about as good as you could hope for. The land owner is ecstatic, because it gives him an income from what had been marginal land." The land had not been used for an agricultural cash crop, and was only used for hay.

Community solar systems are very valuable for people who do not have their own place for solar panels. Participants work with Common Energy, the subscriber service company. Participants get credits on their energy bills for the electricity their part of the community system produces, and this reduces the cost of electricity for them.

In the case of the Clifton Park project, the early subscribers all had to be residents of the city, by agreement with the municipality. There was a window of thirty days during which only residents were allowed to sign up. Once that passed, signups could be taken from anyone in the state who got their power from National Grid, the utility providing power in the region where the array is located.

At the ribbon cutting (L to R) Peter Bardunias, Southern Saratoga Chamber of Commerce (SSCC); Patricia Fahey, NYS Assembly Member; Mary Beth Walsh, NYS Assembly Member; Mark Richardson, CEO U.S. Light Energy; Scott Wiater, CEO Standard Solar, Inc.; James Tedisco, NYS Senator; Linda Tepper, Tepper Group and SSCC Member

U.S. Light Energy did not develop the Clifton Park Community alone. It partners on projects of the type with another company, Standard Solar, which is based in Rockville, Maryland. Standard Solar owns the solar array. U.S. Light Energy is familiar with the geography and conditions in New York. It can scout the territory, talk to local people, and find the most likely sites for arrays. Standard Solar is a much larger company that can deal with issues of financing and ownership. As to getting the work done on the ground, Richardson said, "We collaboratively reviewed and chose the firms that do the construction."

Richardson's approach to solar power is not one of learning how to do the job and then sticking to what he knows. He is clearly looking out to make things better. One thing he is working on is pushing the state to incentivize solar projects differently. "We should not be rewarding megawatts," he said. "What we should be rewarding is megawatt-hours." In other words, a solar array should not be given an incentive based on the amount of power it can produce at noon on a sunny day in the late spring, but on the amount of energy it can deliver over the course of a year, in all seasons, in sunshine or under cloudy skies.

Another thing Richardson is considering is how solar power fits into the overall scheme of the environment. Not satisfied with reducing carbon emissions, he is considering the solar industry from a more holistic point of view. For example, while his company has not yet installed a solar system co-located with agriculture, he is looking at the feasibility of combining solar with sheep or bees. "The reality is that we must be good stewards of the land," he said. "It is one of the things that gives America the advantage it has in the world. It must be cared for." ♻

Sugar Hill Solar Farm. Photos courtesy of U.S. Light Energy.

Grid-Tied Solar with Lithium Battery Backup

Energy Integration in East Jewett, New York

George Harvey

We do not see grid-tied solar systems with battery backup very often, and so they seem especially interesting when we do. High Peaks Solar, an installer based in Wynantskill, New York, brought one to our attention. It is a project that is just being finished in East Jewett, NY.

Rural home with twenty-six 325-watt solar panels. Photo courtesy of Joe Pepe.

East Jewett is part of the town of Jewett, which lies in Greene County and has a total population of almost 950. It is on the edge of the Catskills, near the Hudson River Valley, about 140 miles north of New York City. The area is quite rural and is referred to as "ungentrified."

Joseph Pepe is an architect, licensed to practice in New York, New Jersey, and New Hampshire. He had done some very large projects in the past, but as he nears retirement, he is working on sustainable homes and restorations. He wanted his own home to be able to withstand extended power outages comfortably.

Achieving this goal was complicated by the fact that the house is all-electric. It has electric baseboard heat, well pump, hot water, cooking, and dryer, each of which can draw a lot of power. The result is that a battery system would have to be very large to supply the potential top load regularly without shortening its life expectancy, or the system itself would have to be altered somewhat.

Pepe wanted to be able to fall back on a battery for grid failures. He knew that outages could be longer in the future, as climate change brings more intense weather conditions, and he wanted a system that could be capable of being powered for independent operation for long periods. He also wanted a system that was large enough to supply energy for an electric vehicle, which he would like to buy at some point.

This is being achieved by combining different energy sources. The house has a roof that faces south and is well positioned for a solar system large enough to supply it with sufficient power for typical conditions. This would have to be combined with a sufficiently large storage system. The system would be grid-tied for the sake of reducing stress on the battery. And it would be backed up with a combination of propane and wood for heat to cover the needs of extended outages. The propane also supplies water heating.

Two years ago, Pepe started discussions with Kevin Bailey of High Peaks Solar. They went well beyond solar power to cover all the energy needs for the home. The questions they considered included what would happen normally, when the grid tie was operational, as well as what to do about outages of any type and duration.

The system was also designed with due consideration for changes in how utilities supply power, which might come in the future. For example, what changes would be best if the local utility goes into time-of-use service? The system should be able to draw power when the price is low, but not when the price is high, an advantage for both utility and customer.

In the end, High Peaks put in twenty-six Canadian Solar 325-watt panels. The inverter is from SMA. A sonnen battery system with five Sony batteries, each of 2.5 kilowatt-hours provides for backup. "The system is rapid-shutdown compliant, to the latest code standard," Bailey told us.

Pepe is already delighted with the system, which is nearly finished. As a professional, he seems to be especially happy with the approach to combining energy sources. "High Peak Solar did a great job as integrators," he said. But clearly, knowing that his home can be comfortable even when a big storm hits provides wonderful peace of mind.

High Peaks Solar's website is https://highpeakssolar.com/. ♻

COMMON ENERGY: FULTON PARK COMMUNITY SOLAR

George Harvey

Common Energy (CE) is a company that brings community solar projects to customers, especially in New York and Maryland which have favorable state programs.

Community solar systems benefit people who have no place to put solar systems such as renters and people whose homes are in shady areas. Electric utility customers can subscribe to the system and have the value of the energy generated deducted from their bills. Some people who expect to move can also take advantage of this, because, if they are still served by the same utility, they may be able to apply the credits in their new locations.

CE brings new community systems forward continuously. As one project is fully subscribed, development of another is underway. And this is an advantage for potential customers. Those who discover that the array they wished to buy into is fully subscribed are often able to subscribe to a newer array in their utility's service area.

The Oppenheim solar array has been under development in an area served by National Grid in Fulton County, New York. The 1,940-kilowatt system is large enough to supply the needs of about 333 households. It will reduce carbon emissions by over 750,000 pounds each year, the equivalent of sequestration in 407 acres of forest. Participants may receive $1,440 over the 20-year lifespan of the project.

An announcement from Common Energy now tells us that the Oppenheim solar array is fully subscribed. This means, of course, that finding customers for the development was completely successful.

Those who might have wanted to buy into the system can take heart, however. Even though it is fully subscribed, CE has others available including New York solar farms in Johnstown and Clifton Park and others under development. CE has operational projects or projects under development in a number of New York areas, including those serviced by National Grid, NYSEG, Central Hudson, and Orange and Rockland Utilities.

Oppenheim solar farm ribbon cutting: Boy Scouts and Girl Scouts of Little Falls and Dolgeville along with their troop leaders celebrate the ribbon cutting of the Oppenheim solar farm. From L-R: Andrew Bernstein, Kearsarge Energy; Chad Handy, landowner; Pastor Tom Jones, Bethesda Christian Fellowship; NYS Senator Jim Tedisco; Malcolm Bliss, Common Energy; Cindy Breh, Oppenheim Town Supervisor.

CE partners with a team of other developers on their community systems. In the case of the Oppenheim solar array, they worked with Kearsarge Energy, which owns the project, and National Grid. In addition to serving homes and businesses in general, Common Energy serves low- and moderate-income households through New York State Energy Research and Development Authority's Solar For All Program.

Common Energy's website is commonenergy.us. ♻

The Oppenheim 1,940 kW solar farm in Fulton County, NY. Photo courtesy of Kearsarge Energy.

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

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

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

USDA RURAL DEVELOPMENT PROGRAM

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

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

BIOREFINERY ASSISTANCE PROGRAM

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

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

- Increase the energy independence of the United States
- Promote resource conservation, public health, and the environment
- Diversify markets for agricultural, 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.

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%20Energy/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 (Step 1 application received on or after March 19, 2018); and
- Expansions to existing solar systems are not eligible.
- Incentive levels for solar thermal systems are as follows:
- $0.12/rated or modeled kBtu/year for new solar thermal facilities fifteen collectors in size or fewer;
- $0.07/rated or modeled kBtu/year for new solar thermal facilities greater than fifteen collectors in size;
- 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: http://www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-CI.html

PACE

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

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.

through property taxes. Visit https://www.nh.gov/osi/energy for more information.

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

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

NHEC offers incentives for Level 2 Electric Vehicle Charging Stations. For Commercial and Municipal Members – 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.

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

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

• Homeowners are eligible for a base rebate amount of the lesser of $4,500 or 40% of the installed cost. The system may also be eligible to receive additional funding ("adders") which increase the amount of the rebate. Adders are detailed in the program manual at http://files.masscec.com/SHW_Manual.pdf

• 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. You can borrow up to $25,000 at 0% interest for a 7-yr term.

Energy Efficiency

• After a free residential Energy Audit, residential customers are eligible for up to $25,000, commercial loan up to $100k at 0% interest heat loan with terms up to 7 years for: atticwall-basement insulation, high efficiency heating systems, high efficiency domestic hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows. Available only to utility customers of W. Mass Electric, National Grid, Berkshire Gas, Nstar, Unitil and Cape Light Compact. Visit www.masssave.com/residential-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 – Incentives are up to $300 per charging unit. By participating in the residential program, at http://www.masssolarloan.com/.

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

DEPT OF ENERGY RESOURCES

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

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

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

MA SMART INCENTIVE

Currently 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

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

• 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

• After January 1, the maximum rebate for EVs in Massachusetts will be reduced to $1,500 and only fully battery electric or hydrogen fuel cell cars will be eligible. Hybrids will not be given rebates. In addition, the sticker price of the car must be under $50,000 to qualify for the program. Visit: https://mor-ev.org/

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NYSERDA

Welcome to the 2017 New York solar incentive and rebate information: 169 programs and incentives at: http://dsireusa.org (enter your zipcode) Programs and Services from NYSERDA: 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.

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

Safety in Battery-Storage Options for your On-or Off-Grid Application

Danielle Fergeson

Safety is a full-fledged design feature with lithium batteries, and for good reason. As we've all seen, the chemistry and energy density that allows lithium-ion batteries to work so well also makes them flammable, so when the batteries malfunction, they often make a spectacular and dangerous mess.

All lithium chemistries are not created equal. In fact, most American consumers – electronic enthusiasts aside – are only familiar with a limited range of lithium solutions. The most common versions are built from cobalt oxide, manganese oxide and nickel oxide formulations.

First, let's take a step back in time. Lithium-ion batteries are a new innovation and have only been around for the last 25 years. Over this time, lithium technologies have increased in popularity as they have proven to be valuable in powering smaller electronics, such as laptops and cell phones. But as you may recall from several news stories over recent years, lithium-ion batteries also gained a reputation for catching on fire. Until recent years, this was one of the main reasons that lithium wasn't commonly used to create large battery banks.

A lithium-ion powered device burst into flames on a Russian airliner in 2018. Image: brimstonefireprotection.com.

But then came along lithium iron phosphate (LiFePO4). This type of lithium solution was inherently non-combustible, while allowing for slightly lower energy density. LiFePO4 batteries were not only safer, they had many advantages over other lithium chemistries, particularly for high power applications, such as renewable energy.

Before we dive into the safety features of lithium iron phosphate, let's refresh ourselves on how lithium battery malfunctions happen in the first place.

Lithium-ion batteries explode when a battery's full charge is released instantly, or when the liquid chemicals mix with foreign contaminants and ignite. This typically happens in three ways: physical damage, overcharging or electrolyte breakdown.

For example, if the internal separator or charging-circuitry is damaged or malfunctions, then there are no safety barriers to keep the electrolytes from merging and causing an explosive chemical reaction, which then ruptures the battery packaging, combines the chemical slurry with oxygen and instantly ignites all of the components.

There are a few other ways lithium batteries can explode or catch on fire, but thermal runaway scenarios like these are the most common. Common is a relative term though, because lithium-ion batteries power most rechargeable products on the market, and it's pretty rare for large-scale recalls or safety scares to happen.

Although lithium iron phosphate (LiFePO4) batteries aren't exactly new, they're just now picking up traction in global commercial markets. Here's a quick breakdown on what makes LiFePO4 batteries safer than other lithium battery solutions.

LiFePO4 batteries are best known for their strong safety profile, the result of an extremely stable chemistry. Phosphate-based batteries offer superior chemical and mechanical structure that does not overheat to unsafe levels, thus, providing an increase in safety over lithium-ion batteries made with other cathode materials.

This is because the charged and uncharged states of LiFePO4 are physically similar and highly robust, which lets the ions remain stable during the oxygen flux that happens alongside charge cycles or during possible malfunctions. Overall, the iron phosphate-oxide bond is stronger than the cobalt-oxide bond, so when the battery is overcharged or subject to physical damage, the phosphate-oxide bond remains structurally stable. In other lithium chemistries the bonds begin breaking down and releasing excessive heat, which eventually leads to thermal runaway.

Lithium phosphate cells are incombustible, which is an important feature in the event of mishandling during charging or discharging. They can also withstand harsh conditions, be it freezing cold, scorching heat or rough terrain.

RELiON® 48 Volt 300 Ah lithium iron phosphate LiFePO4 battery (RB48V300L)

When subjected to hazardous events, such as collision or short-circuiting, they won't explode or catch fire, significantly reducing any chance of harm. If you're selecting a lithium battery and anticipate use in hazardous or unstable environments, LiFePO4 is likely your best choice.

Most LiFePO4 batteries also come with a Battery Management System (BMS) that have many extra safety features including over-current, over-voltage, under-voltage and over-temperature protection, and the cells come in an explosion-proof stainless steel casing.

It's also worth mentioning, LiFePO4 batteries are non-toxic, non-contaminating and contain no rare-earth metals, making them an environmentally conscious choice. Lead-acid and nickel oxide lithium batteries carry significant environmental risk (especially lead acid, as internal chemicals degrade structure over time and eventually cause leakage).

Compared to lead-acid and other lithium batteries, lithium iron phosphate batteries offer significant advantages, including improved discharge and charge efficiency, longer life span and the ability to deep cycle while maintaining performance. LiFePO4 batteries often come with a higher price tag, but a much better cost over the life of the product, minimal maintenance and infrequent replacement which makes them a worthwhile investment and a safer long-term solution.

Danielle Ferguson is the marketing manager at RELiON Battery. Learn more at relionbattery.com/solar. Or call them at 404.915.3015. ♻

RELiON® 48 Volt 200 Amp hour lithium iron phosphate LiFePO4 battery (RB48V200L)

A Radical Idea to Get a High-Renewable Electric Grid:

Build Way More Solar and Wind Than Needed

Richard Perez and Karl Rabago

The famous inventor Edwin Land said, "It's not that we need new ideas, but we need to stop having old ideas." He seemed to be telling us that solutions lie just beyond our old habits of thinking.

Cities, states and countries around the world are committing to clean energy economies that run on very high levels – even 100% – of renewable energy. In New York State alone, four competing bills target 50% to 100% renewables by or before 2040.

Realistically, only two renewable energy resources are large enough to meet these very high-penetration objectives on the supply side in the U.S. – solar (by far) and wind.

Both, however, are variable resources, driven by weather as well as daily and seasonal cycles. Therefore, they must be "firmed" – that is, capable of delivery power on demand – in order to replace fossil resources which can be dispatched as needed. Based on our research, we contend that this firm power transformation is not only possible, it is also affordable – if we stop having old ideas.

One entrenched, and very prevalent, idea – likely a result of historically high renewable energy prices – is that all the power generated by renewable resources must be sold as it is generated. The idea of discarding available wind or solar output is anathema, imposed on power producers when production from these sources exceeds what the grid can accept.

This old idea ignores a fundamental proposition: oversizing and proactively curtailing wind and solar. However counterintuitive, a study our colleagues and we conducted shows that these steps are the key to the least expensive path to an electric grid powered largely by solar and wind.

Weighing against energy storage

The reasoning behind overprovisioning solar and wind is straightforward:

- Energy storage is the one essential ingredient needed to fill renewable energy variability when the sun does not shine or the wind does not blow. These gaps include intra-day periods, such as hours of peak demand during the days and nights, and more important, larger multi-day and seasonal gaps from sustained low-sun or low-wind conditions. For storage, grid operators – the organizations that ensure power supply matches demand as it rises and falls during the day – typically rely on water reservoirs called pumped hydro or, for shorter periods, batteries.
- Storage is getting cheaper, but even assuming the most optimistic long-term cost projections, our study led us to conclude that applying storage alone to firm wind or solar will remain prohibitively expensive because of the size of multi-day and seasonal gaps. Wind and solar are becoming much less expensive as well, especially solar, to the point where overbuilding is increasingly affordable. This is true even when the output from wind and solar generators is essentially dumped, or "curtailed," and not fed into the grid.
- Oversizing reduces production gaps because more energy output is available during periods of low solar and wind availability. Overbuilding also reduces storage requirements.

'Firming' with overcapacity

Today, the current regulatory practice for solar and wind-generated electricity favors maximizing production at all times. The companies that operate these facilities seek to sell all their output at the highest prices, so curtailing output is seen as a revenue loss.

That old operational idea inhibits the transition to relying on solar and wind as firm, on-demand sources, since all their output is used only when it is available. This approach also keeps renewable energy at the margin.

How would a grid with overbuilt solar and wind resources work in practice? Let's say the operator of a regional electricity grid needs X megawatt-hours per day to meet demand. Today the solar farms in that region can meet or exceed this demand only on days of the highest production, such as clear days in the summer. On other days, the production gaps are met by storage.

By contrast, when the solar resource is oversized, that solar generator can meet the X MWh/day demand more days of the year and there are fewer gaps – hence there are fewer times that energy storage is needed to fill the gaps.

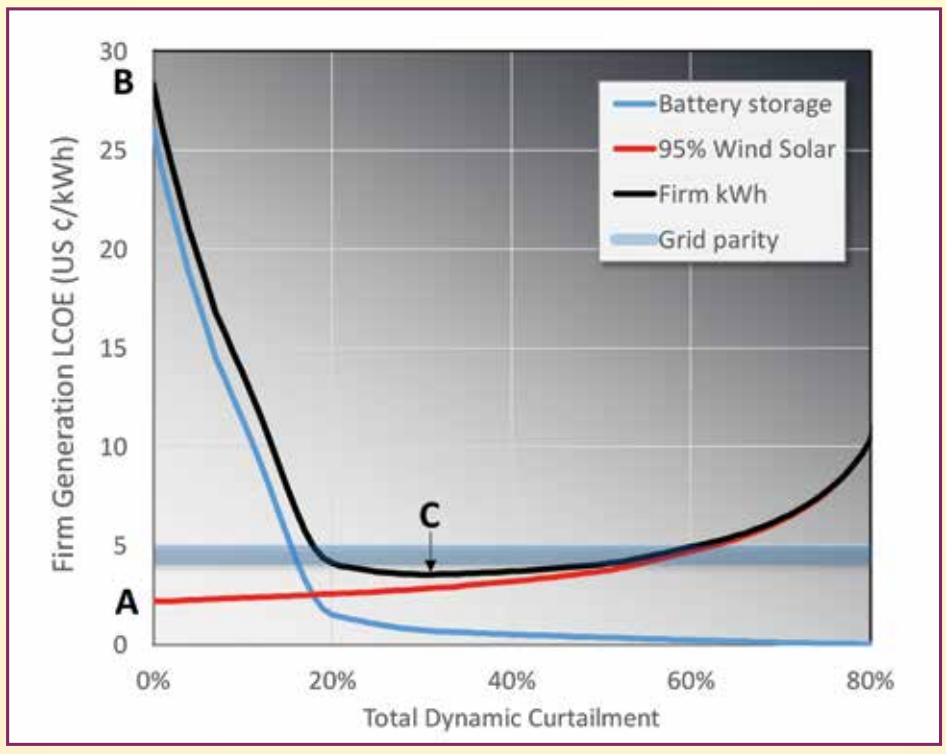
Once firmed up through a combination of overprovisioning and storage, variable renewable energy resources become effectively dispatchable – able to provide power when and as needed – and functionally equivalent to traditional power plants. In this way, renewables can replace these generators without major grid reengineering.

Our team has modeled a high-solar and overbuilt solution for the not particularly sunny state of Minnesota. The goal was to determine the least costly combination of grid-connected solar, wind and storage necessary to provide round-the-clock, year-round energy services.

The study demonstrates that overcoming the natural variability of solar and wind can be accomplished at costs below current grid costs (so-called "grid parity") by overbuilding solar and wind resources and adopting a grid operating strategy of allowing about 20% to 40% curtailment of excess energy generation. Energy storage is also used in our model, but the superior economics directly result from substituting excess curtailable generation for more expensive storage.

A legitimate question to ask is, 'what would be the area required for a full deployment of oversized solar PV?' For Minnesota, in the most extreme 100% PV generation scenario assuming oversizing by a factor of two – or doubling the solar needed to meet current demand – this area would amount to 435 square miles, assuming solar panels with state-of-the-art efficiency of 20%. This area represents less than 1% of the state's cultivated crops and half of the high- and medium-density urbanized space.

Wind turbines above San Gorgonio Pass, known as Banning Pass, in Riverside County, California. Photo: Carol M. Highsmith.



This chart shows how providing round-the-clock energy from wind and solar with storage only remains far more expensive than 'grid parity,' the cost of natural gas-supplied power (B). But storage combined with excess wind and solar that is curtailed about 30% of the time can be less expensive than grid parity and deliver power on demand (C). Richard Perez, Karl R. Rabago, CC BY-ND

Tweaking how the bulk power grid is run

In addition to oversizing, curtailment and storage optimization, several operational and planning practices, some of which are already done now, would further enhance the value and performance of a high-solar grid and foster its realization with minimal disruptions. They include:

- Exploiting the complementary performance and variable operating profiles of solar and wind. In most locations wind and solar have complementary diurnal and seasonal production profiles – wind higher at night and in winter, PV higher in the daytime in summer.
- Utilizing demand management – the practice of reducing power use at electricity customer locations – as a way to minimize supply-and-demand gaps.
- Enabling grid operators to have authority over renewable energy siting and production management within their regions so that decisions over when curtailment occurs or storage is applied are made on a regional basis to minimize gaps in supply and demand.

An attitude of maximizing renewable energy production and avoiding curtailment made sense when variable solar generation was extremely expensive and firming solutions were even more expensive. However, recent and forecast reductions in turnkey solar, grid management and storage costs are changing the optimal solution set, starting with overbuilding solar.

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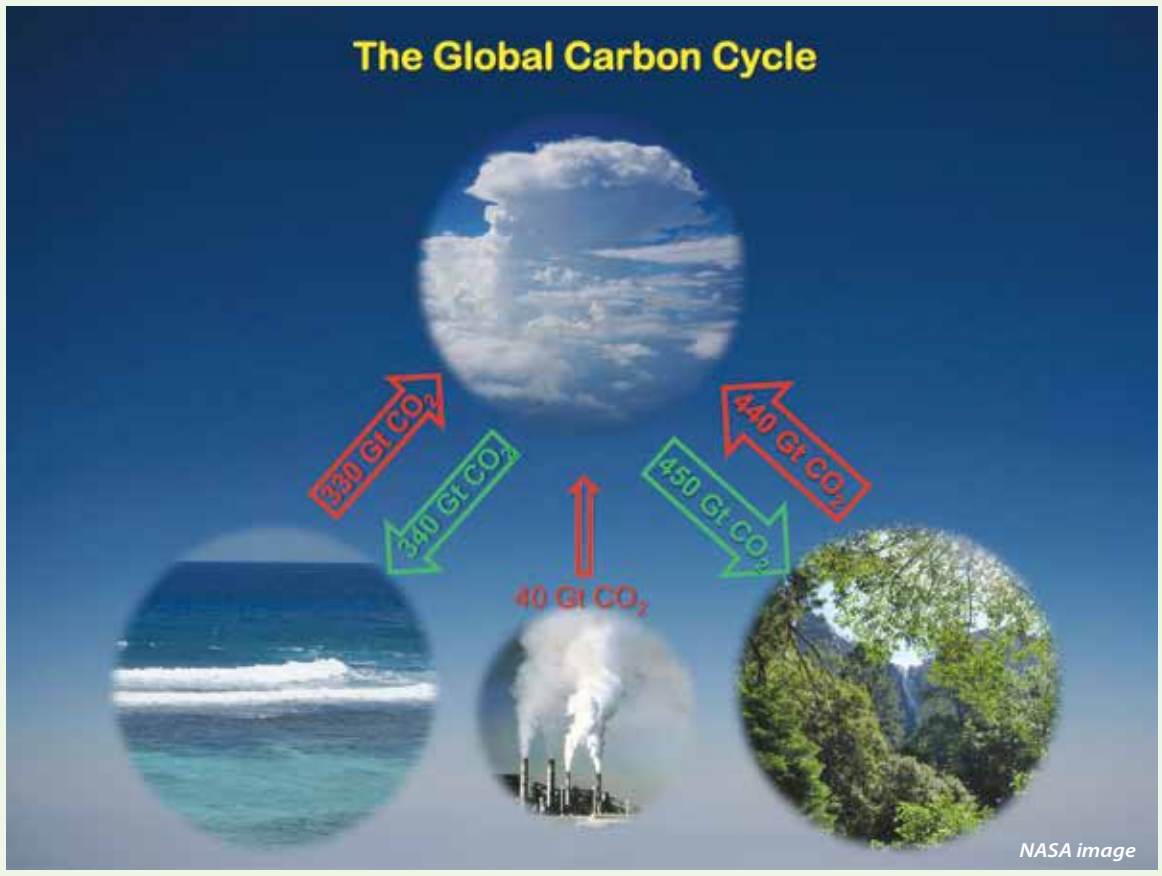
Marc Perez, senior researcher at Clean Power Researcher, who wrote his dissertation at Columbia University on this subject, contributed to this article. Morgan Putnam, VP of Solar Analytics at REsurety, also contributed. ♻

The Biomass Controversy: Are There Options?

George Harvey



Dartmouth College has committed to being 100% free of fossil fuel use, and so it is examining a switch from heating with number 6 oil to use of biomass, which would allow it to continue to use most of the current heat distribution system. The idea that it could use biomass has created quite a stir, however.

Respected scientists and alumni are objecting that there are better ways to do things. They say that burning biomass does not reduce carbon emissions and creates pollution. They say that we have better, less carbon-intensive, and less costly sources of heat. And they say that the forests need to grow to draw down carbon dioxide from the air. They are putting the biomass on hold as they look into other options, but I believe they may be missing important details that should be included in the calculations.

Biomass is part of a natural carbon cycle. Living things are composed mostly from water and carbon dioxide (CO_2). They go through various processes, and they are ultimately decomposed, mostly into water and CO_2. The natural carbon cycle contrasts with the fossil fuel cycle, which burns fossils that are not part of the natural cycle and emits CO_2 that builds up in the atmosphere. Where the natural carbon cycle kept CO_2 rather steady at about 280 parts per million (ppm), the fossil fuel carbon cycle has pushed it up to over 410 ppm.

We should look at what happens to a tree that dies and falls in the forest. Nature taking its course means it will decompose. It can be eaten by insects, such as termites, or decomposed by fungi or bacteria. When fungi decompose wood, they release CO_2, but termites and some bacteria also release large amounts of methane (CH_4).

We can contrast this with burning wood. Clean combustion, which can be done by a number of means, releases the smallest amounts of pollutants possible, with almost no particulates emitted. Ash is captured. Soot is practically non-existent. What comes out is CO_2 and water. A modern stove or industrial combustion unit is very different from an old "airtight" (typical of the 70s and 80s) that produced large amounts of creosote.

Please notice that where CH_4 can be emitted in large amounts by decomposition, none comes from clean biomass combustion. And since CH_4 is a much more powerful greenhouse gas than CO_2, it may be environmentally preferable to burn wood than to let it rot, in terms of greenhouse gases.

This brings up the question of where Dartmouth would get its fuel. To find this out, I obtained a copy of the college's own report, "Dartmouth College Biomass Fuel Supply Assessment" (DCBFSA). According to that document, about 45,000 to 60,000 tons of green wood will be needed each year. All of this wood can be obtained within a relatively short distance.

Some people may exclaim at the amount of wood needed. As a matter of comparison, the New York Times used 104,000 tons of paper in 2018, and a ton of paper requires about two tons of green wood, if none of it is recycled. Accordingly, heating the buildings at Dartmouth could require a quarter of the amount of wood needed for the print edition of the New York Times.

More to the point, according to DCBFSA, forestry in the Dartmouth woodshed produces about 1.26 million green tons of wood each year, producing a total of 1.8 million green tons of forest waste, most of which is unharvested. "Dartmouth's proposed wood use represents 3.3% or less of this volume," the report says.

Leaving that wood in the forest would not only produce its own carbon emissions, it could also produce fire hazards. And those hazards could be amplified as forests are under increasing pressure from climate change, which threatens nearly all species of trees in Vermont and New Hampshire. Maintaining forests will require careful forest stewardship, removing dead wood, cutting dying and infected trees, and disposing of them. And that will mean, very probably, burning a large multiple of the wood Dartmouth College envisions using.

It happens that Dartmouth College is taking the scientists who warned them about using biomass seriously and is examining the whole question again. This brings us to the question of what the alternatives are.

The heating systems at Dartmouth are designed around combustion. Ductwork can continue to be used, providing combustion continues. This probably means a choice of continuing the use of fossil fuels or converting to biomass.

The other choices, while renewable, would require installation of new heating systems, ignoring the ducts that are in place. This can be done with geothermal or air-source heat pumps, which would have to be installed in large numbers, at great expense. The heat pumps would have to be powered by renewable resources, and this almost certainly would mean windpower, which many people object to, or solar photovoltaics, which would cover a lot of land. Regardless of which path the college takes, it would be far more expensive than converting to biomass.

One other issue with renewable energy other than bio-mass is that some of the buildings would have to have their heating efficiency updated for heat pumps to be used efficiently. This would increase the cost of the change-over considerably. While this job will have to be done in the future, avoiding use of bio-mass adds it to current costs.

We have gone a long way with all of alternative technologies, and they all have their place. They are efficient and operate at low cost. But we should recognize that one of the technologies, carefully engineered biomass, has its place along with the others. And Dartmouth College may be a prime example of what that place looks like. ♻

Late News on Energy and Storage

George Harvey

Three noteworthy developments came into the news in the last few days of October, which taken together may show a picture of things to come. It is a future in which natural gas may become increasingly irrelevant.

To start with, the cost of offshore wind power has gone through a startling reduction. According to an article in Forbes titled "Clean Energy Will Continue to Hit Dirty Power as Costs Continue to Fall," while the cost of renewable energy has continued to drop, the levelized cost of energy (LCOE) from offshore wind power has seen declines that have been almost astonishing. BloombergNEF has put that decline at 32% in the last year, to an average of $78 per megawatt-hour (MWh), and the lowest price for electricity produced in the North Sea at about $53/MWh. This is well below the cost of electricity from coal or natural gas in Europe, and less than half that from new nuclear power plants (http://bit.ly/forbes-offshore).

Another article, also in Forbes, was "Huge Battery Investments Drop Energy-Storage Costs Faster Than Expected, Threatening Natural Gas." According to a report from the Rocky Mountain Institute, "Breakthrough Batteries," the costs of batteries for storing electricity are expected to drop from the current $187 per kilowatt-hour (kWh) to $87 per kWh in 2023. (Please keep in mind that we are not talking about the cost of electricity here; we are talking about that of the battery, per kWh it can store.) Such a reduction in cost is seen to be disruptive to fossil fuels used to produce grid power (http://bit.ly/forbes-batteries).

The effects of reductions in costs of renewable electricity and electric storage can be seen clearly in the third of the articles. This article, which appeared at the website of pv magazine, was titled "World's Largest Storage Battery – 2.5 GWh – To Replace Gas Peaker Plants in Queens." It is about a new battery facility that just was approved by the New York Public Service Commission. The battery, which has a power capacity of 316 megawatts (MW), will be capable of delivering 2,528 MWh of electricity. Ravenswood Development, the owner of a pair of natural gas peaking plants with a combined capacity of 316 MW, plans to demolish them and replace them with the battery at the same site (http://bit.ly/pvm-queens-battery).

While the battery in Queens may be the biggest in the world when it is built, it will by no means hold that title very long. New batteries are being proposed regularly, and many are huge. But the cost of electricity from this new plant is likely to be a small fraction of the cost from the peaking plants it is replacing. And it is not very far from really big offshore wind farms scheduled to be built south of Long Island, whose energy it will back up and level out. It is almost certain to reduce not only carbon emissions and other pollution, but also costs. ♻

AN ECOLOGICAL REFORMATION

Cont'd from p.1

in the global processes of sustainability and must act as healing force in response to industrial excess.

A global ecological reformation means a top to bottom restructuring in pursuit of sustainability not only of energy, but also industry, agriculture, forestry, fishing and aquaculture. Renewable energy must be combined with global cooling activities to sequester carbon in soil and biomass, removing carbon from air and oceans. The aim is reducing the carbon dioxide concentration in the atmosphere toward pre-industrial levels and decreasing the acidification of the oceans, again toward pre-industrial levels, to a less acidic pH.

Ecological Economic Growth (EEG)

Second, the pursuit of an ecological reformation rests upon taking steps to make economic growth mean ecological improvement. This means separating economic growth from ecological damage, and making economic growth synonymous with ecological improvement. Fundamentally, a global market system whose central concern is economic growth can be sustainable following ecological market rules.

The central challenge in building an ecological civilization from industrial business and pillage as usual is not technical, because solutions abound, but legal and financial, and, therefore, political. An ecological transformation represents a fundamental question posed to the polis, the political community, whose area of concern stretches from the local to the global.

Ecological economic growth asserts that sustainability is both possible and absolutely necessary. The consequences of growth are what matters, not growth qua growth. Ecological consequences, positive or negative, flow from the practices, ethics, rules and laws conditioning the nature of economic growth. Selling trillions of dollars' worth of information in various incarnations on a renewably powered word wide web has tiny ecological consequences for the n+1 copy. However, replacement of fossil fuels and nukes leads to enormous economic growth and enormous decreases in pollution, depletion and ecological damage. Likewise, sustainable agriculture and aquaculture and forestry will not only produce food, but sequester enormous amounts of carbon in soil and biomass with enormous benefits.

Social and Ecological Justice

Unfortunately, I believe it is not possible to create a sustainable economic growth system based on existing social, political, and economic relations. The unrestrained power of money, technology, and self-interest has proven to be simply irresistible and have shaped a global system of worsening inequality, gigatons of pollution and war.

Rights and responsibilities, freedom and community must be understood and treated as interdependent. Without freedom, community becomes tyranny. Without community, freedom becomes license.

Financial and political power must be balanced, focused and refocused at all times by the rights and powers of those down wind, down river. Power must be democratized. Ecological and social justice must be co-equal imperatives. Without justice we are unlikely to achieve sustainability. Social and ecological justice means, for example, all outputs of industrial production are captured and reused in a zero pollution/zero waste production regime. It is lack of power and injustice that allowed the water of Flint to become poisoned, that enables hazardous polluting chemical plants to be sited in poor neighborhoods from Bhopal in India to Louisiana and Texas in the United States. These plants can be operated to be pollution free or not operate at all. That's the real cost of doing business, instead of licensing and legalizing the output of poison.

We must address the issues of who owns, who benefits, who controls with the conscious intention of creating sustainable market systems. Where economic growth leads to ecological improvement, the regeneration of the ecosphere, of natural capital, becomes inseparable on the balance sheet with the growth of finance capital, and is supported by the growth of social and ecological justice.

We must face with open eyes basic financial questions of why we continue to pursue self-destructive economic and market activity on a global scale. The triumph of the self-serving few at the expense of the many and of the ecosphere is a consequence not simply of markets, modernity, technology but inseparable from injustice, inequality and powerlessness.

The election of 2020 may mean the beginning of a green new deal and a global ecological reformation. It's time to understand what's really at stake. We do not have the luxury of settling once again for marginal change as fires burn in the Amazon, California and Siberia, and the ice melts.he

Roy Morrison builds solar farms. His next book forthcoming is Ecological Economic Growth. ♻

Trouble Ahead for Natural Gas?

Cont'd from p.3

about 20% per year during a two-year period. Extrapolating the data suggests that proposed new additions could drop to the point that they no longer exceed proposed retirements by 2025. The big question, of course, is whether such an extrapolation, based on two years' data, could produce a valid result. Could natural gas capacity go into decline in just five or six years?

The first thing to notice is that the FERC data shows an overall reduction that is at least more or less constant, or possibly accelerating. About one month in three has shown increases in proposed new capacity, where about two in three have been decreases. The reductions in proposed new capacity came to about 18% in the period of August 2016 to August 2017. By contrast, the reductions in the year that followed was 23%.

Flaring natural gas. Photo: Tim Evanson, Wikimedia Commons, http://bit.ly/WC-gas-flare.

Another thing to note is that the nature of new natural gas plants has been changing for years. General Electric got into quite a lot of trouble by betting on big increases in demand for natural gas turbines that never materialized (http://bit.ly/GE-gas-fails). Other manufacturers have said that turbine sales have dropped to nearly nothing. Those turbines were for peaking plants, which produce very expensive electricity and were in competition with solar power that was much cheaper.

So, the question is whether natural gas can stop the downward slide in new plans. For an answer to this, we can look at the trends for wholesale power costs. Wholesale prices for power from natural gas, which had been falling slowly through the years, have started to rise slowly. By contrast, prices for solar and wind power have been tumbling rapidly. This can be seen by comparing the data at Lazard's (an asset management firm) LCOE report for 2016 (http://bit.ly/Lazard-LCOE-2016) with data at the 2018 report (http://bit.ly/Lazard-LCOE-2018).

But a new player has also entered the arena. Battery costs have fallen enormously over the last three years, to the point that solar power backed up with batteries is now a realistic competitor for natural gas. This is clearly seen at the CleanTechnica article "LA & 8Minute Solar Ink Lowest Cost Solar-Plus-Storage Deal in U.S. History" (http://bit.ly/CT-LA-solar-battery).

So, returning to the question of whether we could realistically continue to see reductions in the capacities of planned, new natural gas plants, to the point that total capacity might go into decline by 2025, I would have to say it is possible. And it is hard to imagine what might possibly make that not happen. ♻

Community Solar Investment

Cont'd from p.7

investment credits, and accelerated depreciation.

2. Can determine the pace and rate of return on investment.

3. Can decide on the extent to which one shares the tax benefits with non-profits and off-takers.

4. Builds desirable local assets like solar arrays that will provide benefits for decades.

5. Helps put money into the pockets of low-moderate income off-takers by sharing benefits. This long-term benefit goes on for decades, so people can do as they wish, making a small dent in the income inequality problem.

6. With full return on investment, can recycle the same money and do it again.

Levy has other examples of the benefits local impact investors provide to their communities. He cites as one example an investor who purchased a 100kW share in a solar array and is selling power from that to provide for his municipality.

NST is not the only solar developer to work on strategies for getting solar power to non-profit organizations and people with low incomes. What is unique is the matchmaking service of NST's Community Impact Investment program with a number of successful local systems to its credit.

For those who are interested, NST has a page on its website devoted entirely to Community Impact Investment. It can be found at http://bit.ly/Norwich-CII. ♻

We wish you all a sustainably peaceful, happy holiday season!

Light Your World with a Gift of Solar!

N.R. Mallery, Publisher G.E.T.

I first experienced some simple, little waterproof inflatable solar lights one summer at SolarFest. They were all over the place, and everyone was loving them, throwing them, twirling with them and they were all over the festival. They caught my attention, and I have enjoyed them and shared them with friends and family ever since.

We published at least one story about Luci® lights in *Green Energy Times* in the August 2014 edition. You can read it at http://www.greenenergy-times.org/2014/08/15/meet-luci/. They are perfect to take camping, hiking or use in case of an emergency. Keep one in your car for an emergency and use them nearly anywhere when it is dark. I have always loved giving them as gifts for one occasion or another. I still have and use my original one from 2014.

Luci® solar lights are made by a very giving company, called MPOWERD®. As we started to discuss our Sustainable Holiday feature in this edition of *G.E.T.*, my thoughts went to my Luci lights because of my own personal experience with them, and the excited reaction

Luci original lantern

from others when I gifted them with one.

As I went through their website, I was delighted to discover that they not only have the original Luci lantern, but also some great new styles and products. I think you might want to consider gifting some of their solar-powered lights to the people in your life. Let me tell you why.

MPOWERD® is a Certified B Corporation, and they use the power of business to build a sustainable world. The company recognizes that climate change is real, and this gives value to their solar lights when disaster strikes around the world.

They have helped thousands of communities and individuals after disasters leave places with no power or lights. With the help from 650+ partners around the world and supporters, they have averted 680,000 tons of CO2, and impacted over three million lives. This is done through their Give Luci Program. You simply buy a light through the program and your Give light goes to their non-profit partners who are actively working on the ground to deliver them to where they are needed most. Recently, 70,000 lights were sent to the California region affected by the fires and experiencing massive power outages. They also sent 10,000 lights to the Bahamas through Direct Relief and the Red Cross after recent hurricanes caused horrific devastation.

Giving sustainably as gifts to your friends and family help others in need at the same time. Your holidays can have so much more meaning.

Besides their original inflatable lanterns, they now offer lights with charging capabilities, including Luci Core, a new task light with an adjustable arm that can be recharged with the built-in solar panel or through the USB port. I have one that I use for reading at night. It has bright, brighter and brightest settings as well as their blinking option, so that it is an emergency light if needed. One charge runs the light for twelve hours.

The new Luci Explore is very cool, featuring a light that can change colors while you listen to music connected with Bluetooth® and an app on your mobile phone. It also can be set as a timer or alarm. It was simple to set up and not

Luci Core task light

Luci Explore multi-use light

only functional but fun to use. We used it while star gazing during a recent meteor shower.

They have some more exciting models for other applications that we will share with you in the spring when they are released. One such new release is their innovative foray in the bike world. Check that out on their Indiegogo campaign - https://bit.ly/2WPRYwO.

Meanwhile, when you are deciding what gifts to give for the holidays, you might want to consider the gift of a solar-powered light from MPOWERD. Buy one for a friend at www.mpowerd.com/shop. The link to the Give Luci Program is www.mpowerd.com/give. ♻

Green Gifts for the Holidays

Cont'd from p1

labels are quite beautiful, which makes the gift even more special. AppGap is available on-line and in Vermont liquor stores.

Vermont Soap is solar-powered and only uses organic ethically-sourced ingredients to make bar and liquid soaps, bath salts, air fresheners, and green cleaners. You can shop by product, scent, or skin type, on-line or by visiting the warehouse in Middlebury, VT. A basket from Vermont Soap could also include some of their beautiful, sustainable bath accessories. (See ad on p.38)

Catskills Comfrey makes organic, artisanal comfrey, calendula, and CBD ointments available in many New York stores or on-line. Their website also provides links to scientific articles about the benefits of their ingredients. (See ad on p.20).

Maple products ship well and are always welcome to displaced northerners. Choose your closest producer, or one using environmentally sound methods, such as Fresh Track Farm.

Local cheesemakers have snared multiple national and international awards this year. These high-quality gifts can also be shipped. I'll put a plug in for Vermont Shepherd: David Major has been grazing sheep sustainably, building soil and sequestering carbon, and making award-winning cheese since the mid-80s. Full disclosure: he's my neighbor and hay guy. We grew up together, and I set my most recent middle-grade novel, Rescue, on his farm. Vermont Shepherd cheeses are sublime and can be shipped anywhere.

Books are wonderful gifts. Buy them at a local bookstore, of course. You can also support local publishers. Storey, in North Adams, MA, and Chelsea Green, in White River Junction, VT, offer titles on everything you need to learn about farming, gardening, crafts, and nature. Request their catalogs, make a list, then ask your local bookseller to order for you. Support local authors, like Mary Holland, author of several nature books including Naturally Curious Day to Day. This is a perfect book for anyone who loves outdoors, whether they are active or house-bound. I've given it to two elderly loved-ones who found great joy in immersing themselves in the natural world they could no longer access directly.

You can't find a more beautiful, empowering, muscularly optimistic book than Drawdown, edited by Paul Hawken, which lays out the 100 best solutions to reverse global warming. We're engaged in a giant tug-of-war to maintain the climate in which our species and its civilization arose. There's a place on that rope for everyone to take hold. Drawdown will show you where your opportunities lie. Drawdown affinity groups are springing up all over the world; you might get inspired to join or start one.

For the person who doesn't need one more thing (other than a livable planet), you could give an experience. Many local venues have added solar and other energy-saving features in the last few years. Tickets to an event at the very energy efficient Fairbanks Museum in St. Johnsbury, VT or MoCo Arts in Keene, NH would make a wonderful gift.

Or give the gift of trees. One Tree Planted, based in Vermont, allows you to give any number of trees, and to choose among several areas worldwide where they will be planted. Notification of the gift arrives in the recipient's email in-box. Other tree-planting programs are available through the Arbor Day Foundation and The National Forest Foundation.

Speaking of trees, the Queen and my mom salvage and re-use wrapping paper. Be like the Queen. Be like my mom.

Links: vermontsoap.com, freshtracksfarm.com, appalachiangap.com, catskillscomfrey.com, vermontshepherd.com, onetreeplanted.org, vermontgear.com, arborday.org, nationalforests.org/tree-planting-programs.

Image Credits: Eco-Friendly Gift Ideas: faerieflysavingsmomma.blogpost.com; Gift ideas (cover): ecofreenlove.com.

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

TRIM YOUR WASTE-LINE THIS HOLIDAY SEASON

Marc Morgan

The holiday season is upon us. It is a wonderful time of sharing meals, giving gifts and decorating our homes. It is a time when we think less of ourselves and more of others. It is a generous and giving time of year.

With all this merriment, also comes a whole lot of trash; food scraps, packaging and, dare I say, unwanted gifts.

Between Thanksgiving and New Year's, Americans generate 30% more trash than the rest of the year. Nearly 25% of this increase is wasted food. I am sure we could do better.

Recently, in an attempt to stem the tide of this increased trash, Marc Morgan from the City of Lebanon, NH and Lindsay Smith from the Hanover (NH) Consumer Cooperative (the Coop) offered a free class focused on reducing waste as you shop — from the beginning, and before we purchase items. This educational class was attended by 10 people from communities throughout the Upper Valley. The class was held at the Culinary Learning Center at the Lebanon Coop store and was called "Reduced Waste Shopping". Many of the attendees were pleased this was not a "zero waste" training; they expressed anxiety over not being able to get to zero.

During the workshop, attendees were given some basic information about waste generation during the holiday season. The group was given recipes to shop for in the Lebanon Coop Food Store. Half of the attendees were told to shop as they usually do, and the other half were instructed to shop in a manner to reduce waste. No further instructions were given.

Once the task was completed, shopping bags were presented. The group looked at the "typical shopping" bags and compared them to the "reduced waste" shopping bags. It was interesting to see how the groups shopped. Some already employed waste reduction techniques like buying in bulk, only getting what is needed and buying items in recyclable packaging.

After the experience, the discussion about shopping was open and encouraging. One item that surprised many in the class was the idea of purchasing liquid ingredients like chicken broth. Chicken broth can be made at home, it comes in bouillon (concentrate) and in a paste or a powder can be found in the bulk isle at most coop food stores. Water is heavy and shipping it around adds to transportation impacts. Using concentrates like powered detergents, bouillon and juices can have a positive impact on our waste generation and transportation footprint.

It was clear that some attendees were not aware of some basic waste reduction strategies. That was what the class was for. The group discussed basic techniques for food shopping such as:

- Make a shopping list
- Be sure to give yourself enough time. Don't rush.
- Bring refillable bags and containers
- Buy in bulk
- Purchase items in returnable containers
- Purchase items in recyclable containers

There was a great deal of confusion around recycling and what packing was or was not recyclable. Some items like Tetra-Paks (chicken broth comes in these cartons) are not recyclable in this region.[1] The package says "Please Recycle" but it might not be recyclable in your local program. Film plastic from bread bags and some bags of fruit was also an area of confusion. Many local grocery stores will take clean film plastic, along with grocery bags right at the store.

As a thank-you for attending this workshop, the Coop provided reusable grocery bags to all attendees. The bags are made from surgical wrap from the DHMC Medical Center. It was a wonderful example of how we can reuse our waste.

It was a great night and we all left encouraged having learned something. Too often people feel discouraged about their waste habits. The idea of zero waste is wonderful, but many feel they can't achieve that and opt to do nothing. This session showed the participants that it is important to start somewhere and do something. The most important lesson learned at this workshop was that all of our purchases have consequences and that with a little preparation, we can minimize those impacts.

Cont'd on p.39

Our holiday feature continues on page 39. Learn about recycling paper & gift giving for the holidays and every day!

Wood Heat Is Essential to Carbon Drawdown

Jeff Rubin

In order to avoid the worst effects of climate change, we need to do two things: reduce pollution from heating our buildings and maximize carbon sequestration in forests.

PART ONE: REDUCING HEATING POLLUTION

Most heating pollution comes from America's older, less efficient buildings built before 1980 and heated with central heating systems running on oil or gas. These systems are designed to distribute high-temperature (140ºF-180ºF) air or water around the building. Even with weatherization, a cold climate heat pump (solar, geothermal, mini-split, etc.) can't affordably keep up with the heat loss in these older buildings, and newer, promising technologies like biochar are not yet available in the market.

The idea that we should eliminate all combustion heating is a great goal, but like it or not, in the short term our only choices for America's older buildings will continue to be combustion heat from oil, gas, or wood.

Every week, thousands of central heating boilers and furnaces are being replaced, many with gas (which is worse than oil despite Big Energy's clean gas claims). Those heating systems are going to be pumping CO2 out of the ground and into the atmosphere for the next 25 years. We have two choices: fossil fuels (oil and gas) that add to the total carbon in the atmosphere or wood, which releases less than half the carbon. At a minimum, heating with wood pellets reduces greenhouse gas emissions by about 60% when considering the life-cycle analysis of sourcing, processing, and transporting heating fuels.

And it's not just lower carbon. High tech wood heating also has lower particulates emissions than fossil fuels. Wood is a bridge fuel and, given the urgency of the climate crisis, we need to offset CO2 pollution from fossil fuel heating now.

PART TWO: PRESERVATION VERSUS CONSERVATION

Most U.S. forest land is not protected. Here in the Northeast Wood Heat Region (NY, VT, NH, ME, & MA), 79% of the forest is in private hands. Much of that is managed as working forest, mostly by individuals, not the forest-products industry.

There is neither money nor will to preserve the vast amounts of forest that are in private hands. That's not necessary. Our system of private property rights has led private landowners to invest in management practices that have increased both the productivity and carbon sequestration of their wood lots.

Over the past 65 years, healthy markets for forest products have driven the increase in private forest lands and, with it, increased carbon sequestration. Not surprisingly, increased sequestration tracks with increased productivity and economic expansion. These increases in acreage, productivity, profitability, and sequestration are why private forests have sequestered more carbon than they've emitted.

Now all that is at risk.

The threat of development

That same system of private property rights means that to private land owners, their woodlot is an asset, and assets either need to earn their keep or get "reevaluated." The real threat is permanently losing forested lands to development. That's what's happening now.

Currently, we are losing 22 acres of forest per day to development just in Vermont. Similar amounts are lost across the Northeast Wood Heat Region. Deforestation is another complex issue, but much of it comes back to the incentive for private landowners to maintain their woodlots in current use. Land is always more valuable when it's developed. Because the lure of quick profits from converting woodland to development is a real and present danger, the key to conservation is healthy markets for all wood harvest—not just the 20% of high-grade wood that ends up sequestered in buildings, furniture, and other wood products.

Markets for low-grade drive responsible forestry practices

70% of forest harvest is waste wood that can't be used for building materials or furniture. In the Northeast Wood Heat Region, we have an abundance of this low-grade waste wood. It once was used for making paper, but the loss of those markets (think smartphones) makes it more difficult for landowners to maintain their wood lots in current use. Leaving wood to rot on the forest floor still releases CO2 as the wood is broken down over time.

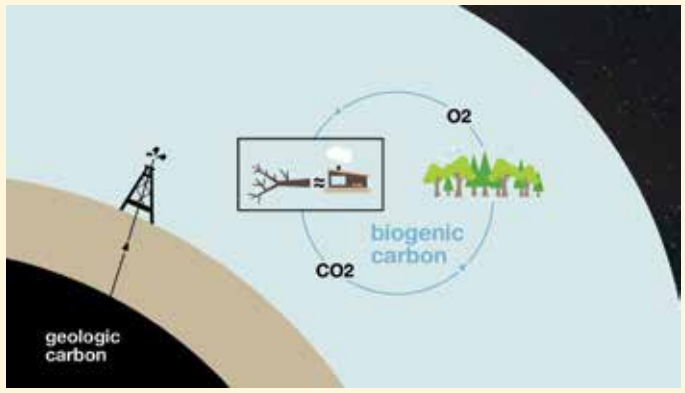
Effective utilization of waste wood drives responsible forest practices. In addition to disincentivizing development, responsible use of low-grade wood conserves wildlife habitat, water quality, air quality, and view sheds. Using clean-tech wood pellets and chips to heat our homes and businesses is better for the environment than oil or gas.

We need to take advantage of our opportunities to preserve important tracts of land while we concurrently support the conservation of working forests.

PART THREE: CONSERVATION FOR MAXIMIZING SEQUES-TRATION AND THE CARBON SINK TIMELINE

Will switching from fossil fuels to automated wood pellet heating systems adversely impact the important role America's forests play in sequestering carbon? We only have 10 years to avoid the worst effects of climate change, and trees absorb carbon slowly but release it quickly when used for heating—people refer to that carbon dynamic as "slow in, fast out." It's a legitimate concern, but it's a pretty simplistic view of a very complex system.

It's counterintuitive, but the sentiment that "we only have 10 years and that's why we shouldn't cut any trees now—because we don't have 50 years to recover that carbon" is exactly what will lead to dangerous levels of deforestation and CO2 in the atmosphere.



The 2007 "IPCC Assessment (Intergovernmental Panel on Climate Change)" states that long-term cumulative CO2 emissions — the emissions that are always reduced by using forest biomass to produce energy — are correlated with Projected Peak Global Temperature. So, if we want to limit global temperature increases to 1.5 degrees centigrade or 2 degrees centigrade, we need to use forest biomass because doing so reduces long-term cumulative CO2 emissions."[1]

A managed forest does more to draw down carbon in the atmosphere than a forest we leave untouched.

Managed forests continue to grow and sequester carbon. Removing select trees from an overcrowded stand can release the residual stand and increase the amount and quality of wood grown (and amount of carbon sequestered) in subsequent years as compared to a stand that was not thinned.

"In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit."[2]

The essential thing here is that a managed forest does more to reduce greenhouse gas emissions than an unmanaged forest, and that even though we only have 10 years to turn the tide on climate change, the essential context for forest carbon drawdown is in the 20 to 50-year window according to the IPCC.

The short-term risk is not the sudden release of carbon stored in trees. The short-term danger is in losing forest land permanently to development, because we have not incentivized the use of forest products and low-grade waste wood in particular.

True (carbon) cost accounting

What is the true cost of all the greenhouse gasses (not just the CO2) released from the three available heating fuels? The essential context is one of real-world alternatives. Since the Northeast Wood Heat Region has such a large percentage of private forest, low-grade waste wood that needs a market, and buildings that rely on high temperature distribution systems, it doesn't make much sense to pull oil and gas out of the ground for heat.

PART FOUR: ENSURING RESPONSIBLE PROCUREMENT OF WOOD HEATING FUEL

In order for all this to be true, we need to sustainably manage our forests. According to actual forest inventories (as opposed to modeling or projections), the private landowners of this country have been doing that for decades. We currently have a system of federal, state, and local laws and best management practices that ensure they would be able to continue to do so as long as the market demand exists. That's where consumer choice can make a dent in the climate crisis.[1]

We should take our cue from CSAs (Community Supported Agriculture) and empower a new subcategory of civic agriculture: Community Supported Forestry (CSF)! The Northeast Wood Heat Region is the ideal seabed for an alternative model of a carbon economy based on connecting the producers and consumers of advanced wood heating. In the process, we strengthen a sense of community through local markets[3], while working both sides of the climate equation—lowering greenhouse gas emissions and increasing carbon

Cont'd on p.23

Drawdown - *Cont'd from p.22*

drawdown by incentivizing long-term carbon sequestration.

Groups like the Forest Stewardship Council, Certified Family Forests and the Sustainable Forestry Initiative give consumers the power to incentivize responsible, sustainable forest practices by prioritizing products that come from certified sources.

An even more local community-centric model

Individual communities are figuring out how to develop their own community energy plans that connect their school or municipal buildings with local, sustainably-managed woodlots. In Vermont, the Mt. Abraham Unified High School uses a SELF (Sustainable, Efficient, Local and Fair) standard that gives landowners a financial incentive to engage in sustainable forest management.

A project of the Forest Guild and the Yale School of Forestry and Environmental Studies, the steps to create a reliable supply of wood chips can be found in the publication, *Harnessing the Power of Local Wood Energy.*

PART FIVE: CLIMATE ADVOCACY WITH AGENCY!

The Northeast Wood Heat Region is a model of public-private partnership with state incentives for wood pellet heating systems, a proven track record of sustainable forest management, and millions of dollars invested by private industry. The wood pellet boiler and furnace industry have built out the infrastructure to deliver the automated, hands-off convenience we've come to expect from our heating systems. They've invested millions in proven technology with lower emissions than oil or gas. Now it's up to us.

We can have a distributed system of clean heating instead of the dirty, polluting centralized fossil fuel heat that got us into this climate mess. We can choose a polyculture based on conservation of renewable resources instead of a fossil fuel monoculture that works to pass our climate problem to the next generation. We can reduce heating pollution today while conserving a vital carbon sink for the future. That is why wood heat is essential to carbon drawdown.

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All photos courtesy of Jeff Rubin, copyright 2019 sustainableheating.org.

Source links available online.

Jeffrey Rubin is founder and interim executive director at Sustainable Heating Outreach & Education, Inc. After a 30-year career as principal at APM ADVERTISING, INC., Rubin has focused his marketing background on green energy adoption in the building thermal sector. An admitted home-heating geek, he is fired up about mitigating climate change through consumer and industry education on the topic of clean heating. ♻

BURTON TAKES A STAND FOR THE PLANET

Cont'd from p.1

Understanding that there is a climate emergency at hand, Burton has undertaken a number of environmental actions to ensure that its snowboards are made to high environmental standards. It changed assembly methods for snowboards in 2016 to reduce wood waste by 20%. In 2017, it started to use FSC-rated wood for all its snowboards, which means that all its wood is sustainably harvested. Also, in 2017, it stopped using polypropylene packaging for adult snowboards, switching to selling them in paper bags. In 2017, it also started using Super Sap bio-based resin to reduce the carbon footprint of the resin on all boards by 33%. In 2018, it started using solar photovoltaics to provide it with electricity (please see the article on Burton's solar drive on page 8). In 2018, it also started using Re-Rez® recyclable epoxy in some product lines, and it is expanding that use to other lines. In 2019, Burton became a certified B-Corp in Vermont.

That is not the end of Burton's work by any means. By the winter of 2020, Burton hopes to have all its clothing and soft goods contain only sustainable cotton. This is intended to reduce chemicals and use of water.

Some things the company does are a bit surprising. It is running what it calls a "Burton Pass Along" initiative. Customers are encouraged to trade in their unwanted Burton gear for reuse, in exchange for store credit or a charity donation. The reason this seems so surprising is that it seems counter to just about everything we expect from a business that is being run for profit. The gear is cleaned and redistributed for reuse. This means, in effect, that new Burton products are being put into direct competition with used Burton products, which people can get at little or no cost. The advantage to Burton may not be much, but the advantage to the planet is that Burton's products stay out of landfills all that much longer.

This year, Burton did something else we might find perfectly extraordinary. As the Global Climate Strike was gearing up, with over one million people in countries around the world inspired by sixteen-year-old Swedish activist Greta Thunberg to get involved, Burton itself joined the protest. The company announced that it would not conduct business in its stores on September 20th. Retail outlets and offices in the United States, Canada, Europe, China, Japan, South Korea and Australia would do no business on that day. In fact, Burton would not even accept orders placed online, and its web site redirected visitors to the Global Climate Strike website.

On that day of protest, stores were to be open to visitors but not for shopping. The doors would be open so people could come in, gather, and get supplies to make posters for protests. Employees were given the day off, with pay, so they could attend marches and do other protest work.

Donna Carpenter, Burton's co-CEO, said "I've been so inspired by Greta Thunberg and the students around the world who have used the weekly Fridays for Future protests to beg adults to pay attention to the climate crisis." She added, "At Burton, we want to help preserve the winter outdoor experience for future generations, so I'm proud to have our company join Greta's movement. As Greta said, 'We're all in the same boat, so everyone should be concerned about this.'"

It is obvious that the people at Burton Snowboards are motivated by a love of the environment and of humanity to address the issues of climate change. They are in an industry that is more aware than many of the effects climate degradation has already had, because they can see it firsthand. But there is more than that behind their actions. Clearly, they recognize that we are in a climate crisis that affects every one of us. Burton G.E.T.s it!

Burton Snowboard's website is www.burton.com. ♻

Burton's headquarters were closed in Burlington, VT and around the world during the climate strike. Photos are courtesy of Burton.

New England Sustainable Energy Association (NESEA)

PRO TOUR BURLINGTON, VERMONT

Barbara Whitchurch

NESEA Pro Tour -- it sounds like a golf tournament, but it's actually an ongoing series of tours of residential and commercial buildings whose designers have employed up-to-date materials and construction methods to cut back on the pollution caused by standard building practices. It's also an opportunity to hear from the architects, builders and occasionally even homeowners, about the process of planning and constructing these buildings. And, of course, the lessons learned along the way. The aim is to cut back on the pollution, energy waste and lost comfort opportunities caused by the outdated building practices still being used by so many behind-the-times builders. All of this while drastically reducing operation and maintenance costs.

The NESEA Pro Tour in Burlington, VT on September 20, 2019 was our fourth, and, like the others, it did not disappoint us. From the careful planning, yummy food, hassle-free transportation to and from the sites (in spite of local climate strike demonstrations in Burlington that day), to the fascinating presentations, all was expertly orchestrated, informative and fun.

Attendees at this event toured two very different projects. Representatives from Efficiency Vermont led the first portion of the event, which showcased a Zero- Energy Modular (ZEM) small (not tiny!) home, measuring 560 square feet. This particular ZEM is a traveling model home that demonstrates some of the latest high performance and healthy home strategies. The home is all-electric with a super-insulated air-tight envelope, battery storage, and environmentally preferable/healthy finishes. The unit moves every few weeks to a new location, acting as a teaching tool and demonstrating a new approach to affordable housing that considers life-cycle costs, rather than just initial out-of-pocket cost.

A three-unit multi-family house which has been expanded and retrofitted to the Passive House standard. Photo: Barb and Greg Whitchurch.

This initiative was developed by Peter Schneider, a Senior Consultant at Efficiency Vermont, during the aftermath and recovery efforts following Tropical Storm Irene, in which a disproportionate number of mobile homes were damaged. The intent was to replace substandard mobile homes with affordable, resilient, healthful and durable modular homes for low-income homeowners.

As Schneider explained, the mobile homes are constructed in the Vermod factory in Wilder, VT, using a technique called "crib bunking." Five homes are constructed at once, each taking about five weeks to complete, all in a climate-controlled indoor environment. The homes are built from the inside out, allowing time to insulate them properly. Framing is done with x 14' SIPPs filled with dense packed cellulose. Because of their light weight, smaller cranes and trucks can be used to deliver the units, which are then tied into existing water, electric and sewer. (They are replacing existing homes on already-developed lots and bases.)

The home's specifications include a super-insulated envelope (the entire shell of the building from the basement floor to the roof), a cold climate heat-pump that also cools in the summer, and a 4.5kW photovoltaic solar array with battery backup. The blower door test yielded less than 1.0 ACH50.

According to Peter, two-thirds of Vermont's mobile homes need to be replaced. But the replacements don't have to look like "trailers." The modular construction can be lofted or 'cathedral-ized,' customized to look like a more typical New England home (bit.do/hfh-charlotte-ph), and most are quite a bit larger, too.

The second site we visited was a three-unit multi-family house in Burlington's Old North End which has been expanded and retrofitted to the Passive House standard. The presenter, Arthur Chukhman of Duncan Wisniewski Architects, is the owner, architect and general contractor.

This home features a three-story addition to a pre-1877 duplex. The addition includes new space for the existing units and a third unit, which is the first Certified Passive House in Burlington and is modeled to be net zero. The addition features foam-free construction, showcasing carbon-storing materials such as 6 1/4" thick fiberboard continuous insulation (Gutex), dense pack cellulose in the stud cavities and roof, and foam-glass (Glavel) below the slab. Other features include triple-pane tilt-turn windows and full house balanced ventilation with a heat recovery unit from Zehnder.

This portion of the tour was led by Arthur Chukhman and the builders, Jacob Racusin and Ace McArleton of New

Cont'd on p.25

NESEA Pro Tour -- Cont'd from p.24

Frameworks. The goals of this project included: Passive House certification for the new construction; renovation of the existing duplex without raising the rent per unit; make the new unit net zero; and minimizing the amount of embodied carbon in the new construction. (Embodied carbon calculations were performed to inform materials choices. An upcoming article will focus on embodied carbon, and what it means for sustainable construction.)

All of the buildings toured have demonstrated how modern building technology rewards the owners with a lower cost, a healthier and more comfortable living space, and a lower maintenance building. That these buildings cost no more or only marginally more to erect while saving significant money every month throughout their lifetimes is always a surprise to the new folks on a tour.

One intended takeaway from these tours is that anyone building or remodeling a home can afford these benefits if they choose the right builder. The engineering principles are by now well-known to responsible, certified builders. Efficiency VT provides free consulting and financial incentives to build responsibly. Be sure that your contractors have Certified Passive House, LEED, or EEN certifications at the very least. Yes, there are still many old-fashioned builders who decry the new science and engineering discoveries - always the case with new techniques and technologies. But cheaper, healthier, more comfortable, more reliable homes have finally hit the mainstream. EfficiencyVermont.com (bit.do/evt-een) or Vermont Passive House (VTPH.org) can help you find a qualified builder, architect or designer to remodel or construct your home to the latest comfort, value, and efficiency standards for a price you can afford.

Barbara Whitchurch is a freelance writer and a member of Passive House Vermont. She is the co-owner of a Passive House, a Nissan Leaf, a Kia Niro, and a large St. Bernard named Remi. ♻

A Vermod Zero- Energy Modular (ZEM) small, traveling model home. It is all-electric with a super-insulated air-tight envelope, battery storage, and environmentally preferable and healthy finishes. Photo: Barb and Greg Whitchurch.

IPCC REPORTS ON OCEANS AND CRYOSPHERE

Watching the Permafrost Thaw; Man Heats Ocean First

J.D. Kaplan

In the last issue of *G.E.T.*, I took it upon myself to profile the latest report issued by the Intergovernmental Panel on Climate Change (IPCC), the United Nations body concerned with climatic changes. It is a policy document, but you only have to breathe air for this panel's work to be relevant to you.

IPCC groups continually assess the mass of academic work that concerns Earth's fluid and living systems. Their latest release was timed to coincide with student protests. The Special Report on the Ocean & Cryosphere in a Changing Climate (SROCC) would, then, lend informative support to go with a demand for attention to the changes we face.

The SROCC exposes the oceans, of course, and our cryosphere. This is the frozen matter at our poles: snow, glaciers, ice sheets, icebergs, ice at the surface of seas, ice atop rivers and lakes, and ice that reaches deeper than the layers on top. It also includes areas under permafrost, which is important to the projections of carbon in the air, and which is thawing visibly in some places. Permafrost is frozen ground that starts at ground level and may reach as deep as a kilometer.

Any major document dropped by the IPCC is an education, if you're willing to learn from it. SROCC assesses "the latest on the physical science basis and impacts of climate change on ocean, coastal, polar and mountain ecosystems," as well as the folks who live with them. Plans and pitfalls are explored, and then projections are made.

Anyone can take a quick look at the Fact Sheet, which I recommend. For now, I'd like to share two axioms from the SROCC that I see as invaluable for readers.

A collapsed block of ice-rich permafrost along Drew Point, Alaska. See more at (on.doi.gov/arctic-coastal). Credit: U.S. Geological Survey.

Number one is that the oceans have absorbed over 90% of the heat we have added to Earth's systems. That includes our CO2 trapping as well as everything else. We have been heating the oceans, primarily.

Another group, Ocean Scientists for Informed Policy (OSIP), asserts that "complex interactions between continued emissions of greenhouse gases, consequent energy imbalance, and changes in the storage and transport properties of heat in the ocean will largely determine the speed and magnitude of long-term [sic] anthropogenic climate change impacts." In short: Deep in the water is where it all happens.

All the heat we trap in the atmosphere may be subject to the oceans' propensity to move it around the globe. These rates vary, as do the absorption activities in differing ocean surface conditions. Accurate projections depend upon these rates — SROCC explains what, exactly, makes the long-term behavior of our atmosphere so hard to nail down.

Sea level rise projections fall to this mechanism of uncertainty, too. Measuring up to about 4mm per year, we observe two main contributors. Only one of them is the glaciers.

Number two is, essentially, that water expands when you heat it. Hotter water just takes up more space. According to the IPCC this accounts for 1.4mm in sustained sea level rise per year, whereas the meltwater directly adds about 1.8mm. This makes glaciers and ice sheets the dominant factor behind sustained average rise.

The SROCC is based upon nearly seven thousand other academic studies. In that way, it is a supreme meta-review. Interest in climatic changes has burgeoned over the past few decades, and these reports draw on the strength of what has emerged. However, governments have only just begun to stand on these findings, as they vie for ways to respond to climates in flux.

The chair of the committee, Mr. Hoesung Lee, insists that the choices of policymakers depend upon a thorough assessment of the global situation. To empower them to do so was the reason cited for bringing the report to completion just as organizers around the globe would march to demand more of their governments. The SROCC launch was held in Monaco on the same weekend. This was done to maximize political attention and to deliver these crucial messages to power brokers. Let us hope they will hear them clearly and act without bias.

J. D. Kaplan is a certified remote pilot and a former member of the I.T. crowd. He is a reader in the areas of bioelectromagnetics and cryptocurrency. For G.E.T. readers, Mr. Kaplan intends to profile blockchain activity within the energy sector. He lives and works at or above sea level near Boston, MA. ♻

WHERE IS THE FIRE DEPARTMENT?

"It is often very difficult to make up one's mind. The difficulty may be due to the complexities of the issues involved, or to the limited number of facts available for consideration, or certain fears that overshadow the horizon, or a general habit of indecision that has developed over the years… Of course, one must never forget that postponing a decision may be to decide by default. It is the nearest illusion to think that, if I do not make up my mind, events that are contingent upon me and my decision will await my pleasure."

– Howard Thurman: author, philosopher, theologian, educator, and civil rights leader

John Bos

Greta Thunberg shrugged off one more mocking Trump trademark tweet following her emotional speech about climate change at the United Nations (U.N.) General Assembly on September 23rd. She said she expected him to make comments about her. After Trump's derisive tweet, Thunberg used it in her biography on her Twitter profile.

Thunberg, the 16-year-old environmental activist who rose to global fame after founding the School Strike for Climate campaign, was at the U.N. headquarters in New York City to deliver a speech to world leaders when she crossed paths with Trump.

In response to Thunberg's highly charged statement that "people are dying" and "we are in the beginning of a mass extinction," our climate denier-in-chief snidely tweeted, "She seems like a very happy, young girl looking forward to a bright and wonderful future. So nice to see!" This writer can only imagine Trump's upset about a young woman attracting more media coverage than him.

You can see and hear for yourself Greta's truth that so few of our leaders have the moral capacity to acknowledge at wired.trib.al/VXdAnKt,

In her newest must-read book On Fire: The (Burning) Case for a Green New Deal, Naomi Klein writes that people with autism "tend to be extremely literal and, as a result, often have trouble coping with cognitive dissonance, those gaps between what we know intellectually, and what we do that are so pervasive in modern life."

"For those of us who are on the spectrum [autism]," Thunberg says, "almost everything is black and white. We aren't very good at lying, and we usually don't enjoy participating in this social game that the rest of you seem so fond of." Those strengths have served Thunberg well, as she explained on CBS This Morning that her Asperger's actually helps her in seeing the world through a different lens. "In some circumstances it can definitely be an advantage to have some kind of neurotypical diagnosis, to be neurodiverse, because that makes you different, that makes you think differently," she said. "And especially in such a big crisis like this, when we need to think outside the box. We need to think outside our current system, we need people who think outside the box and who aren't like everyone else."

Image: Wikimedia Commons/Leonhard Lenz.

Underscoring Thunberg's statement is this from Richard Epstein on the American Enterprise Institute web site. "What if the green crusaders have overstated the risk, or what if they are just plain wrong? Then massive social resources will be squandered without obtaining any advantage in return." Epstein doesn't ask the other side of that question which is, "What if the green crusaders are right and we haven't expended social resources on attempting to mitigate the climate crisis?" The answer is obvious. The sustainability of the human race will have been endangered beyond comprehension.

Thunberg has inspired a new world-wide generation of young climate activists. As an effective communicator on climate change, the Swedish schoolgirl is currently in a league of her own. "In a way," Klein writes, "she is asking those of us whose mental wiring is more typical – less prone to extraordinary focus and more capable of living with moral contradictions – to be more like her." Klein adds, "these traits explain why some people with Greta's diagnosis become accomplished scientists and classical musicians, applying their super focus to great effect."

Most of us do have the capacity to rationalize, to compartmentalize, and to be distracted easily. "All three of these mental tricks," writes Klein, "help us get through the day." But then she adds that these traits are also "proving to be our collective undoing" when it comes to rising to the reality of our climate crisis. Rationalization is "reassuring us when we should not be reassured." These traits "are distracting us when we should not be distracted. And they are easing our consciences when our consciences should not be eased."

Klein cuts to the chase in explaining the core reason for climate denial. That is because "if we were to decide to take climate disruption seriously, pretty much every aspect of our economy would have to change, and there are many powerful interests

Cont'd on p.32

The Global Rebellion is Underway

Dr. Alan K. Betts

At the end of September, seven million people, mostly youth around the world, joined with Greta Thunberg in a global climate strike to protest the fact that our industrial societies intend to sacrifice our children to protect the present economic system, and especially the profits of the fossil fuel industry. Pause and listen to the clarity of her speech to the UN (https://www.washingtonpost.com/climate-environment/2019/09/23/greta-thunberg-vows-that-if-UN-doesnt-tackle-climate-change-we-will-never-forgive-you/). If a 16-year-old can understand so clearly our destruction of the Earth's stable climate and living biosphere, one might wonder whether our leaders are just stupid. Of course, we know why. In the past 30 years as the climate crisis has accelerated and our understanding has deepened, many of our leaders have tried to hide from the truth in a web of lies to avoid acknowledging their greed, corruption or political self-dealing.

Entire websites have been created with phony climate science to feed their ideologies of denial and try to pacify their conscience. Even though at a deeper level, most of them know that destroying the Earth's ecosystem to make money is a crime against our children and the Earth itself.

The first step is to realize this is an existential crisis, a real planetary emergency for humanity and much of life on Earth. No amount of ideology and denial can protect us from warming oceans, more

Extinction Rebellion: London, October 10, 2019

powerful storms and extreme weather, and the loss of so many species that we and all life depend on. We have idolized economic growth and the freedom to exploit the Earth and the poor, but the Earth is not listening to our self-righteous doctrines that maximize profit and protect the wealthy. Our planet is simply getting warmer as increasing greenhouse gasses slow the cooling to space; while at the same time, ice and snow melt so that less sunlight is reflected.

As I write in mid-October, the first global phase of the Extinction Rebellion to save the Earth (Rebellion.earth) has just finished. Their motto is Compassion; awareness; courage. This remarkable group formed in the UK over the past winter and has spread rapidly around the globe. They understand deeply that climate change, and the extinction of so many species in the living biosphere, is now a civil rights issue for our children and for the Earth itself: it is the crime of ecocide. Like previous civil rights issues, it will take non-violent civil disobedience to wake the conscience of reluctant societies and selfish people.

Time is running out as scientists have been shocked by how much climate change has accelerated in the past ten years. These Rebels are pushing for rapid reduction of our greenhouse gas emissions; asking for a serious attempt to zero our global carbon budget by 2025. Since our global carbon budget is still increasing despite 25 years of promises, this is unthinkable to our economic system. Actually a 50% reduction by 2025 would be a staggering achievement and set us on the right track.

For nine days in cities around the globe, this powerful, non-violent rebellion challenged the ecocidal reality of our global market economy that refuses to place value on the future of the Earth. This movement is peaceful and loving, creative and artistic, but relentless and disruptive, since without pressure, governments will refuse to make the radical policy changes needed.

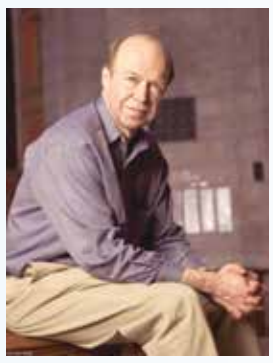
In London, Paris, Berlin, Brussels and Dublin; Rome, Amsterdam, Madrid, Prague and Istanbul; Cape Town, Buenos Aires, Rio and Santiago; Mexico City, New York, Montreal and Vancouver; Melbourne, Perth, Mumbai, Colombo and Jakarta, the Rebels are putting down roots for the long struggle ahead to save the Earth. Some countries treated them with compassion and understanding, while others reacted with anger and violence. Many have been arrested, but their dance and music will continue across the Earth as they regroup and regenerate for the next phase. They understand clearly what most refuse to understand: that business as usual is driving accelerating climate change with catastrophic consequences for all life on Earth within the lifetime of our children and grandchildren.

Because they see this clearly, they have resolved to resist for the sake of life on Earth. Generations to come will be grateful to them. I hope readers will stop and reflect deeply on their values and act to support this courageous movement.

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

PIPELINES!

09 October 2019 / James Hansen



How much effort to spend fighting pipelines? What is the best use of our time and resources? On one hand, educating lawmakers and the public about the merits of a rising carbon fee is crucial. Once enacted, a rising carbon fee will make the most carbon-intensive energy sources uneconomic. Oil derived from tar sands or tar shale is high on the list of the most carbon-rich.

However, as part of my testimony last week to the Illinois Commerce Commission, in opposition to the proposed expansion of the Dakota Access pipeline, I did a calculation of the amount of CO2 that will be released by the additional crude oil, if the pipeline capacity is increased from 570,000 bpd (barrels per day) to 1,100,000 bpd. The additional CO2 emitted is equivalent to fifteen 1,000-megawatt coal plants.

The lawyers asked the question, "If the proposed expansion does not occur, won't refiners find other sources of crude?" The real question, it seems to me, is whether the Illinois Commerce Commission will pave the way for expanded use of this exceptionally harmful fuel or whether, by making the right choice, the Commission will exercise leadership that other authorities can emulate, which decisions, in combination, will function to restrict full exploitation of this carbon-intensive crude.

Stopping pipelines is difficult. Yet, climate science is clear. Most of the additional CO2 pumped into the air will need to be extracted, somehow, if we are to maintain shorelines and a hospitable climate for future generations. Just slowing approval of pipelines has merit. If construction is delayed long enough to allow governments to come to their senses, we may prevent some pipelines from ever being built.

My testimony to the Illinois Commerce Commission is available at http://www.columbia.edu/~jeh1/.

We have launched a new Climate Science, Awareness and Solutions (CSAS) Columbia website: https://csas.earth.columbia.edu/. CSAS is funded 100% by the public. Our continued work depends on your support, which is much appreciated. Columbia University provides a direct online giving option. Other giving options and full instructions are available on our new Giving page.

We especially appreciate any support prior to 15 December, as we face that deadline for finding support to continue our program into 2020.

The DAPL (Dakota Access Pipeline) being installed between farms, as seen from 50th Avenue in New Salem, North Dakota. Image: Wikimedia/Tony Webster.

James Hansen, former director of the NASA Goddard Institute for Space Studies, is director of the Climate Science, Awareness and Solutions program at the Columbia University Earth Institute. ♻

Burlington Mayor Weinberger Proposes Carbon Fee to VT Legislature

Barbara Whitchurch

In a press conference held during the final day of the Renewable Energy Vermont (REV) (https://www.revermont.org/) conference in October, Burlington Mayor Miro Weinberger announced that he will ask the Vermont Legislature to levy a carbon pollution fee on heating and transportation fuels. Joined at the podium by a coalition of environmental and business leaders, Weinberger proposed a statewide "revenue-neutral" carbon pollution fee that would help cut emissions by 37% by 2040. Under this proposal, virtually all of the revenue collected would be rebated back to Vermont households and businesses.

The announcement came as two towns, Norwich and Hartford, declared a "climate emergency" to increase awareness of climate change and encourage more people to take action.

Weinberger stated that Vermont would be part of a coalition of seven mayors of northeastern U.S. cities (bit.do/nem4cc) who have proposed a multi-state "carbon pollution fee" on fossil fuels to curb greenhouse gas emissions. The mayors are asking their legislatures to enact carbon fee and rebate programs that will be effective, equitable and "pro-economic growth." One component of such a "feebate" would be to provide fast charging for electric vehicles (EV) owned by all EV households in Vermont.

In his statement, Weinberger referred to the initiative as a "transformative tailwind that would dynamically push forward our efforts toward mitigating the current climate emergency."

Barbara Whitchurch is a freelance writer and a member of Passive House Vermont. She is the co-owner of a Passive House, a Nissan Leaf, a Kia Niro, and a large St. Bernard named Remi. ♻

My Zero-Energy Retrofit Beats My 401(k) – A DIYer Project

David Green

I own a 5,400 square foot home built in the 1970s. I did a deep-energy retrofit and successfully achieved my net zero carbon goal. The return on investment on my zero-energy retrofit is about 15% per year. No fees, no taxes, no volatility. Sure beats my 401(k)!

Our new wood-framed triple-glazed windows have almost eight times the insulation of the old single-glazed ones and have transformed the look and feel of our living room. Courtesy photo.

I am a physicist by training, so I have a solid understanding of energy saving technologies. I also have an MBA from Harvard Business School, so I also understand how to use standard financial analysis to see which investments would make me money.

For the past two years, I have kept daily records of my heating oil and electricity use, so that I could measure the effect of each improvement. My results are based on real measurements, they are not predictions based on a software model or on manufacturers' claims.

In going zero, I only took measures that paid for themselves. This excluded doing many things typically done in deep-energy retrofits:

- I did not remove and replace my siding to add insulation because it is so expensive that the savings on utility bills would never pay for it. Instead, I added 12" of fiberglass to the ceiling of my basement. This cost me $1,000 and paid for itself in four months. I installed it myself. The return on investment is over 100% per year.
- I did not install geothermal (ground-source) heat pumps, because modern air-source heat pumps are almost as efficient but are about one-quarter the cost. My heat pumps are about four times as efficient as my old oil-fired furnace. Ours cost about $23,000 installed. The savings on the oil bills (after accounting for the extra electricity the heat pumps use) will pay for the heat pumps in about 9 years. That's a return on investment of about 9% per year after tax. These heat pumps both heat and cool the house. They replaced our old air conditioning units. They cut our house energy use about 55% and are saving us about $3,000 per year.
- I opted not to install solar hot-water panels, because solar photovoltaic (PV) panels powering a heat-pump water heater are more efficient and more effective. Solar hot-water panels tend to overproduce hot water in the summer and do not make enough hot water in the winter. Net-metering allows us to store credits for excess electricity generated during the summer months and then use those credits when the sun is not shining. Hence, we can use solar PV plus net metering to generate hot water even on cold cloudy days, which is impossible with solar hot-water panels.

Instead of installing solar thermal panels, I covered the roof of my house with solar panels. I make money on every solar panel. Solar panels are cheaper than they have ever been and are heavily subsidized. My total investment in solar panels, after the tax breaks and subsidies, was about $42,000. My savings are over $5,500 per year on electricity bills. The panels will pay for themselves in about 7 years. The return on investment is about 13% per year after tax.

I installed modern low-E triple-glazed windows, which have about eight-times less heat loss than my old single-glazed windows. These do not pay for themselves, at least they won't for decades. However, the additional cost of installing triple-glazed windows above the cost of installing double-glazed equivalents did pay for itself. In other words, since we were replacing our windows and patio doors anyway, it made sense to install R-5 and R-4 triple-glazed ones rather than R-3 double-glazed ones. The additional cost will pay for itself in about five years. The return on investment on the additional cost is about 19% after tax.

My total investment for the entire zero-energy retrofit was $75,000 (after tax breaks and subsidies), and I am saving over $11,000 a year on heating and electricity bills. The investments pay for themselves in about 6 years. My return on investment is about 15% after tax. That beats the growth of the S&P 500 stock index of 11.7% before tax over the last 43 years. So, I think I've found a way to both go zero and make money.

You can read more about my experience, including the low-interest or zero-interest loans that are available to pay for it all at http://www.GreenZeroCarbonHome.com.

David Green has a BA in physics from Oxford University and an MBA from Harvard Business School. He founded two biotechnology companies, was CEO of both of them and took both public. He also is the founder of Zero Carbon, LLC. David is the author of Zero Carbon Home and Zero Carbon Pool. ♻

Our first solar panel array on the roof of our house as seen from our son Jack's drone. © Jack Green.

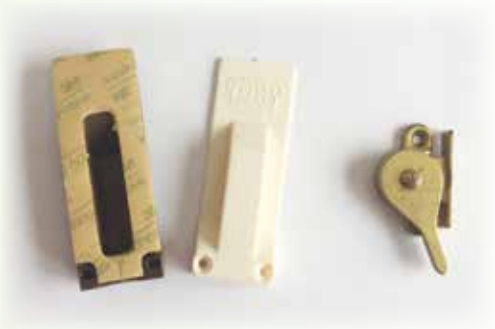
Do-It-Yourself Energy Upgrades: Windows

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

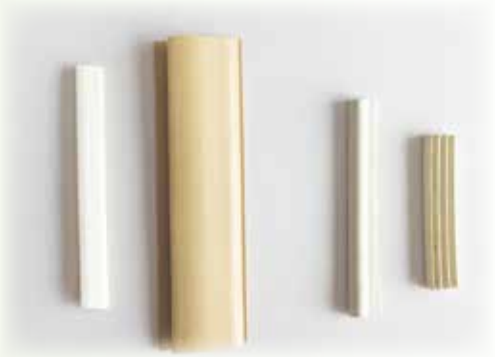
David Keefe

We expect our windows to be easy to open and close, to let the sun in, and to be invisible. But they also need to keep out the wind and cold.

If you have older windows, you've probably thought about replacing them. It can lower your heating bill and make you more comfortable, but it's expensive and is rarely justified by energy savings alone. So, in this article we are exploring things you can do to make your existing windows more efficient. There are essentially two strategies – add a layer or make things more airtight.



Pully seals, side-mount sash lock



Polypropylene V-seal, EPDM rubber

Adding an additional layer of glazing can make quite a difference. If you don't have exterior storm windows you can add them. Choose "low-E" storms, which have a special coating to reflect more of the heat back inside. Storms protect the primary windows from the weather and provide a screen when the window is open. If you already have storms, check in the fall to make sure they are closed all the way.

You can also add one or more layers to the inside. The layer can be almost anything – glass, acrylic or flexible plastic film. All these materials work fine. The differences are cost, convenience, durability and aesthetics. The plastic film option is a good choice for renters or others who can't afford to spend much. You can buy or build interior storms with acrylic sheets (better than glass for this because they are light and don't break). Some interior storms have two layers instead of one, which is a great idea.

Your interior storms should be weatherstripped to be as airtight as possible. Hold the panel in place with clips. Make sure you consider fire egress and make the panel easy to remove in case someone needs to escape. For non-openable windows, the panel can be permanent.

The second thing you can do is to make the window assembly more airtight. This means caulking any non-moving joints or cracks and weather stripping the moving parts. Use a soft rubber or silicone seal for compression joints, where the parts push directly onto each other without sliding. Use a smooth low-friction material like polypropylene for joints where the pieces slide against each other. If your windows have factory-installed weather stripping that has worn out, try contacting the manufacturer for replacements.

You can buy temporary caulking which goes on with a caulking gun as usual but is designed to be easily removed in the spring. Or use the "rope caulk" which is like clay and is pushed into place with your fingers.

Many Vermont houses have the classic "farmhouse" single-pane vertical sliders. These can be weather stripped with polypropylene V-seals on the sides and meeting rail, and a soft compression seal at the bottom.

Farmhouse windows typically have a clamshell sash lock at the meeting rail. This is designed to push the bottom sash down and pull the meeting rails together, but it needs to be properly positioned to do that. You can also get side-mounted sash locks which are installed in pairs and push the bottom sash out firmly against the frame.

If your windows have ropes and pulleys, the biggest air leak in the assembly is probably the hole that the pulley is in. You can get a plastic cap that fits over the pully and has a hole for the rope. It is installed with an adhesive-backed gasket and two screws. The rope and pulley arrangement remains operational.

Make sure to caulk any cracks or seams with a good acrylic caulking, including where the interior trim meets the wall surface. The biggest cracks are often where you don't see them, at the very bottom and top of the window trim.

Insulated window coverings are effective if they seal well around the perimeter, but they can be expensive and there's no benefit when they are open. Regular heavy curtains also help. They typically won't change your heating bill much, but they can make you more comfortable by reducing the chilling effect of that cold glass.

Next time we'll talk about basements.

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. ♻

Cold-Weather Reminders

Michael Canavan

Family game time in a safe, warm home. Wikimedia Commons

'Tis the time of year to get ready for the colder weather, and what better way than to inspect the areas of your home that allow cold air and drafts to enter. As a home inspector, I look at the conditions of the windows and doors: weather-stripping, alignment, locks, and glass seals. Now is the time to replace and repair as needed to save on heating costs.

For the windows, check the top and bottom of each sash and with doors don't forget the bottom sweep. These are easy to change in a few minutes. When you remove any screens for the winter, you can check these items out along with the condition of the caulking around the windows and doors. Separated caulk seals can add up and equal the same as an open window on a house coming in small one-inch gaps. Caulking is only good for two to five years if installed correctly.

When you remove and drain your garden hoses you should drain the non-freeze protected hose bibbs, and it is always good to install an insulated cover over them for a little more protection in the inevitable below-zero cold snaps. Leaving even a small amount of water can cause a large amount of damage.

Have you had your chimney inspected and cleaned for the year? Animals will nest in them during the spring, summer and early fall. As you stack your firewood for the season remember to have the main stack 20 feet from the house and just a few days of logs nearer the door. This will prevent unwanted vermin intrusion at the house. Speaking of wood, are there any tree branches that need trimming away from your home and power lines? Do you have any branches that look like a good

Outdoor faucet cover referred to as a hose bibb.

Carbon monoxide monitor.

wind could cause them to come down on your home? The winds will surely come, and now is the time to cut out the dead wood before the snow settles in and makes these chores harder to manage.

Now let's shift gears to home safety. October was fire prevention month. Have you made an escape plan and talked about it with all the family members? Please check your fire extinguishers for the service charge - the arrow must be in the green area on the dial. Replace or service if needed. Give them a good shake to keep the material inside loose so it will work properly for you if you ever need it to save your home or life. They are very effective so review how to use one with the family. Use an old one to demonstrate how it's done.

Now that you have closed and sealed the windows in your home, you need to make sure the smoke detectors and carbon monoxide alarms are working. Install new batteries and push that test button to verify. While we want to seal up the house against the cold, if your house is sealed too tight, the draft flue vent on water heaters and heating equipment can draft into the home when the wind blows or when your exhaust fans are turned on. This is why carbon monoxide alarms are so important. They do save lives.

Learn and show your family members where water, gas, oil and electric shut-off valves or switches are, to be used in emergency situations only. You don't want to wait until there is an emergency to figure this out.

As part of your annual home maintenance review, you should trip the test buttons on all GFCI outlets and your electrical breakers one at a time to make sure they work. Test your emergency generator before the season starts. It may need a preventative service call so it will run when required.

With the holiday season approaching, remember electrical safety while decorating inside and out and do not overload outlets: one socket - one plug. Do not run electric extension cords where they will be a trip hazard to grandma (and others). Be careful not to over-reach when on a ladder hanging lights or tree decorations. Use safe practices when lighting the yule log and dinner table candles.

If we all can do this, then we will have a safe and happy holiday season. Best wishes, health and happiness to all in this season of hope from Eagle Home Inspection Solutions.

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

Fire alarm test time. They do save lives. All images courtesy Eagle Home Inspection Solutions.

Interview: Efficiency Vermont's Efficiency Excellence Network Program Manager

Green Energy Times Staff

Efficiency Vermont has a program that anyone looking for serious work on a building should know about. It is the Efficiency Exellence Network (EEN) program. Professionals associated with it are required to keep updated on the latest technology in their fields. Its manager, Allison Fode, answered some questions for us.

Allison Fode, Efficiency Vermont

What is an "Efficiency Excellence Network" contractor?

Efficiency Excellence Network members are a network of independent contractors, designers, and other professionals committed to providing their customers the highest level of energy efficiency services. These professionals can perform heating and cooling, electrical, new construction, insulation and air sealing, and commercial refrigeration work. We also have architects, engineers, and lighting designers who can help you rethink your living and working spaces.

Why use an EEN contractor over another contractor?

Our members are experts in the advanced technologies and science that makes buildings more energy efficient and affordable to maintain. They are also trained to understand and consider important health and safety measures that are key to any job. We train them in energy efficiency fundamentals and specialties, so you can trust that they are skilled in making energy efficient improvements cost-effectively within their specialties.

What does an EEN contractor offer customers that others don't or can't?

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.

How do I know if my contractor is EEN? Where can I find an EEN contractor?

The easiest way is to visit our website, www.efficiencyvermont.com/contractor. We have a special tool called "Find a Contractor or Retailer" where you can search for an energy professional. Just look for the "EEN Member" icon in your search results! If you're still not sure or don't have access to the internet, give us a call at (888) 921-5990. Our Customer Support team can help you out.

What are some questions you recommend presenting to a contractor to meet energy efficiency goals?

- How many projects have you completed? How many do you do per year?
- What are some of the results of your projects?
- Do you use subcontractors? If so, are they trained in energy efficiency?
- When could my project fit into your schedule?
- Do you have experience with Efficiency Vermont and securing rebates for customers? (Hint: An Efficiency Excellence Network professional does!)
- Do you have insurance that covers the type of work you are performing?
- Can you provide a certificate of insurance listing me on it?

You should also check references when you narrow down your list to a couple of professionals – this will give you confidence to make a final decision. Here are a few questions we recommend asking a professional's previous customers:

- Were you satisfied with the contractor's work?
- Are you as happy with the results today as you were when the project was completed?
- Were there cost or schedule overages? If so, why – and how did the contractor handle the situation?

You can also check in with Vermont's Better Business Bureau. You'll be able to find out whether a contractor has a history of disputes with clients or subcontractors. ♻

Community Campaigns for Renewable Heating and Cooling: HeatSmart Northampton, MA

Georgena Terry, CESA Research Associate

The city of Northampton, MA worked with the organization ener-G-save to gather thermal imaging on 100,000 area homes, revealing which homes were the best candidates for energy-efficiency improvements. Courtesy photo.

Note: This is the second in a series on community-based strategies for increasing the adoption of residential renewable heating and cooling technologies. For more information on community-based strategies and renewable heating and cooling technologies, please see Green Energy Times' September-November 2019 issue and read the Clean Energy States Alliance's full report and case studies.

Renewable heating and cooling (RH&C) community campaigns, commonly called HeatSmart, are running successfully across the U.S. These campaigns build on the successful Solarize community campaigns, which dramatically increased the adoption of solar photovoltaic applications and reduced costs through bulk-purchasing discounts. Below, we highlight one of the original HeatSmart communities and provide information on its goals, outreach approaches, and impacts. HeatSmart strategies vary from community to community; these strategies are easily replicable and adaptable in other communities.

The City of Northampton, Massachusetts is a national leader in combatting climate change. It adopted its first Climate Change Strategy in 2010. The current strategy has a goal of reducing greenhouse gas (GHG) emissions by 80 percent by 2050 from 2000 levels. Strategies for reducing GHG emissions include increasing deployment of renewable energy, renewable heating and cooling, and energy efficiency technologies, and promoting local economic development around clean-energy technologies.

Building on the successful 2013 Solarize Northampton campaign, Northampton developed the HeatSmart Northampton program, which sought to increase the adoption of RH&C technologies. HeatSmart Northampton offered only air source heat pumps (ASHP), because ASHPs had more recognition than other technologies, and a contractor base already existed in the area. In addition, MassSave rebates and HEAT loans were available to lower costs.

Like the widely known Solarize program, HeatSmart Northampton relied on municipal officials, local volunteers, and competitively-selected installers to implement a community group-purchasing, outreach and education campaign. Northampton sought out potential HeatSmart customers by emailing surveys to existing Solarize contacts to ascertain the level of interest in the program. Approximately 600 residents completed the survey.

Northampton released a HeatSmart Northampton Request for Qualifications to identify ASHP installers to participate in its program. To be eligible to participate in HeatSmart Northampton, an installer had to be qualified as a "primary installer" under the Massachusetts Clean Energy Center's (MassCEC) Clean Heating and Cooling Program. Primary installers have met certain criteria and are eligible for rebates. In addition to meeting MassCEC's qualifications, selected installers were asked to propose discounted fixed-fee costs for the installation of ASHPs.

The program recruited volunteers to spearhead outreach. Despite their enthusiasm for climate mitigation, many volunteers were not familiar with ASHP technology. One of the City's first tasks was to educate them about ASHPs. Ultimately, these volunteers explained ASHP benefits including their carbon and cost reduction potential to more than 1,000 residents.

HeatSmart Northampton used Tableau analysis (a visual analytics platform) to create a visual data portfolio, mapping residential building attributes, such as year built, building type, existing heating system, and current heating fuel, to identify potential program participants. Volunteers approached homeowners that the Tableau analysis identified as high-value potential customers.

Other outreach strategies included "Meet the Installer" workshops, open houses at the homes of residents with ASHPs, social media, placements in newspapers and on television and radio, signage, direct mailings, and staffing tables at local community events.

There were no specific eligibility requirements for ASHP applicants. The program sought to attract those homeowners who would appreciate the environmental benefits of clean energy and who would save money by switching away from high-cost heating fuels. HeatSmart Northampton recommended, but did not require, home efficiency and weatherization improvements to make sure the ASHP performed as expected. However, the program did require that HeatSmart customers undergo a MassSave energy assessment so they could access state incentives.

One hundred sixty two individuals expressed interest in the program through the HeatSmart Northampton website. These initial inquiries led to 130 installer site visits and 106 price quotes. Ultimately, installers installed 54 ASHP systems. Compared to the regional average cost of heat pumps after rebates, the HeatSmart Northampton prices were approximately 3-16% lower for the same ASHP models. ♻

Lawn campaign posters advertised the HeatSmart campaign. Photo credit: HeatSmart Northampton.

Cancer or Parasite?

Cont'd from p. 6

Look at the energy and transportation sectors. We as a species seem to feel fully entitled to whatever level of energy use we can afford. Yes, we have made our energy appliances more efficient (energy and pollution, including vehicles) over time, but energy consumption has grown faster than efficiency improvements. Our air now contains so much CO2 (>400ppm) from our energy generation, that it is now the highest in three million years when the earth was a very different place from what it is now (poles and coastal plains as shallow tropic swamps, water 20-70 ft higher than now). Using transportation in this country as a case in point, we seem to prefer, and feel entitled to, SUVs and pickup trucks for personal use, if we can afford them. What vehicles do you use? Why? How would you react to being restricted to buy smaller sedans, station wagons or walk, bike, or scooter for the common good? How would our general populace react? Now consider China, India and all of Asia as another case. As their economies grow (and they have) and personal wealth increases, they too feel entitled to whatever energy-using appliances they can afford. Can we invent our way out of disaster or will our improvements come slower than unregulated demand growth?

Enough said. The initial question is intended as rhetorical, my comments as food for thought. As we head into the holidays, please think on it, for our progeny's sake.

And recovering from that dour note, I hope you have a very Happy Thanksgiving and merriest of holidays (again, for our progeny's sake)!

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

WHERE IS THE FIRE DEPARTMENT?

-- Cont'd from p.26

that like things as they are. Not least the fossil fuel corporations, which have funded a decades-long campaign of disinformation, obfuscation, and straight up lies about the reality of global warming."

Why climate deniers ignore the fact that Exxon and other fossil fuel conspirators have worked so long to hide their own analysis that their products are a primary cause of the climate crisis is not a mystery. Nor is it a mystery that they don't accept the Pentagon's view that the daily worsening climate crisis is a threat to our national security. Climate change denial is rooted in political polarization, the economy over the human condition, or willful ignorance.

It is somewhere within this context that Russian president, Vladimir Putin, also criticized Greta Thunberg's Climate Action Conference speech by saying, "Nobody explained to Greta that the modern world is complicated and complex."

It is complicated and complex. That's why choosing the right figure of speech is important in any communication. Thunberg's focus on the simple statement that "our house being on fire" is one example. Forest fires are getting attention around the world, including recent blazes in Indonesia and Brazil. The increasing damage to our earth by fires dramatizes her narrative. Comprehending the difference that 1 degree Celsius will make is difficult for most of us to comprehend. However, everyone can visualize a house burning down.

Unlike warfare and images of climate struggles that are only sometimes effective in getting attention, Thunberg focuses on something that can relate to everyday life.

Not only is our house on fire, but the fire department has vanished.

John Bos is a contributing writer to Green Energy Times *and a columnist for the Shelburne Falls West County Independent. He invites comments and dialogue at john01370@gmail.com.* ♻

A Place to Grow

George Harvey

A Place to Grow (APTG), a childcare center in Brentwood, New Hampshire, has some features that set it apart. True, it takes children as young as six weeks, and true, it is open from 6:30 AM to 5:30 PM, but these are not the things that make it quite as unusual as it is. The unusual features have to do with a philosophy that offers the children a holistic understanding of nature, environmental stewardship and how human beings fit into a larger picture.

APTG was founded by Jennifer Briggs in 2005, but it recently made a big move that allowed it to operate in closer alignment with her own environmental feelings. Her philosophy aims to instruct children about nature and how to maintain it as the beautiful resource that it is. That being the case, it was perhaps perfect that she found a new location for APTG, with a 3,700-square-foot building sitting on 13 acres of land. She purchased the property in 2016.

Taking on such a large building and property had its challenges, but meeting them provided a value for instruction to others who might want to meet similar problems. The children, of course, can be shown the wonders of nature, but those of us who are not children might find the work done on the building, especially as regards to energy efficiency and independence, informative.

Above: Interior of A Place to Grow; below left: A Place to Grow and their 44 solar panels; below right: Children watching the installation of a heat pump. Courtesy images.

Briggs started with a building that had high costs. In February, 2017, just the propane bill was $1,200. She carefully went for the least expensive plan to buy propane, but nevertheless, for the whole year, the propane came to $4,005. While her business could not count on a steady inflow of money, she could see that the energy demands would vary considerably, and had to be kept under control.

The costs of upgrading may have seemed daunting, but Briggs was able to get some help. The support that she was able to line up included Community Development Finance Authority's (CDFA) Clean Energy Fund, grants from the Public Utility Commission, Energy Tax Credits, one REAP Grant for energy efficiency and another for renewable energy, and Eversource Rebates.

She started with an energy audit, which cost $2,000 but was 75% covered by a CDFA grant. Sustainable Energy Education & Demonstration Services did work on this, including blower door testing. Based on the audit, she was able to come up with a plan. It included reducing heat loss with weatherization by Shakes to Shingles, a contractor in Concord, NH. Dependence on propane was reduced and heating efficiency increased as six heat pumps were installed by ReVision Energy, and adding a solar array for increased independence. Other work included changing out fluorescent and incandescent lights and other electric work by Amore Electric of Haverhill, Massachusetts.

The overall project was funded by CDFA, also. In the end it cost $93,000, with the principle reduced as rebates and grants came in. The loan was at 4% for ten years. The improved energy efficiency was partly covered by a rebate of $6883 from Eversource, and partly by a REAP Grant of $9263.

Renewable energy came in the form of a solar array on the roof, a 14.08-kilowatt (DC) system consisting of 44 solar panels. Installing it, however, required installing a new metal roof. The Public Utility Commission provided a grant of $4800. An Energy Tax Credits provided an additional $11827. And a REAP Grant put up $9856.

In the end, the $43,000 of the $93,000 was covered by grants, rebates, and credits. This meant that of the cost, $50,000 had to be paid off over ten years.

A Place to Grow has reduced its overall costs, even including the cost of paying off the loan. There is a 58% reduction in energy used from 2018 to 2019. Propane consumption dropped by 3,000 gallons per year. And the solar array saves over $400 per month, in a comparison of June and July, 2018, with the same months in 2019.

One great payoff is that the children can interact, play, and learn in more comfortable and more environmentally friendly surroundings. ♻

Ten-year old Boy Making a Difference with Recycling Business

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

Ryan Hickman, founder of Ryan's Recycling Company.Photos courtesy of D. Hickman.

At 10 years old, a legendary boy is making his dream come true, with his own recycling business.

Ryan Hickman is the CEO of Ryan's Recycling Company.

In Orange County, California, at just three years old, a little boy started recycling his neighbors' bottles to help save the planet and ocean life.

"I saw that all the litter and plastic going into the ocean, and it's hurting sea life, and I wanted it to not happen, so I started recycling, and I think it's making a big difference."

Ryan focuses on collecting plastic and glass bottles and aluminum cans. He picks up recycling from friends and neighbors and sorts it. Then Ryan and

Cont'd on p.38

The truck is loaded (whoa!) and ready to take everything to the recycling cemter.

Elmore Roots' Permaculture Know-How

Something About Red

David Fried

There is something about red. The color. You don't see it out in nature much in winter or spring. Sometimes you may catch a glimpse of the red berries of highbush cranberry or winterberry or the stems of red osier dogwood, glowing against the pearl white snow.

As summer comes, it is everywhere! Strawberries, rhubarb, tart cherries, roses, Red Sox.

Hummingbirds are very attracted to red. This is why we sometimes have to help them out of our farm office where one will fly in. We have red trim around our doors and windows. Plant breeders have worked to perfect the velvety red rose (even though they gave up aroma for more dark red). There is even a new one so red it is almost blue, called "navy lady."

Everyone talks about the foliage. How red it is. A good foliage season really means "a lot of red." Sometimes people ask if we have red maples at our nursery. A true red maple "acer rubra" has green leaves in summer that usually turn orange or red in fall. Their buds are round and red in spring. Often though, they are actually looking for a maple with red leaves in summer. This is a type of Norway maple. It is not native in Vermont and not as hardy and does not have very attractive fall color.

The red oak, however, has a red color that glows. When the light shines through, the world is magical again! The other day I noticed one red oak leaf standing up glowing amongst others. Nearby, red apples carpeted the soft wet grass. There is a lot of red in the air around us in October!

Some are challenged by the red. A bull fighter in Spain uses a red cape to get the bull so angry it charges at him, and he looks macho. My friend, Rick Winston, recently wrote a book called Red Scare in the Green Mountains. It is about Vermont in the late 40s and 50s, showing how a lot of people here were concerned that communism would take hold here if they did not do something to stop it. A UVM professor was fired for not naming others, and a congressman was not re-elected due to being accused of being "Red." At Woodstock in neighboring New York State, Country Joe and the Fish made famous the Phil Ochs song "draft dodger rag". It has the line "and when it came my time to serve, I knew better dead than red." This song helped a community form where others who did not believe in war could find comrades.

Left is an image of red oak leaves; below are highbush cranberries. ***Photos : David Fried.***

I have a friend who grew up across the street from me who is a very good organic vegetable farmer (and skier) in East Hardwick. He has a red beard and red hair, and I told my children his name was "Uncle Red." Each fall I go to his barn and he loads me up with red cabbage and red beets and red potatoes.

Now that the days are colder, we can still sit by the red coals of a wood fire as those trees with the red leaves are now warming our feet. Once in a while, we may even catch a red sunset. "Red sky at night, sailor's delight. Red sky in morning, sailors take warning!" Uncle Red is also pretty good at predicting the weather..

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

Slather Up for Better Aging

besthealthfoodstore.net

I have a big problem with the phrase "anti-aging." It sounds so military. As if aging is the enemy, and we must marshal all forces against it.

The new term circulating through the trade rags is "better-aging," and I consider it to be a much more appropriate moniker. After all, we are talking about the natural cycles of human existence here. If a thing is like gravity (pretty much inevitable), the best that you can do is to practice doing it with grace.

Sunflower oil. Image from Wikipedia.

Regular readers will note that the natural health and healing "program" advocated in this venue and in The Reactive Body Handbook (www.reactivebody.com) is in fact also a better-aging program. After all, living well and healthy is the best medicine to take over a long and active life.

Nature-based better-aging actives generally include anti-inflammatory botanicals and plant seed oils. This mix appears to have a profound and potent effect on maintaining the facial collagen when used daily.

Remember the rule: If you can eat it, you can put it on your skin. If not, think twice.

Natural plant seed oils contain trace amounts of botanical goodies that seem to enhance their effects. Sunflower oil contains vitamin E and omega 6 fatty acids. Olive oil contains polyphenols. Both oils contain additional natural anti-inflammatory compounds. This is true of many natural seed oils unless the goodies were taken out in the processing. Applying liquid oils topically seems to improve skin elasticity and tone, and some of the compounds in them may help to heal or minimize sun damage.

Solid oils like cocoa, shea, palm stearin, cow's milk butters or even pig fat are a mix of both liquid and solid oils. Oiling your skin has a strong humectant effect which helps to keep it from drying out. Over time, oiled skin tends to lose the "old and dry" look in favor for a healthier and more youthful aspect.

One old Vermont farm gal confessed that she took a little of her home-grown pig fat (bacon grease without the salt and additives) and rubbed a little on her face and hands each day just before supper. Everybody always commented on how youthful looking her skin was.

Solid oils and the waxes they contain add an extra amount of humectant-ness to a skin soothing better-aging blend. These work especially well as a base for nighttime use since solid oils take a long time to absorb. Alternate with liquid oil blends or "serums" during your day for a glow rather than a shine.

The role of anti-inflammatory botanicals on mammal health is well studied, less so are the benefits when used topically and in combinations. And it may be that their benefits are much more than just skin deep. What we do know is that a calm, hydrated face presents a very different image to the world than a dry, inflamed one.

Modern pharmaceutical medicine works using known active ingredients of isolated potency. Natural medicine works by throwing "bundles of botanical goodness" at it. This is true both as medicine and as a preventative regimen inside and out. It takes both approaches to keep a body healthy, happy and aging better!

This is the Soapman saying adios amigos!

Larry Plesent is a writer, philosopher and founder of the Vermont Soap Company; dedicated to replacing yucky stuff with yummy stuff for all the girls and boys who care. Thanks for reading. Learn more at www.vermontsoap.com and www.reactivebody.org. ♻

girlfromarabia.com

Supporting Local Agriculture with Worms

Ben Goldberg

In our quest to live more sustainably, composting with worms (vermi-composting) is one thing we can easily do that supports our efforts in a number of ways. This article will touch on some of the basic concepts of vermi-composting. If you are not already a worm composter, then we hope this will encourage you to try it out.

Besides converting food and garden scraps into nutrient-rich compost, vermi-composting also supports local agriculture by keeping the food-nutrient cycle local. A healthy soil microbiome supports plant vitality and immunity to disease and pests. The vast numbers and diversity of microorganisms in worm compost contributes sizably to the microbial populations of our garden soil or potting mix. Disposing your food wastes in the trash and sending it to the landfill as garbage contributes to global warming, because the decomposing food generates the greenhouse gas, methane.

Of the many thousands of species of worms, two species, the Red Wiggler (Eisenia fetida) and Redworms (Lumbricus rubellus) have become popular for home composting. Both species serve as voracious decomposers in the natural world, and both also thrive in bins with dense populations. (1)

There are numerous styles of bins. The most common for home use are either the ones with stackable tiers or plastic tote bins that have been modified to house the worms. Because liquid (leachate) tends to accumulate at the bottom of plastic bins and become anaerobic (smelly), my preference for this type of bin is one with a reservoir to collect and drain away the leachate. (2)

With both of these types of bins, the worms need to be separated from the castings. More on this shortly. There are some self-separating bin designs that make the task much simpler, especially for larger volumes. I am using a horizontal migration bin now that I am happy with. The composting is done in one chamber that is separated from a second chamber with a 1/4" mesh screen. The second chamber is separated from a third, also with a screen. Once the first chamber is full, bedding and food are then added to the second chamber, the worms will migrate through the screen to the food. Same strategy for the third chamber. When the worms have fully migrated to the third chamber, the process is repeated in the other direction.

To create a successful bin, it is useful to mimic their natural environment as much as possible. It will be necessary to keep a source of bedding material on hand to provide a residence for the worms, and into which you can bury your food scraps. Many worm keepers use shredded newsprint, but for health and safety reasons, I am a purist, preferring to use a mixture of more naturally occurring materials. Plus, I think it serves a higher purpose to recycle the paper products on behalf of trees.

To make my bedding, I mix together leaf or straw mulch, coffee chaff from a nearby coffee roaster, spent coffee grounds, and some active plant compost or composted animal manure. If you can locate a source of llama, alpaca, or rabbit manure, these can be used without pre-composting, and are favored by the worms.

Worms will eat just about any food that will decompose, but they have their preferences. Avoid feeding them spicy foods such as onions or hot peppers. Also avoid meat, fish, and dairy. Please keep in mind as well, that worms have small mouths, so larger scraps such as broccoli stalks will linger for a long time. The organisms in the bin are helping to break down the food scraps into smaller bits. It is considered to be good feeding practice to mix the food beneath the bedding. Some worm keepers will rotate their way around be bin, feeding in a different area each time. Avoid clumps or globs of food which can become smelly, anaerobic pockets.

If you are using a tote bin for worm composting, once full, you will need to separate the worms from the castings. The easiest method I have found for this is the "light avoidance" method. Worms are sensitive to light. If you empty any amount of the bin contents onto a tray or sorting table, the exposed worms will burrow back into that pile. You can then remove any of the surface layer of castings until you begin to expose worms again. The newly exposed worms will then burrow further into the pile. Repeat this process until you have removed all the castings. The worms will have clumped together making it handy to gather and to restart your freshly emptied bin. (3)

Castings are potent and do not need to be used full strength. Roughly 20% castings will be sufficient in your soil mix. Or top-dress your house plants and water the castings into the plant. The castings can be made into a steeped tea for watering house plants, or a specially brewed tea for generating larger volumes for larger areas.

Besides the practical results of generating your own fertilizer for your home or community, worm composting offers a window into the diversity and function of intact healthy ecosystems. I find it fascinating to observe the variety of species that reside in the bin and the way they interact with each other to generate a hugely useful by-product simply in exchange for our stewardship.

Ben Goldberg has been playing in the dirt since he was a kid, and has been keeping worms and making worm bins in various sizes and shapes since 1995. He enjoys presenting interactive worm composting workshops, which are informative and fun. Ben lives and works in the Pioneer Valley farming region of western Massachusetts along with some of the most productive soil in the world. For questions and to learn more contact Ben at plunkatune@gmail.com. ♻

(1) This is a Red Wiggler (E. fetida) worm depositing a cocoon. Red Wigglers have yellow tails. All photos courtesy Ben Goldberg.

(2) This tote type worm bin has screened vents and a reservoir with spigot drain.

(3) Worms clumped together after castings have been removed.

Food Scraps Diversion: Vermont Act 148

Michele Morris

Food is many things: Fuel for working bodies, a livelihood for farmers of all sizes and types, an expression of love and nurturing in many families. One thing food should never be is wasted.

The Vermont Agency of Natural Resources estimates that Vermont's businesses, institutions and households sent more than 80,000 tons of food and food scraps to the state's only landfill in 2018.1

In fact, wasted food is consistently about 25 to 30%, by weight, of all the stuff we landfill. Studies estimate that wasted food costs U.S. consumers from $350 per person to around $1,500 a year for a family of four. And that's just the cost of the food you bought but didn't eat! It doesn't even cover the amount you pay to "trash" it.

Landfilled food doesn't "disappear," and it doesn't turn into anything good. It degrades very, very slowly in the dark, airless landfill environment, releasing methane, a powerful contributor to global warming. The Agency of Natural Resources estimates if we took all that food out of the landfill, it would be like taking 7,000 cars off the road every year in terms of climate benefit.

In 2012, Vermont's Legislature decided this must change and included phased-in requirements in Act 148, known as the Universal Recycling Law, for keeping food scraps out of the landfill.

Beginning July 1, 2020, that requirement will apply to everyone in Vermont—businesses, institutions, and residents. You'll have choices for what to do instead of trashing this valuable resource:

1. Reduce your food waste! Buy only what you need, store it properly, and eat what you buy.

2. Manage food scraps and spoiled leftovers at home. Backyard composting is the cheapest but not the only option. Other possibilities include countertop desiccators, backyard digesters, or feeding livestock. (Contact your local solid waste management authority to learn more about all these options including costs, effort involved, and laws regulating feeding animals.)

3. Take them to a drop-off location such as a transfer station, Drop-Off Center, or compost facility.

4. Hire a hauling company to pick them up at your curb.

So, start thinking now about what changes you need to make before July 1. And remember, you have options, and we're all in this together.

Source: VT 2018 Waste Characterization Study.

Michele Morris is the Director of Outreach and Communications for the Chittenden Solid Waste District. CSWD's mission is to reduce and manage the solid waste generated within Chittenden County in an environmentally sound, efficient, effective and economical manner. Our vision: Products are designed to be reused or recycled and our community fully participates in minimizing disposal and maximizing reuse and recycling. ♻

Transfer stations and compost facilities across the state now offer food scrap drop-off. Image: CSWD

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…

Burton Snowboards Goes Big Solar

Cont'd from p. 8

snowboarding company to reach these standards.

Jenn Swain, Senior Sustainability Manager at Burton stated, "We are constantly striving toward sustainability in our business practices (they have headquarters in Burlington, Innsbruck and Tokyo) and every employee plays a role in the positive impacts we have." The sustainability goals created for a three-year period are intended to be accomplished by the end of 2020 and impacts will be on products that would be on store shelves in October 2022. Burton's sustainability goals involve categories such as reducing carbon footprints associated with production and operation, fair labor standards compliance, women's leadership programs, and collaborating on sustainability with other outdoor industry leaders.

For more information visit www.burton.com and catamountsolar.com.

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. ♻

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GUIDE TO ADVERTISERS

Put Your Asparagus and other Perennials to Bed for the Winter

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

My asparagus bed that needs to be put to bed for the winter. Photos by N.R. Mallery

Perennial vegetables like asparagus, horseradish, Jerusalem artichokes and rhubarb need protection over the winter to survive freezing temperatures.

Asparagus is hardy down to zone 4 and needs a little care in the fall. Here is what you do: when the ferns start to turn yellow to brown, or after the first frost, cut them back to about two-inch stubs. This will help prevent disease setting in over the winter. Apply about two to three inches of compost around the remaining plants and cover with mulch such as straw and leaves to a depth of about four to six inches.

This is also the time to dig your horseradish. Try to get all of it, which I find nearly impossible since my no-till garden produces deep roots. I never planned to have it in my garden, but followed a recommendation to grow horseradish in pots and place in the garden to repel pest such as the white moths. I now struggle with this invasive perennial in the garden because the containers had drainage holes which allowed the roots to happily find their way directly into my garden. So, let this be a warning! Regardless, dig your roots before the ground freezes, wash off the soil and store in the refrigerator until you are ready to process them. Jars of horseradish are great to share at Thanksgiving gatherings. It's easy to make, yet a bit dangerous to process. Warning: do NOT open the food processor and look into the container — it will burn your eyes and sinus cavity. Smell that wonderful aroma with caution. To make it, simply scrape off some of the skin and cut the roots into one-to two- inch chunks. Put them into your food processor and just barely cover them with organic white or rice vinegar. Cider vinegar can be used if you prefer, but it does not give you a nice white result. Process it until smooth. Use caution when lifting the lid and as you scoop it into your jars. Screw the lid on the jars and store in the refrigerator for months. Baby food jars make great storage containers in the perfect size for sharing. It's always fun to watch when the recipient opens the jar to smell or taste it. Their sinuses will be cleared! It is sure to give some laughs at the reactions.

Jerusalem artichokes are another invasive perennial. You can dig them as you need them until the ground freezes, but do try to dig enough so that they do not get out of control as they spread in the spring. If you are trying to establish a patch, cut back the stalks to 2-4 inches, cover with leaves and even straw if you have it. The artichokes store nicely in your refrigerator drawer for months and are known to help to regulate blood sugar. I would consult your doctor about using it for this purpose if you have diabetes.

Rhubarb is another perennial that I have never done any more than throw some compost around. It loves rotted manure and leaves. If you are trying to establish it, be sure to cut it back to two to four inches, add a couple shovelfuls of rotted manure, compost and leaves. It does not hurt to put a layer of straw over it, as well. Fall is a great time to break up the root to share or manage.

Horseradish that is ready to be dug before winter sets in.

In the spring, when I cut some to make sauce or pie or to freeze, I generally leave the large leaf on the ground to keep weeds down and add compost to the soil surrounding the plants.

You can also break off the seed pods to try to keep it from completely going to seed and be able to use it. New plants will sprout easily. Seed pods take longer to get established plants than if you break up the roots in the fall.

Did you ever notice that the rhubarb is ready to use before the strawberries are ripe? How did strawberry-rhubarb pie and sauce ever start? Freezing fresh rhubarb in chunks will assure you have some when strawberries are in season and can be used throughout the year. The sauce can be preserved by canning it, and it freezes with great success.

Something that I am not the authority on, but both my neighbor and I lost some blueberry plants that were too close to the rhubarb. I don't think they like to grow near each other. Rhubarb likes rich soil. Blueberries like acid conditions. I advise planting them in different areas.

There you have it. While it is kind of sad to put your garden to bed before winter arrives, there is comfort knowing it will be safe, warm and healthier after you tuck them in. Now you get to enjoy the fruits of your labor from all that you have harvested this year. Enjoy the break from gardening chores.

With full bellies from the year's harvest, I wish you a happy fall and winter. We will see you in the spring! ♻

Recycling: Who, What, Where and When?

Evan Lawrence

Despite the widely-publicized crash in the recycling markets, recycling is still possible and still worth doing. Depending on where you live, it may just be harder to do.

Markets continue to be good for aluminum. Recycling the metal saves a whopping 95% of the energy necessary to process virgin ore. Steel still has buyers, as does cardboard—all those Amazon shipping boxes have to come from somewhere. Paper, plastics, glass? There's the rub. China, which was buying the bulk of U.S. waste paper and plastics, stopped accepting them in early 2019 causing prices to plunge to the point where municipalities and haulers sometimes have to pay for disposal. Glass has virtually no market. Most of it is simply crushed for road and building construction.

In the tri-state area (NH, NY, and VT), Vermont has the strongest recycling system. The state's Universal Recycling Law bars paper, aluminum, cardboard, steel, glass, and hard plastics from the state's landfills. Whether residents pay a private hauler, have municipal trash pick-up, or drive their waste to the transfer station, they must take those materials out of their garbage. A study commissioned by the state in 2018 showed that about 72% of recyclables were in fact staying out of the landfill.

Flickr/Walter Parenteau.

The state does its own recyclables marketing and finds a buyer or use for just about everything covered by the mandate.

Vermont is divided into solid waste districts, plus a few towns that run their own waste disposal programs. If you don't know your district, find it at dec.vermont.gov/waste-management/solid/local-districts. All collect the Big Six. The Central Vermont Solid Waste District, including Montpelier, Barre, and 17 more towns, recently started accepting a wide variety of other products through its Additional Recyclables Collection Center in Barre. The list, which may change from time to time, includes personal care product tubes, refrigerated and frozen food boxes, toothbrushes, thermal cash register receipts, and jar lids. See the full list at www.cvswmd.org/arcc.html.

Neither New York nor New Hampshire mandates recycling, although New York requires local governments that collect residents' trash to have a source separation program for recyclables with a viable market. With paper and plastic becoming a financial liability instead of a revenue source, some towns in both states have stopped collecting recyclables, and some transfer stations are imposing fees on the materials.

For New York and New Hampshire residents, check with your hauler or municipality about what materials they accept. The list may change depending on whether they have a market. New York will ban single-use plastic bags starting in March. Plastic bags and wrap, for example the wrapper on paper towels, can be recycled at many stores in marked bins, usually by the front door. Visit www.dec.ny.gov/chemical/50042.html for details.

No matter what state you live in, here are some recycling dos and don'ts.

"Wishful recycling" is the bane of the recycling business. Don't put anything in the blue bin just because you hope it's recyclable. If in doubt, throw it out.

Materials go to a facility where they're sorted by people and machines. Careless disposal can endanger people and damage machinery. Plastic bags and film and old clothing can tangle in the machinery and shut it down—never put them in the blue bin. Food residues in containers stink, attract rodents and insects, reduce the value of a bale of material, and are really yucky for the people who have to pull them off the conveyor belt.

Don't try to recycle anything smaller than 2 inches on two sides. Little debris falls off belts and out of bales and just makes litter.

Styrofoam, drink cartons, and black plastic (such as microwave trays) have no market. They're trash.

Many products are recyclable but not through blue bins. Never put in scrap metal, batteries (the leading cause of fires in recycling facilities), electronics, or hazardous wastes such as pesticides, used motor oil, or old paint cans. Many localities have special hazardous waste collection days or collect these products separately. Hardware stores may take back larger batteries and compact fluorescent lights, which contain trace amounts of mercury.

The deposit on beverage cans and bottles still applies in Vermont and New York. When you return containers for deposit, the material is recycled or reused, and you get your nickel back.

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

Ten-year old Boy's Recycling Business

Cont'd from p.33

his dad take the recycling to a redemption center, where Ryan is paid for the recyclables that he brings in.

The young entrepreneur has earned thousands of dollars and at present has recycled over 673,000 cans and bottles weighing 104,000 pounds, all that have been saved from going to the landfill. His parents are saving the money for his college education, but Ryan wants to spend the money on a bigger trash truck. His original collection was done by a child's electric truck [pic] that he drove throughout his neighborhood to gather bottles and cans with. Green Energy Times staff is rooting for another electric-powered truck. Perhaps, he will consider the new all-electric Ford F-150 that will soon be available. Ryan's business is doing so well that he has donated $9,344 to the Pacific Marine Mammal Center thus far.

This young legend has been recognized for his outstanding leadership role in many media outlets and television shows around the country. He has received at least 26 accolades for his outstanding efforts since his story went viral in 2016. His father told us, "We've had a lot of amazing moments since Ryan started his business, but I think our favorite thing is the amount of email, letters and messages he gets every day from people all over the planet who want to know more about making a difference with recycling. Ryan said his favorite thing was traveling to NYC as a CNN HERO or going on the Ellen Show." We just learned that Ryan was featured (November 8, 2019) on Good Housekeeping's list of kids who changed the world!

Read more at ryansrecycling.com. ♻

Ryan started collecting bottles and cans in his neighborhood at just three-years-old. Above shows how well the business is doing. At ten, he has no thoughts of stopping!

A Guide to Sustainable Gift Giving and Wrapping

Michele Morris

The holiday season leaves much in its wake: Warm memories, lots of leftovers, maybe few extra pounds, and a whole lot of… stuff. Because you're reading this, we know you're committed to reducing your waste as much as you can. Read on to see how you can reduce, reuse, and recycle as much as you can this year, while also making sure that what you put in your blue bin really does belong there!

Christmas lights and other long, stringy "tanglers" don't belong in your recycling bin! Photo: CSWD.

Spoiler alert: you can't go wrong by sticking to this list for recycling-bin items: Paper and cardboard (clean and dry); and empty, rinsed beverage, food and non-hazardous cleaning product bottles, cans, tubs and jars bigger than your fist.

Give—and Receive--Thoughtfully

We've said it before and it bears repeating: Instead of giving stuff, give experiences, shared time, or a tasty homemade treat you know the recipient will enjoy. Let your loved ones know you'd prefer a gift certificate for a shared activity. If they're far away, make it for Skype time to catch up. Or, request a donation to a favorite charity on your behalf instead of another thing you don't need.

Wrap Wisely

Obsolete maps are a favorite wrapping paper in our household. If you must buy wrapping paper, follow these guidelines for maximum sustainability.

- Seek out paper made with recycled content to boost the demand for recycled paper.
- Use natural, uncoated kraft-style paper. This is widely and inexpensively available online. Gussy up your packages with natural sprigs of pine, spruce, or holly. Add more bling by attaching an old ornament or costume jewelry scored in a second-hand shop or flea market.
- Only wrapping paper made from 100% paper—and nothing else—is recyclable. Here's what to avoid:
  - Plastic or foil coatings: If you tear it and see a thin film on the edges or stretching into the tear, it's trash.
  - Glitter: Glitter, and the glue that keeps it in place, turns paper into trash.
  - Any other flocking, coating or texture: All these make wrapping paper non-recyclable.
- Ribbons and bows: None of these are recyclable, no matter what they're made from. But fabric ribbon can be reused over and over, and simple cotton string or even baling twine lend a rustic feel to packages and can be cut up and composted when you're done.

Reusing and Recycling Outside the Blue Bin

Think of your recycling bin as a special creature that has specific feeding needs. Just as you wouldn't risk choking or poisoning your beloved pet with chicken bones or chocolate, please don't mistreat your recycling bin by feeding it filmy plastic—bags, overwraps, etc.—or other nasty stuff it can't handle.

Styrofoam, packing peanuts, and bubble wrap

None of these items belong in your recycling bin! Lots of stores will take packing peanuts, bubble wrap and packing "pillows" for reuse, though. Search for "packaging" on our website (www.cswd.net) to find local organizations that accept packaging materials for reuse. Take plastic bags back to a participating grocer or other store for recycling.

String lights

Unwanted strings of holiday lights are accepted as scrap metal at any CSWD Drop-Off Center and other locations—for no charge! Larger, old-fashioned bulbs should be removed and placed in the trash first.

Batteries

Please DO NOT put batteries in your recycling bin. Bring batteries of all types to any Chittenden Solid Waste District (CSWD) Drop-Off Center for special recycling at no charge (quantity limits apply to certain battery types). Find even more battery recycling locations at www.Call2Recycle.org. Better yet: Use rechargeable batteries (if your gadgets operate well with them) to reduce your overall energy footprint. Some can be reused hundreds of times before they stop holding a charge.

Electronics

Thanks to the Vermont E-Cycles program, Vermont residents and businesses can bring old TVs or computer items to locations all over the state for special recycling at no charge. Some electronics require a fee, though, so visit the Electronics Recycling Page on www.CSWD.net to learn more.

As the holiday season approaches, lists often grow long and stresses add up. Sorting out what is and isn't recyclable doesn't need to be hard or confusing. See all the details at cswd.net/recycling, or give our Hotline a call at 802-872-8111.

Michele Morris is the Director of Outreach and Communications for the Chittenden Solid Waste District. CSWD's mission is to reduce and manage the solid waste generated within Chittenden County in an environmentally sound, efficient, effective and economical manner. Our vision: Products are designed to be reused or recycled and our community fully participates in minimizing disposal and maximizing reuse and recycling. ♻

TRIM YOUR WASTE-LINE THIS HOLIDAY SEASON – *Cont'd from p. 21*

This holiday season, we encourage everyone to do something to reduce your waste. Maybe you will compost your food scraps; or better yet, reduce the portion sizes and eliminate some of your waste. You could buy tickets to a local concert or museum; giving "experiences" reduces a whole lot of waste. Use a new reusable grocery bag as "wrapping paper" to give a gift in. Think through your gift giving and other purchases this season and make it a Greener Holiday.

1 Tetra-Paks are recyclable in many places. For more information visit www.recyclecartons.com.

Marc Morgan has been working in the waste and recycling industry for nearly 25 years. He is passionate about waste reduction. Currently, Marc works as the Solid Waste Manager for the City of Lebanon, NH where he manages the City's landfill and solid waste/recycling programs. ♻