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Air Pollution Steals Lives

George Harvey

On September 1, Air Quality Life Index® (AQLI) published its Annual Update for 2021(www.bit.ly/air-quality-report). It compared the rates of loss of life from air pollution to other causes of early death. The results may surprise some people. According to the report, air pollution kills more people than war, auto accidents, malaria, smoking, or abuse of alcohol or drugs.

Air quality pollution at dangerous levels sicken our kids. (Adobe stock/246557543/wckiw)

And an article at Bloomberg, using AQLI data, says that while Covid-19 killed about 2.6 million people in its first year, air pollution killed about 10 million in the same time (www.bit.ly/Bloomberg-air).

The problem of early deaths from air pollution is worldwide, but it is not evenly distributed. In the countries where the air does not meet the World Health Organization standards, life expectancy was reduced by air pollution an average of 2.2 years. In some places, it is far worse than that. In India, bad air shortens people's lives an average of 5.9 years. Certain South Asian countries have similar numbers.

Among the most problematical types of air pollution is particulates known as PM2.5. The designation refers to the size, 2.5 microns or less. It can get into the lungs and the body has no easy way to remove it. This can produce a problem that gets worse over time.

There is some good news for the United States. Our air is of better quality than it is in much of the world, and our air pollution kills far fewer people than our Covid-19. Nevertheless, people do die of pollution in this country, and it is not just a problem for polluted cities. According to Wikipedia, it is estimated that 22,000 to 50,000 people die in the United States due to air pollution each year (www.bit.ly/wiki-particulates). A study published in *Atmospheric Environment* in 2005 put the number for Vermont at 224 per year, despite the state's clean air (www.bit.ly/US-air-pollution).

There are numerous sources of air pollution. In this country, pollution was extreme in some places over the summer of this year because of smoke *Cont'd on p.21*

THE CLIMATE CRISIS IS WORSE FOR CHILDREN

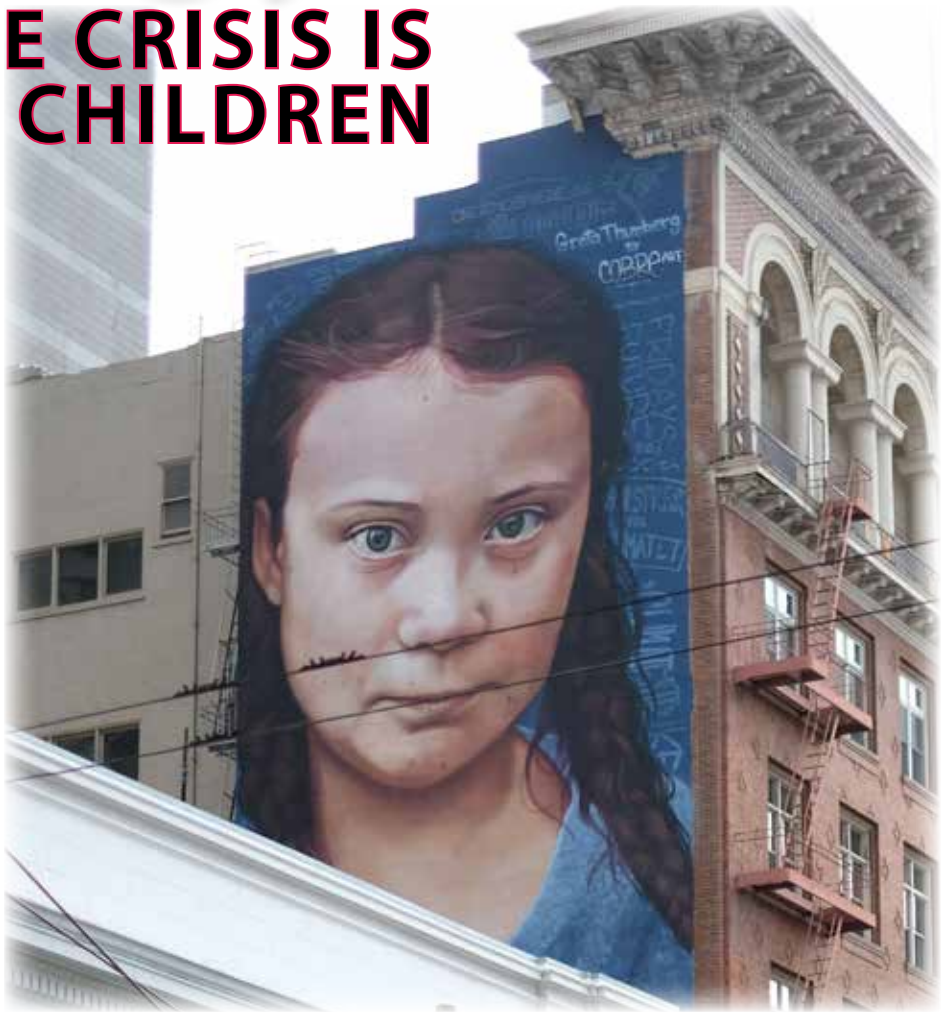
Brett Yates

When many of us think about climate change, we think first about children.

It's primarily a matter of longevity. Adults have witnessed record-setting temperatures and wildfires the size of small states and may expect them to worsen rapidly without serious climate action. But the point where the future becomes unimaginable – a place of widespread food shortages and permanently drowned cities – seems to belong to our children's lifespans, not to our own.

Recently, however, doctors, scientists, and researchers have found evidence that, in its current iteration, the climate emergency already is worse for kids than it is for their parents. In August, UNICEF released a report titled "The Climate Crisis Is a Child Rights Crisis," which aims to quantify the climate-related risks borne by children around the world while shedding light on how the stresses of climate change interact with their unique vulnerabilities.

According to UNICEF, 240 million children right now are "highly exposed" to coastal flooding, 330 million to riverine flooding, 820 million to heatwaves, 920 million to water scarcity, and two billion to dangerously high levels of pollution. The last figure represents 90% of children globally. *Cont'd on p.20*



A mural of Greta Thunberg towers over Mason Street in San Francisco. (Aslıhan Altın)

Code Red for Humanity and the Climate Crisis

Dr. Alan Betts

WThe climate crisis from the burning of the fossil fuels is bringing disaster after disaster this year. We have known for decades this was coming, but mostly societies have made promises but delayed action.

The Intergovernmental Panel on Climate Change (IPCC) was established in December 1988 by the United Nations General Assembly to provide policymakers with regular scientific assessments on the current state of knowledge about climate change. The first IPCC report was released in 1992. The Fifth Assessment report (AR5) in 2014 was the basis for the Paris Agreement the following year, when 190 nations made voluntary commitments to make a determined effort to reduce the warming of the Earth to less than 2oC, and preferably less than 1.5oC. The first part of the Sixth Assessment Report was released in draft form in August 2021. It was described by the UN Secretary-General António Guterres as nothing less than "a code red for humanity. The alarm bells are deafening, and the evidence is irrefutable". It is clear that climate change from the warming of the planet is now at a crisis point for humanity and life on earth, as nations have not followed through on their 2015 Paris commitments, and CO2 keeps rising.

Hurricane Ida floods in Central Park. The Lake overflowed to flood the plaza around Bethesda Fountain. (Roman Tiraspolsky/Adobe stock photo)

The next meeting of the UN Council of Parties, COP 26, starts 31 October 2021 in Glasgow, Scotland to review progress since the 2015 Paris Agreement. These international meetings search for agreement. Former President Trump had canceled the U.S. commitment to the Paris Agreement and discouraged global progress, but President Biden rejoined and promised *Cont'd on p.39*

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GREEN ENERGY TIMES' TEAM HELPS SAVE THE PLANET

Green Energy Times staff

We at *Green Energy Times* are working to save the planet. Sometime the most important thing we can do is to get the word out. We let people know about the needs we see and the solutions we believe are the most important. For those messages, we try to cover everything we know of.

As individuals, we find ourselves making the decisions in our own lives intended to help the environment, just as others do. When we do that, we try to act in ways that are consistent with what we know is best for the environment

Different people have different opportunities to support the broader changes we need to do to. Some of us can improve insulation in our homes. Some can switch to solar panels to provide us with electricity, and there are many ways to do that. Some switch to electric vehicles, install heat pumps, or do other such high-tech things. Some turn the thermostat down and wear a sweater.

The list of opportunities seems endless. And so does the list of things people actually do.

Not long ago, Nancy Rae Mallery, our editor, decided that it might be a good idea to ask those who work or volunteer for *G.E.T.* to tell people about the things they do to reduce their impacts on the environment and promote sustainability. So, for a couple of months, we have been collecting the responses we have received. We will share these, and one or two will be in each issue for a while. We will have two in this issue.

Sally Bellew – *G.E.T.* volunteer distributor for the White River Junction and West Lebanon, NH regions.

Sally is our adjunct distributor for the White River Junction, VT and Lebanon, NH communities. (Courtesy image)

"I have 16 solar panels in a nearby community array. These have generated enough clean energy to cover my heating and cooling, thanks to a heat pump, and my transportation needs for the past two years. My electric bills have been about $20 a month, year-round, for the past two years. My plugin hybrid is getting 999.9 mpg because I make use of every conceivable opportunity to recharge it. So far, I've gone 3000 miles on one-eighth of a tank of gas. Obviously, I'm borderline hysterical about the climate collapse I see all around."

***G.E.T.* comments:**

Everyone should take a look at the facts in this case. Sally does distribution for us, but she has powered her car, heated her home, and provided herself with other electricity at a cost of $20 per month. The money-saving potential of renewable energy sources and efficient use of electric power is so clear here.

For those who burn fossil fuels in their cars and at home, we might ask a question: If you add the costs of fuel for your car, fuel for heating, and electricity, would you rather pay that sum each month, or would you rather pay $20? For any among us who may wonder when, or whether, the cost of renewables will be low enough to save money, clearly the time is now.

Sally is a champion, and we are thrilled to have her on our team. Thank you, Sally!.

Joanne and Paul Coons co-lead in the New York region's distribution.

Joanne (and Paul) Coons - G.E.T. volunteer distributor, writer, and event representative. The Coons co-lead in the New York region's distribution.

"We (my husband is my partner in crime and we are a team) have solar photovoltaic (PV) for electricity, batteries for storage, PV thermal for domestic hot water, ground-source heat

Cont'd on p.17

Concentration of CO2 in the Atmosphere

413.30
parts per million (ppm)
October 5, 2021

Learn more at www.co2.earth.

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Burlington Moves Toward Its Net-Zero Energy Goal

George Harvey

Burlington Mayor, Miro Weinberger, speaks at the Net-Zero Energy Revenue Bond press conference on September 2, 2021. Standing in the background are (from L to R) Jennifer Green, City of Burlington Sustainability Director, Darren Springer, BED's General Manager, Emily Stebbins-Wheelock, BED's Manager of Strategy and Innovation, James Gibbons, BED's Director of Policy and Planning, and James "Duke" Dutra, BED's Chief Union Steward for IBEW Local 300. (BED)

Burlington, Vermont, is making moves toward its goal of having net-zero emissions of carbon dioxide for its energy. A new proposal for a $20 million Net-Zero Energy Revenue Bond is intended to finance most of the work. Mayor Miro Weinberger and Darren Springer, general manager of the Burlington Electric Department (BED), explained that the proposal, by itself, would provide for 25% of the emissions reduction to achieve the goal.

The bond, with an added portion of BED's annual General Obligation Bond, would be used for a series of investments. One of these is $17.5 million to support projects that help advance progress toward the Net-Zero Energy goal. Another is $7.8 million to fund grid upgrades that support reliability and manage new loads from strategic electrification. Certain more specifically targeted projects were also mentioned, including maintenance and upgrades for renewable energy generation plants, infrastructure for electric vehicle charging and demand response, and upgrades to technology systems to support new dynamic rates and load control.

One of the issues addressed by the bond is a need to upgrade the grid for improved reliability while at the same time giving it an ability to accommodate new loads. In the near future, we can expect increases in use of electric vehicles and heat pumps. We need an electric grid that can provide the additional electrical energy those changes require. The bond was designed to cover costs for these changes coming to $12.3 million.

The increased use of electricity for heat and transportation will not only change how much electricity is delivered, it will change how it needs to be regulated. Addressing this issue will be very beneficial for the customers, because it will allow dynamic rates for electricity. This means that customers can buy electricity for energy-intensive purposes at the lowest possible rates. The technology required to do this is expected to require $3.9 million, which is also included in the overall costs.

Two more items are also included. One is a sum of about $2.2 million to maintain renewable generation plants and convert a gas-powered "peaker" plant to run on biodiesel. The other is about $1.5 for EV charging stations, an electric bucket truck for the line crew, and other technological improvements.

The proposal will help customers pursue their own improvements to address climate change, live more efficiently, and save money. Among the examples of things people might want to be able to use are electric vehicles, cold-climate heat pumps, electric lawn care equipment, and electric bicycles. Costs for these would be supported by incentives over 2023 to 2025 with funds also coming from the annual bond.

The effects of the changes are expected to reduce the use of fossil fuels in Burlington by roughly 100,000 barrels of oil, reducing emissions by 47,000 tons. That reduces emissions by a bit more than one ton for each Burlington resident.

For anyone who is concerned that all this will drive electric rates up, according to BED the new bond will significantly reduce pressure on the electric rates for the future. In fact, its impact is expected to cause no increase in rates over the next five years. Moody's Investors Service affirmed an A3 rating for BED's revenue bonds and said the outlook for them was stable. Among the positive indicators Moody's cited were the fact that BED is using renewable resources for 100% of its electricity and the fact that it went twelve years without adjusting rates.

Clearly, a number of environmentalists support the bond. Among groups that are not primarily environmental in their orientation, the International Brotherhood of Electrical Workers, whose Local 300 represents about two-thirds of the BED workforce, also supports the bond.

The BED Net-Zero Revenue Bond was approved unanimously by the Burlington Electric commission and by the Board of Finance before it went to the Burlington City Council. The city council passed it on September 13. This means that the issue will go before the voters for a decision in a special election on Dec. 7, 2021. ♻

A Deal of the Century to Produce Less Pollution

Matt Power, Editor-In-Chief, Green Builder

If it costs $15 million to build a machine that removes the same carbon as getting a few hundred cars off the road, why not skip the middle man?

A new contraption called the "Orca," now under construction in Switzerland, will remove about 4,000 tons (about 2,240 U.S. lbs.) of CO2 from the atmosphere each year. It's an oil man's dream, a device that will allow us to keep burning fossil fuels as we kick the ball down the road until 2050, with the promise that big tech will save us. What could go wrong?

How much CO2 pollution is 4,000 tons? Not much. The Guardian reports (www.theguardian.com/carbon-to-rock-iceland) that: "According to the US Environmental Protection Agency, that equates to the emissions from about 870 cars."

That's pretty meager air-cleaning bang for the buck. Dive in a bit deeper and you learn that this reverse Deathstar won't be fully operational for about 10 years. And it's hardly a passive device. To pull the CO2 from the air, it uses fans to drive air through filters, then "injects" the captured carbon dioxide 1,000 meters into the ground to "mineralize" it. No figures are offered for how much energy all that will take, but it sounds substantial. And producing energy produces more CO2, unless it's done with renewable technology.

What else will $15 million buy?

But let's ignore the obvious technical hurdles and focus on the value proposition for techno-topian fixes like this. To begin, let's think about other ways we might spend that $15 million to reduce CO2 emissions.

- **Provide free public transportation.** Surveys find that many people don't use public transit because of the cost. In New York City, the average monthly commuting cost is $119.88 (www.thepointsguy.com/transport-costs-worldwide/). That's $1,438.56 annually. Let's say we wanted to get an additional 870 drivers in the New York metro area out of their cars and into the metro. What if we gave them all free commuting passes? We'd pay $1.2 million per year. Result: 12 years of equivalent CO2 reduction (at $15 million), with no hidden energy production costs, and an economic boost to public transportation.
- **Insulate Existing Homes.** Estimates from NAIMA (www.nsulationinstitute.org/NAIMA024.pdf) suggest that bringing residential building insulation in the U.S. up to a higher standard could rid us of 125 million tons per year of carbon dioxide emissions. What would $15 million buy? NAR estimates that the average cost to upgrade insulation in a home is $2400. That's enough to bring 62,500 homes up to a much higher efficiency Estimates suggest current American homes produce about 6,400 lbs.of CO2 annually for heating and cooling. Insulation upgrades on those 62,500 homes would likely cut their annual HVAC-related emissions by 50%. Stay with me. Multiply 62,500 x 3,200 lbs. of CO2 (the amount of emissions cut annually), divide by 2,000 (for tons) and you arrive at 100,000 tons! That's more than 100 times the CO2 reduction of the $15 million machine.
- **Drive Electric.** Is it too soon to trade in a gas car for an electric car? Maybe not. EVs are not perfect yet. Battery technology is still messy, and overly CO2-intensive, for example, but because EVs can transition seamlessly to renewable power sourcing, they have the potential to get "greener" over time. I like this analysis (https://blog.ucsusa.org/rachael-nealer/gasoline-vs-electric-global-warming-emissions-953/) comparing the lifelong CO2 footprint of EVs with gasoline models: "Based on where EVs are being sold in the United States today, the average EV driving on electricity produces global warming emissions equal to a gasoline vehicle with a 68 MPG fuel economy rating." The author continues, "In a grid composed of 80% renewable electricity, manufacturing a BEV will result in an over 25% reduction in emissions from manufacturing and an 84% reduction in emissions from driving for an overall reduction of more than 60% (compared with a BEV manufactured and driven today)."

The construction of Climeworks direct-air capture plant, Orca on the geothermal park in Hellisheidi in Iceland. The plant is expected to be in operation in late summer 2021. (Climeworks) (www.climeworks.com/orca)

I could go on all day with examples like these, demonstrating why technological solutions to climate change are quite simply a waste of money at this stage of the climate crisis. We don't need new technology. We need a shift in focus, and a shift in big subsidies to industries and ideas that can make the biggest difference.

Sure, if this were 2050, and we were mostly off fossil fuels, CO2 extractors might provide a little climate stabilization, but until then, they're a distraction--a dangerous example of what some people have called "magical thinking." We need to change the discussion every time someone comes up with a new gadget that promises to allow us to keep misbehaving --and keeps the fossil fuel people running the world.

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Local Shops Get Northern New England Cyclists on the Road

Brett Yates

Conversations about how to lower your carbon footprint often revolve around solar power and wind power. Transportation emissions are also significant. A big part of the solution there is pedal power.

Visions of a carbon-free society tend to imagine a future with fewer cars and far more bicycles, along with infrastructure to match. But in rural states like Vermont and New Hampshire, potential riders often have to endure long automobile trips simply to get to the nearest bike shop – an irony especially acute for those who, for environmental reasons, prefer not to use one.

Red Clover Bikes, located on Rt 5 in the center of Fairlee, VT opened in June 2021.

Fortunately, in some of New England's small towns, bike lovers and entrepreneurs have perceived the need for local options – particularly amid a rise in interest in cycling since the start of Covid-19 – and have taken action to make them available.

One example is the BF Community Bike Project in Bellows Falls, Vermont.

Bonnie Anderson founded the organization – a retail store, repair shop, and community center – eight years ago in the Windham County village, where the next closest bike shop involves a trip up or down I-91, not to mention an interstate crossing over the Connecticut River. Efforts to supply Burlington's refugee community with bikes through Bike Recycle Vermont, which would later become the 501c3 Old Spokes Home, provided an inspiration for Anderson's own nonprofit.

The BF Community Bike Project specializes in matching low-income Vermonters with bicycles, but because it's the only bike shop in town, it serves people of any income level. Some of the adult bikes cost as little as $80, but there's as much variety in the stock as there is in the clientele.

"Over the years we've gotten some much higher-end bikes donated, and we price them accordingly," Anderson said, noting a few special occasions where price tags have exceeded $1,000, raising funds that help keep the other bikes – all of them used – affordable.

In some cases, real affordability means giving the bikes away for free, or in exchange for volunteer hours.

"We don't turn anyone away," Anderson emphasized. "If they can't afford a bike, we work with them on whatever they can do. And we have given away a lot of bikes. With our annual appeal, where we send out a mailing to raise money, we give people the option to sponsor bikes, so that way people know their money is going to help someone get a bike or bike repair."

In addition to personal wellness and social justice, the Community Bike Project's mission emphasizes environmentalism. Many of its reclaimed bikes might have otherwise ended up in landfills, and whenever donations can't be refurbished to a high enough standard, mechanics strip them for usable parts.

"People come looking for parts that they just can't get, and we're often able to provide parts that people need to do their own repairs," Anderson explained. And when they don't know how to do repairs, the Community Bike Project aims to teach them.

Friends for Change youth meeting at the Bike Project for the weekly ride (Bonnie Anderson).

While most of the organization's indoor programming – including its repair classes and its open shop, which provides space and tools for do-it-yourself jobs – has been on hold since the start of the pandemic, other initiatives have continued. Over the summer, kids from a nearby youth organization met at the storefront weekly for a group ride. And through the Duet Wheelchair Bike Program, volunteers have provided trips to the local farmers market and scenic riverside rides for seniors and people with mobility challenges, using a special bicycle that hooks to the back of wheelchair.

The bike shop is still going strong, but customers are asked to make appointments in advance.

Fifty miles upriver, another Vermont town, Fairlee, now has a bike shop to call its own. Owner-operator Sarah Pushee opened Red Clover Bikes on the village green in June this year.

Pushee worked in a bike shop in Hanover after college, until 2003, and over the course of a subsequent career in the heating and plumbing industry, she never forgot the experience. A Thetford native, she also recognized the dearth of bike shops in the mid-Upper Valley.

"You shouldn't have to drive 45 minutes to an hour to get your bike fixed," she said.

Opening during the pandemic wasn't easy. Supply chain problems limited her inventory to kids' bikes and e-bikes, plus parts and accessories.

Fortunately, from the beginning, Pushee was more intent on repairing bikes than selling new ones. "Selling bikes is a big part of my business, but the primary goal here is to keep people on bikes functioning well," she clarified.

Plenty of locals have taken advantage. "This has long been a desert. You either had to go to Lebanon or Littleton or Barre or Plymouth to get a bike serviced. And when a bike shop opens, there's going to be a significant amount of people who've got a bike that's been parked for a long time, because it needs a minor repair and traveling a long distance to get it repaired is kind of a hassle or not a priority," Pushee observed.

Along with her part-time employees, Pushee does much of the mechanical work herself. She finds it gratifying. When she changes a flat tire, she takes care to recycle or reuse the tube.

"I think it's really important to keep

Cont'd on p.5

Local Bike Shops – *Cont'd from p.4*

people's equipment functioning and to be on top of what it takes to fix something and how to source the parts and, rather than just throw a new part on something, to have really troubleshot something," she explained. "People form an attachment to their bicycle, and they want to repair it rather than replace it. It's an investment."

Another brand-new shop is Pedego Electric Bikes in Salem, New Hampshire.

Nationwide, more than 180 locally owned dealerships sell Pedego's line of twenty e-bikes, but the Salem location, whose ribbon-cutting took place in May 2021, marks the first in the Merrimack Valley.

Owner Rachel Higginbottom has a background in healthcare and exercise physiology. "I taught spinning for 25 years, and I've worked in orthopedics, and I came to the realization that these bikes are perfect for patients that have had knee replacements, hip replacements, and spine surgery," she said.

In addition to offering new recreational opportunities to riders with injuries and infirmities, the California-based brand markets five of its models to commuters. Overall, prices range from $1,895 to $5,000.

"It's less than people think," Higginbottom commented. "All bikes come with a five-year warranty, the best in the industry," according to Higginbottom, "and can be delivered for a nominal fee."

Moreover, customers can expect "white-glove concierge service" for any repairs. "You bring the bike in, it's done within five days, if not that day. Most bike stores, there's a six-week wait," Higginbottom pointed out.

Located on the Salem, NH rail trail, the store also offers rentals by the day or hour, with eight bikes in its rental fleet. Fall is a popular time for riders on the trail.

"We're running a bunch of foliage specials," Higginbottom noted. Customers can call the shop for custom tours.

Brett Yates is a contributing writer for Green Energy Times. *He lives in Mendon, Vermont.* ♻

Recycling Bike Tire Tubes

A tip from Sarah Pushee, owner of Red Clover Bikes in Fairlee, Vermont:

Enough bicycle tubes are put in landfills each year to fill the Eiffel tower at least seven times over.

Please recycle your used bicycle tire tubes.

Some helpful tube recycling links where used tubes are accepted are:

- Tannus Tires accepts tubes to be recycled through bike repair shops. Learn more at www.tannusamerica.com/tube-recycling
- Alchemy Goods makes products out of recycled bike tubes www.alchemygoods.com.

Please note that slime self-sealing tubes are not recyclable: www.shop.slime.com/self-sealing-bike-tubes. ♻

Electric Cars Are Setting Records

George Harvey

2021 Ford Mustang Mach-E. (Ford)

Two electric cars set some impressive records since the August issue of *Green Energy Times* came out. One is a Tesla Model S Plaid, which competed in the Mount Washington Hillclimb, held on August 13-15. The other is a Ford Mustang Mach-E, which set records in the United Kingdom on a run from John O' Groat, on the northeastern tip of Scotland, to Land's End, at the farthest possible point in Cornwall, England

The Tesla that ran the Mount Washington Hillclimb was not the first electric vehicle (EV) to climb that mountain, by any means. GET readers with good memories may remember an article in Green Energy Times in 2013, "Mt. Washington Auto Road Alt Energy Summit" (www.bit.ly/3zhjMMa). That article covered an event that was an expo for many types of alternate energy, including EVs racing to the top of the mountain.

Now, a Tesla has run the famous Mt. Washington Hillclimb, establishing a record for its class, stock EV, and for EVs in general. Blake Fuller, who drove the car, had never entered in a Mt. Washington Hillclimb before, though he had driven and won on Pikes Peak. Overall, the Tesla placed 15th in the race out of 78 that started, which is not bad, all things considered. Fuller said he is looking forward to competing the next time the event is run.

This summer, there were also three records set and recorded by the Guinness Book of Records for a run from John O' Groat to Land's End. This is the longest road trip available in the UK. As the bird flies, the distance is about 603 miles, but parts of the UK are rather hilly, and it has lots of rivers, so the road trip is a good deal longer. The records were set by a Ford Mustang Mach-E on a trip of 874 miles.

The most impressive of the three records might be the one for the amount of energy used. The car used about 135 kilowatt-hours (kWh), for an average of 6.5 miles per kWh. The thing that makes this most impressive is the fact that the previous record was 1.8 miles per kWh, which had been set by a Tesla.

The second record was for the least number of charging stops, at a total of one. And the third record was for the least amount of time charging, at 43 minutes and 13 seconds.

The fact that the Mustang Mach-E set a record with one charging stop suggests that the Tesla model used in the previous record for that was not a Tesla Model S Long Range. I would expect that car, driven carefully, could also do the whole run with one stop.

We might add that other cars are coming along that should break new records quickly. We can expect that Tesla will try to beat these records soon. The new Lucid Air was just rated by the EPA as having a range of 520 miles. I expect that the Aptera, if it comes out as planned, it will be possible to do the entire journey on a single charge. We will see. ♻

NINE EV Charging Station Sites Coming To NH!

Fast-charging Public Electric Vehicle (EV) Charging Stations Needed in NH!

Tom Belair

The State of New Hampshire has announced the availability of money from the Volkswagen Environmental Mitigation Trust, part of which will be used to increase the number of publicly available, fast-charging Electric Vehicle (EV) charging stations along key highway corridors, many of which are located in New Hampshire Electric Cooperative (NHEC) service territory.

If you have been considering installing an EV Charging station, and have a business or municipal account along one of these corridors, you may be eligible for 80%, or even 100%, reimbursement for installing and hosting a public charging station.

An informational session was held via webinar on Wednesday, October 6, 2021 at 1:00 PM. Interested parties should check out the State of NH website to learn more about that session or to hear about any updates. See all the RFP deadlines and details at www.des.nh.gov/VW-mitigation-trust.

A Quick Summary of the RFP

Funding Amount: ~$3,000,000

For: 50+ kW Direct Current Fast Charging (DCFC) and co-located Level 2 electric vehicle supply equipment (EVSE) on key travel corridors in New Hampshire*.

Reimbursement Levels: Up to 80% of eligible costs may be reimbursed from the NH VW Trust for selected proposals, or up to 100% of eligible costs for EVSE located on state or local government-owned property.

Installed by: The Contract term shall be from the effective date of the Contract until five years from the in-service date of the last (if award is for multiple stations) charging station installed under the Contract.

Where: Eligible Project Locations (Section 3.2)

Eligible locations for EVSE projects under this RFP include sites that serve the following corridors:

1. US Route 3 from the junction with US Route 2 in Lancaster, NH to the Quebec border
2. US Route 2 from Lancaster, NH to the Maine border
3. NH Route 16 in its entirety
4. US Route 302 from I-93 to the Maine border
5. Interstate 93 from the Massachusetts border to the Vermont border
6. Interstate 89 from Concord, NH to the Vermont border
7. NH Route 11/103 from New London, NH to Claremont, NH
8. NH Route 9/US Route 202 from the intersection with I-89 south to the Vermont border
9. NH Route 101 in its entirety

Working with your Utility (Section 2.5): All Applicants must consult with the electric utility company providing service for each proposed site, and submit completed DC Fast Charger Utility Application and Electric Vehicle Preliminary Site Feasibility Assessment Information forms for each site. Applicants must provide the utility a minimum of 10 weeks to complete the form.

NHEC is available to help business and municipal members who are interested in pursuing this opportunity. Because each project will require time to determine how to provide electricity to your site, please try to let us know as soon as possible. For questions, feel free to contact NHEC Commercial Accounts Administrator Chelsea Smith at 603.536.8855, or email smithc@nhec.com.

Tom Belair is on the Energy Solutions team at NH Electric Cooperative, a not-for-profit, member-owned electric utility serving 85,000 members in NH. Please visit NHEC.com for more information.

**Vendors who manufacture or install qualifying chargers are ChargePoint, EV Go, Blink, ReVision Energy (Maine), Voltrek , Greenlots, EnelX and EV Launchpad.* ♻

(Adobe Stock image 282208447/petovarga)

Popular Charging Stations

EVgo charging station in parking lot (Adobe-Stock_284263050 Sundry Photography)

With more than 150,000 charging ports available to drivers, ChargePoint is one of the largest EV charging networks in North America and Europe. (Steven Bullock, courtesy of Voltrek)

Highland Center, AMC Pinkham Notch. ReVision Energy collaborated with Nissan and Plug In America and distributed free level two chargers throughout the region. Eleven of them were given to AMC. (Revision Energy)

EV Accelerator Program Advances Climate Program Objective in Maine

Efficiency Maine Extends its EV Accelerator Program for Another Year, Advancing Key Climate Change Objective

On Sept. 2, 2021, the second anniversary of launching its electric vehicle (EV) rebate program -- the EV Accelerator Program -- Efficiency Maine announced it will extend the program for another year.

Efficiency Maine estimates it has sufficient funds to help defray the cost of approximately 2,500 more EV purchases in the next year. Twenty-five percent of the funds are reserved for income-eligible buyers. Efficiency Maine estimates the vehicles added with these funds can save Maine drivers a total of $2 million per year in fuel costs, and more than $18 million over the lifetime of the vehicles. Those same vehicles will prevent an estimated 82,000 tons of CO2 from being emitted over the course of their on-road lifetimes. The funding for the next year of the rebate program comes from a one-time $5 million payment received from the settlement of the New England Clean Energy Connect (NECEC) project, approved by the Maine Public Utilities Commission on May 3, 2019.

"The Maine Climate Council identified cars and trucks as the state's largest source of carbon pollution and recommended shifting to EVs as one of the best ways to achieve Maine's carbon reduction targets," said Michael Stoddard, executive director of the Efficiency Maine Trust.

"The transition to EVs is picking up speed," said Amalia Siegel, EV program manager for Efficiency Maine. "We're seeing a surge in the number of rebates we issue thanks to the introduction of new EV models with longer range, increased availability of public charging, and growing consumer acceptance of EV technology. In recent months, Efficiency Maine rebate numbers have increased to more than 250% of pre-pandemic levels."

Efficiency Maine will also use the funds to continue to produce a suite of educational materials to help Maine consumers overcome barriers to EVs. Mainers can find extensive information on the website efficiencymaine.com/ev about EVs, EV rebates, and EV charging. There they can also find the new guidebook on "How to Select and Install a Home Electric Vehicle Charger" and an instructional video on the different ways to pay for a charge at any public charging plug.

Recently, the Governor's Energy Office and the Governor's Office of Policy Innovation and the Future kicked off an initiative to develop a Clean Transportation Roadmap to 2030, one of the key transportation recommendations of the Maine Climate Council. The Roadmap seeks to identify necessary policies, programs, and regulatory changes needed to meet the state's transportation emission reduction goals.

"With increasing federal support for electric vehicles and given the recent growth in EV sales in Maine, it's great to see Efficiency Maine's rebate program extended for another year," said Dan Burgess, director of the Governor's Energy Office. "As more options for electric cars and trucks come onto the market, this one-time funding from the NECEC stipulation will help Maine's economy and environment by enabling more Maine people to purchase an EV and reducing harmful greenhouse gas emissions."

Efficiency Maine programs provide instant rebates for eligible battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) at 66 participating car dealers in Maine. The standard rebate is $2,000 for a BEV and $1,000 for a PHEV. Higher rebates are available for low-income customers, governmental entities, and select nonprofits. For a limited time, Efficiency Maine is offering a promotion for businesses on the purchase of two to 10 vehicles, paying rebates of $4,500 on a BEV or $3,500 on a PHEV for the first 50 vehicles on a first-come, first-served basis. To learn more, visit https://www.efficiencymaine.com/electric-vehicle-rebates/.

Efficiency Maine's EV work also includes an initiative to install a network of universal, publicly accessible EV chargers across Maine. A first phase of this initiative used funds from the settlement of a federal lawsuit against Volkswagen to develop high-speed EV chargers (also called "level 3" chargers or "DC fast chargers") on the Maine Turnpike at the Kennebunk plazas (northbound and southbound) and the West Gardiner Plaza, as well as in Jackman, Skowhegan, Farmington and North Windham. A subsequent phase is in the process of developing public high-speed EV chargers in Lewiston-Auburn, Fairfield, Newport, Bangor, Ellsworth and Belfast using a previously received $1.5 million from the NECEC settlement.

In addition to installing these publicly accessible fast chargers, Efficiency Maine is also supporting the expansion of lower-cost, public "level 2" chargers in other strategic locations across the state. To date, it has helped fund 150 new, public plugs in Maine's public EV charging network, which has now grown to a total of 120 DC high-speed charging plugs and 395 level 2 "community" plugs.

The NECEC stipulation with HydroQuebec and Central Maine Power was agreed to by several parties including the Conservation Law Foundation, Acadia Center, the Industrial Energy Consumers Group, the Office of the Public Advocate, and the Governor's Energy Office.

The funds comprise of one of several elements of funding from the NECEC settlement that have been directed to Efficiency Maine to help advance the dual objectives of lowering energy costs for Maine consumers and reducing carbon pollution. Other elements of the settlement have previously sent $2.4 million to Efficiency Maine, which it has begun deploying to promote high-performance heat pump systems, heat pump water heaters, and weatherization in qualified low- and moderate-income homes and in K-12 schools.

To learn more about electric vehicle technology and how to maximize its benefits visit www.efficiencymaine.com/ev. Drivers can also find a charging station locator on the Efficiency Maine website or by using a variety of available smartphone apps. ♻

REV2021 Virtual Conference: REV It Up! Climate Action, Equity and Resilience

October 18-19 and October 26, Renewable Energy Vermont (REV) will host its 21st Annual Conference, a two-part, virtual event. "Thought leaders," advocates, entrepreneurs, elected officials, state agency heads and regulators, will convene virtually for in depth discussions on this year's theme, REV It Up: Climate Action, Equity and Resilience. Each session features opportunities for networking, interactive discussion, and inspiration for climate action.

On Monday evening, October 18, keynote speaker Dr. Saul Griffith, Co-Founder and Chief Scientist at Rewiring America, will share the investment, infrastructure, and production strategies to get us from where we are now to the low-carbon economy we need to mitigate climate change. A growing nonprofit, Rewiring America is working to launch a movement that electrifies everything, starting with America's 122 million households. Through accurate, accessible, and actionable data and storytelling tools that power smart, inclusive advocacy and market-transforming partnerships, Rewiring America aims to achieve national emissions goals, improve our health, lower monthly bills, and create millions of clean energy jobs. U.S. Congressman Peter Welch will offer remarks and updates on federal energy issues. Vermont Senate Pro Tem Becca Balint will offer a preview of climate action in the upcoming legislative session.

Following the keynote address, REV2021 features two days of exceptional plenary panels. U.S. Senator Patrick Leahy welcomes attendees October 19 to examine the wide variety of innovation, policy, and climate action happening in Vermont and across the Northeast region. Attendees will have the opportunity to engage with State energy commissioners and agency leaders including Celina Cunningham, Deputy Director of the Maine Governor's Energy Office; Marissa Paslick Gillett, Chair of the Connecticut Public Utilities Regulatory Authority; Matthew Nelson, Chair of the Massachusetts Department of Public Utilities; and June Tierney, Commissioner of the Vermont Department of Public Service.

Vermont House Speaker Jill Krowinski welcomes attendees on October 26 to explore questions of equity in the transition from a fossil fuel economy to an economy powered by renewables. Kiah Morris of Rights and Democracy will moderate a panel discussion of ways to build energy equity and how state and federal governments can help. Speakers include Vermont Senator Kesha Ram-Hinsdale; Dr. Tony Reames, Senior Advisor to the Department of Energy's Office of Economic Impact and Diversity; and Jon Copans of the Vermont Council on Rural Development. Attendees will also gain insight on women in leadership from Mary Powell of Sunrun; Jennie Stephens of Northeastern University; Marie-Claude Francoeur, Quebec Delegate to New England; Claudine Bouchard, Hydro Quebec; and Karen Jernigan of Power Guru. Former Vermont Governor Peter Shumlin will offer concluding remarks.

For the most up-to-date conference information, including speakers, sessions, and registration visit revconference.org. ♻

29,000 Solar Panels for Solar Sustainability at Middlebury College in VT

A new solar array at Middlebury College will bring it close to its 100% renewable energy goal. Senator Patrick Leahy (D-VT) joined representatives from Middlebury College, Encore Renewable Energy, Green Mountain Power (GMP), the state of Vermont, and the town of Middlebury on October 12 to break ground on the 5-MW solar project.

Groundbreaking at Middlebury's new solar array (Courtesy image)

Middlebury College will buy 100% of the array's production to help meet its goal of 100% renewable energy by 2028. The array will provide about 30% of all the electricity the college needs. The other 70% of its electricity comes from a number of sources, which is already 100% carbon-free and 68% renewable. The agreement on the new array between Encore, GMP, and Middlebury eliminates any cost shift to the utility's customers.

Encore, the project developer, will complete the construction of the array in 2022. The project, which is on 30 acres of land owned by the college, will include 29,000 panels mounted on single-axis trackers that will follow the sun east to west over the course of the day.

After a blessing from Don Stevens, chief of the Nulhegan Band of the Coosuk-Abenaki Nation, the groundbreaking event continued with remarks from the speakers.

Senator Leahy spoke of the consequences of the climate crisis and the economic benefits of the array, which he called an "economic imperative." He said, "I am so proud to see that urgency being demonstrated so clearly right here in Middlebury," adding, "I continue to be impressed by the Middlebury College commitment to leading by example in its investments in renewable energy and reducing carbon emissions."

"This is a great example of how our community partners make us stronger. This new resource will offer a rich source of study and exploration for our students, staff, and faculty," said Middlebury College President Laurie Patton.

"The solar project will allow the College to receive clean electricity from a new, locally generated source," said David Provost, Middlebury executive vice president for finance and administration. "With this groundbreaking, we are further diversifying our energy mix as well."

GMP President and CEO Mari McClure said, "We plan to add storage to this solar project, which will directly help lower costs for all customers as we use the stored energy from the solar project to reduce power demand from the grid during high energy use days."

Initially, flocks of sheep, rather than noisy fossil fuel-powered mowers, will provide vegetation management at the site. Eventually, the site will feature pollinator-friendly plants and shrubs that will attract an increased number of bees, butterflies, and other insects to help support crops in the Middlebury area. The College will also dedicate up to 95 acres of its land to be managed as a habitat for bobolinks and other grassland birds.

"This project is a great example of how large customers like Middlebury College can collaborate with their electric utility on carbon-free energy solutions," said Chad Farrell, CEO of Encore Renewable Energy. "It is also a model for the expanding benefits that a solar array can offer, including pollinator-friendly ground cover and a location for grazing farm animals, as well as a potential interactive learning opportunity for students."

"It's wonderful to see this solar project move forward," said Brian Carpenter, chair of the Middlebury Select Board. "Middlebury College and Encore were great to work with – while making an effort to meet a clean energy goal they also took into consideration the five-megawatt array's imprint on wildlife, the local landscape, and the neighborhood."

"Middlebury's leadership and this solar project serve as a model for Vermont. If this pandemic has taught us anything, it is that our resiliency as a State depends on innovative partners coming together to find solutions to our greatest challenges, climate change being top among them," Lt. Gov. Molly Gray said.

Once the solar array is constructed, it will produce about 50 times the energy required annually to power Forest Hall, a Middlebury College residence hall that houses 155 students. The project is a carbon-free energy source producing the equivalent to the energy needed to power 800 average Vermont homes through the year. The new solar project will join eight other Middlebury College solar arrays that comprise just over one megawatt. ♻

Zpots Creates Pottery, Sustainability and a Smaller Footprint

George Harvey

Zpots is a pottery studio in Brookline, Vermont. It was founded in January 2001 by Noelle VanHendrick and Eric Hendrick, who had studied ceramics together at the University of West Virginia and had long known that they wanted to support themselves "producing art and furthering craft."

The pottery they make is all hand-thrown, hand inscribed, and hand painted. It is bisque fired at 1900°F, and glaze fired at 2200°F.

Zpots, a pottery studio, is located in Brookline, Vermont. (Courtesy photos)

Historically, there has been much more to Zpots than the details of its wares. Noelle and Eric have been extraordinarily careful to see that they not damage the world we all live in, and they continue to make pottery that is as safe as possible for human use.

From the time their business started, when the electric utility in Brookline was CVPS, they have used Cow Power to power all phases of their business. There is a lot of electricity involved because all four of the kilns they use for regular production are electric, and they usually do two firings each day. The kilns are not exactly small, at twelve to fourteen cubic feet each. That makes them roughly the size of a refrigerator, though they are short and wide by comparison.

Noelle told us, Zpots is getting more and more sustainable. She said, "Anything that we can do, any program we can be involved with is a step in the right direction." In fact, she and Eric want to do even more, saying "Hopefully more programs will be introduced that we can be part of."

We might even say that the electricity used to heat the kilns does double duty, because the residual heat from firing stays in the building, supplying the heat for the studio. The building contains the office, the photography studio, library, and lunch room, all above the studio, and the heat from the studio rises into it, keeping it as warm as needed. So, the heat itself is reused.

We should bear in mind that nearly all materials used in ceramics are mined, as nearly all of them are clay of one type or another. The footprint on the environment need not be large, however. And the materials are mined from abundant deposits.

Noelle told us, "Everything that we make and all the materials come from Standard Ceramic in Pittsburg. We have used them ever since we were in college, all the materials are mined in the U.S. Clay is a mining process, but we recycle. We formulate the clear glaze in house, but we use commercial colors, we use commercial color that are safe for kindergartners." She also noted that since most of the Zpots customers were buying wholesale and reselling the products, they needed certifications of safety, and that is far easier if all the source materials are already certified.

Unsurprisingly, Noelle and Eric recently decided to reduce their dependence on outside electricity supplies, even though they were buying Cow Power. They got together with their local solar business owners Simon Piluski and Victoria Roberts at Southern Vermont Solar, who set them up with a system that would work well for them. It is a 13.2-kilowatt (DC) system with 33 LG 400-watt panels. It uses Enphase IQ7PLUS microinverters and includes two Tesla Powerwalls.

Noelle and Eric were surprised at how much more energy could come from their roof with the higher wattage panels that are available today. It now made sense financially and ecologically – it was time to go solar! The array covers all of the south-facing roof of the studio building. As big as that system is, however, it does not supply all of the power needed by Zpots, which continues to use Cow Power for what it cannot produce. The system is grid tied, however, and can bank energy either in its own batteries or in credits that are maintained by Green Mountain Power. In fact, Victoria Roberts told us the array was cash positive from day one with a VSECU loan. GMP is the owner of the batteries and is leasing them to Zpots.

Right now, Zpots has three artisan employees. That number has been up to nine before the pandemic struck. In addition, they have two packers.

The business is primarily wholesale, with a self-serve barn. Zpots is now working on opening a store on Main Street in Brattleboro, but the goods will include more than pottery. Everything in the store will be designed by Zpots, and everything will be made locally in ways that are as green as possible, but the offerings will include cards, T-shirts, pillows, hats, jewelry, and more.

Zpots website is zpots.com. Be sure to see Zpots ad on p.38 of this issue of GET. ♻

A pot made at Zpots shows their connection to the earth.

As Solar Interconnection Costs Rise, Who Should Pay to Improve the Grid?

Sam Evans-Brown


Adobe Stock photos/ by ctvvelve

The cost of connecting a completed solar project to the grid is rising.

James Hasselbeck, the Director of Operations at ReVision Energy, told attendees of the NH Energy Summit in September that, "We've seen those interconnection costs double to triple in the past three years alone in the state of New Hampshire."

"The same exact equipment that used to cost us $100,000--maybe $150,000--is now costing upwards $300,000 to $400,000," said Hasselbeck. "And there's been additional needs and additional equipment that solar developers are being asked to provide that we haven't seen before, and that's really making some of the financing structures quite challenging."

And it's not just New Hampshire, it's all over New England. One Rhode Island developer told the Energy News Network this spring that the cost per megawatt is now three to five times higher than it was ten years ago.

To a certain extent, these increases are predictable. Our grid wasn't built to handle the demands of a distributed energy future, and we need to invest now to realize savings down the road.

In a typical "hub-and-spoke" grid, power plants connect to the high-voltage transmission grid, but as we build more small-scale renewable energy sources, more and more generators are connecting directly to lower-voltage distribution networks. This will mean that investment will need to shift away from transmission and more towards distribution.

Bloomberg New Energy Finance predicts that investment in electricity grids globally will need to grow from roughly $235 billion in 2020 to $636 billion by 2050, and that 63% of that investment will be at the distribution level, up from 52% today.

But the question policymakers must ask now is who pays these costs, and what is the process for deciding how to spend that money.

The model that exists today in many states is called the "triggering cost-causer pays." Under this model, utilities make no plans for new generation until a project asks to connect. They then conduct a connection study, and the generator (or "causer") has to pay for any upgrades the utility demands. If the generator disagrees with the methodology used to determine those costs, they've got no recourse other than to pound sand and find a new project to develop.

Cost-causer pays is not the only framework to pay for these upgrades, however, and some states are getting serious about the alternatives. On the other end of the spectrum is the idea that upgrades to the distribution grid are valuable not just to the individual energy project hoping to interconnect, but to society as a whole, meaning the cost should be shared.

A perfect example is the replacing of fuses with reclosers. Fuses need to be replaced whenever a circuit is shorted by, say a branch touching a wire in a wind storm. This is time consuming and costly for utilities and ratepayers. Reclosers are more like the circuit breaker in your basement and can be reconnected remotely, without a line crew being on site. Swapping out fuses is a key grid modernization investment for many distribution utilities and is also a common requirement for large commercial solar arrays to connect to the grid. Yes, these investments are triggered by the developer, but all ratepayers will have shorter outages and cheaper rates in the long term as a result.

The question of how to share the costs of these upgrades is being discussed all around the country, and the time has come for that discussion to come to New Hampshire, too. The Public Utilities Commission should open a docket to take up these concerns and investigate what best practices exist to accelerate the transformation of our shared grid.

Sam Evans-Brown is the executive director of Clean Energy New Hampshire. He was an energy and climate journalist for ten years before transitioning to the policy arena. ♻

So, What's Up at Maine Solar Solutions This Summer?

George Harvey

It seems there are always interesting things going on at Maine Solar Solutions, and it is time to revisit them in Green Energy Times.

Recently, they were able to report on the success of a system they had installed for one of their customers. Maine Solar Solutions installed a solar array at the Replenova Farm, in Durham, Maine, and now, with the passing of time, we have been given a record of a year's performance. The array has been called a great success by the customer.

Replenova Farm's solar array consists of 59 panels producing about 31,600 kilowatt-hours of electricity in its first year of operation. This reduced carbon emissions by 48,938 pounds. (Replenova Farm)

Replenova Farm is certified organic by the Maine Organic Farms and Gardens Association. Its operations are entirely sustainable. It is not large, at 17 acres. But it has a barn, two commercial kitchens, and five high tunnel greenhouses. In addition to lighting, these buildings can have powerful electricity demands. They have a walk-in cooler, three refrigerators, and a freezer. The farm provides breakfast and lunch, and so it has multiple electric ovens and induction burners. It uses electric hot water. All of the greenhouses need ventilation. No fossil fuels are used, and all of the power is electric, and it is all solar, when possible.

Gary Goodrich, the owner of Replenova Farm, made clear that he has the goal of sustaining the land, water, and air resources in ways that are compatible with local food production and sales through our farm market. This includes wholesale and retail customers. The farm also donates vegetables to the Good Shepherd Food Bank.

The system was designed by Maine Solar Solutions, which took the customer's sustainability goals into account. The solar array has 59 panels, which produced 31,600 kilowatt-hours of electricity over the course of 2020. The excess electricity produced on sunny summer days is banked for use later, when the days are shorter and the sun is not as bright.

Apart from the payoff of reducing electricity costs quite a lot in the long run, Goodrich can take pride in the fact that his organic farm's energy use reduced carbon emissions over their previous output by 48,938 pounds over the course of the system's first year of operation. Maine Solar Solutions helped apply for a REAP grant for the system, which was awarded. Goodrich said, "If we can do projects like this to not only save money but help our environment and give back to our communities, just by taking advantage of something as abundant as the sun, then it's worth looking into."

One of the things Gary Goodrich said he liked best about the electric system is that requires nearly no maintenance. That is something a farmer can appreciate.

Another recent installation worth reporting is a 49.59 kilowatt (kW) solar photovoltaic installation for ServiceMaster in Auburn, Maine. ServiceMaster is a very interesting company that specializes in helping people and businesses recover from disasters. For more than a quarter century, it has been helping clean and restore homes and business locations after fires, floods, and other similarly distressing problems. Its services range from carpet and upholstery cleaning to mold remediation and sewage cleanup.

Clearly, a business of this type can use a lot of electricity, which is the reason why it would have an array of nearly 50 kW. Maine Solar Solutions designed the solar system to provide 100% of ServiceMaster's electricity for its 10,000 square foot building. The solar array has 114 roof-mounted REC 435-watt solar panels with Solar Edge inverters. The solar system will reduce emissions of carbon dioxide by 39.3 metric tons every year. This is the equivalent of one gasoline-powered car driven 98,840 miles.

ServiceMaster's 50kWsolar array consists of 114 panels. It reduces carbon emissions by 39.3 metric tons per year. (ServiceMaster Clean)

Given the type of work ServiceMaster does, it should not be surprising that it operates with a great interest in resilience and sustainability. Steve Cox, the co-owner of the company, expressed his views on the possibilities of solar power, saying, "Not only do we see this as a cost-effective solution for the business's future energy expenses, but it also protects our environment and, in turn, the community we care so much about."

We might also note that Maine Solar Solutions can help guide customers as they think about ways to finance systems. There are many ways to do this, and there is an informative posting on this in the blog at the company's website.

Maine Solar Solutions' website is mainesolarsolutions.com. ♻

Green Power Series: Solar Farms in the Northeast

Part 1: Solar Farms Make a Difference with Renewable Power

Toby Martin

In the broadest sense, a farm can be defined as an area where something of sustainable value is deliberately propagated for human consumption, a concept that originated thousands of years ago with plants and animals when some people made a transition from hunting and gathering to agriculture.

Today, farming acres of electricity, once the exclusive domain of hydropower, has now evolved to solar generation, as on- and off-grid technology becomes increasingly available and affordable, and increasingly offsets the harmful carbon emissions created by fossil-fueled power plants.

Today's climate crisis has created a focus on sustainability, human survival and technology that has brought solar energy into worldwide consciousness. Out of the solar power surge has come the dramatic growth of the solar industry and related businesses: new companies needing engineers, builders, inventors, electricians, manufacturers, certification, training, salespeople, office staff, installers, equipment. And now solar farms are becoming an important, relevant and fast-developing outgrowth of inventive thinking and economic development that offers opportunities for increasing numbers of people.

A solar farm is a large-scale, ground-mounted photovoltaic installation that collects solar energy to generate and transmit electricity to an electric utility grid system. Community-scale solar farms ordinarily generate from as little as 100kW (kilowatts) to five MW (megawatts), while commercial farms span from 1 MW to 2,000 MW. Community solar farms, on the other hand, serve their subscribing shareholders, while commercial systems serve a utility company's customers. Both systems are clean, non-polluting energy producers.

Community solar farms are essentially electric companies that handle all operations, from negotiating property sale or lease of a site, hiring a solar contractor, and coordinating billing and coordinating other business once subscribers signs on.

Community solar, because it is independently owned and sited at a distance from its subscribers, unlike off-grid or net-metered home solar systems, is not tied to the fee requirements mandated by public utilities, and is therefore able to offer subscribers cost reductions between 10 and 15% lower than utilities' standard offers. It also appeals to a diverse range of subscribers. Some are those are earning lower and middle incomes; and it can supply people who are renting, as well as provide a way for homeowners on a tight budget to invest in a reduced cost clean energy sharing approach that would not

Cont'd on p.21

Community Power Coalition of New Hampshire Incorporates

with Membership of 13 Municipalities and One County

Do you know where your power comes from? If you live in select municipalities in New Hampshire, soon you will be able to have more control over the source of your electricity.

On Friday October 1, 2021, thirteen municipalities and one county joined together to incorporate Community Power Coalition of New Hampshire (The Coalition). The nonprofit Joint Powers Agency was created to assist participating cities and towns in launching Community Power programs by which they aggregate and sell electric power on a community scale. Community Power was made possible by recent legislation enacted in 2019 amending RSA 53-E, also known as the Community Power Law and is a voluntary program for residents and municipalities.

The founding members of the Coalition are: Cities of Lebanon, Nashua and Dover; Towns of Hanover, Harrisville, Exeter, Rye, Warner, Walpole, Plainfield, Newmarket, Enfield and Durham; and Cheshire County. Each member community has appointed a Director and an Alternate to serve on the Coalition's Board of Directors.

"This is the most exciting thing to happen to the electricity sector in New Hampshire in decades," said New Hampshire's Consumer Advocate, Don Kreis. "If you are fortunate enough to live in a Community Power municipality, your municipality is going to be intimately involved in delivering to you not just cheaper electricity, but a whole menu possibly of energy initiatives that will deliver concrete benefits to you, that it will make you a more empowered and flexible consumer of the electricity grid and of energy generally."

"A lot of work has occurred over the past two years to get us to this point, and I'm thrilled that we are kicking off the Coalition with such a robust and diverse membership," said Hanover Sustainability Director April Salas, who was elected Chair of the Coalition. "This new institution is going to have a real impact in empowering our cities and towns to really lead on energy issues."

Pictured (L to R): Steve Holmgren, Durham; Ned Hulbert, Harrisville; Andrea Hodson, Harrisville; Everett Hammond, Lebanon; Julie Gilman, Exeter; Peter Kulbacki, Hanover; Lori Wilshire, Nashua; Kim Quirk, Enfield; John Tabor, Portsmouth; Doria Brown, Nashua; Andrew Maneval, Harrisville; Don Kreis, Consumer Advocate; Matt Miller, Pembroke; Howard Kalet, Rye; Peggy Schirrer, Walpole; Clifton Below, Lebanon; Renay Allen, Exeter; Craig Putnam, Hudson; Evan Oxenham, Plainfield; Penti Aalto, Pembroke; Dori Drachman, Peterborough; Jo-Ellen Courtney, Enfield; Phillip Stephenson, Hollis; April Salas, Hanover; Sam Evans-Brown, Clean Energy NH; Mary Day Mordecai, Growing Edge Partners; George Packard, Warner; Henry Herndon, Consultant; Tad Montgomery, Lebanon; Samuel Golding, Community Choice Partners; Lew Hitzrot, Exeter.

Coalition Membership is open to all New Hampshire cities, towns and counties, and to regionally operated Community Power programs. The Coalition is subject to New Hampshire's Right to Know law and all official meetings will be noticed and open to the public.

"It is finally here" was a resonant sentiment heard often throughout the day. Consultants Samuel Golding and Henry Herndon have been working with these fourteen municipalities, among others, over the last year and a half to help form and launch the Coalition.

Clifton Below, Lebanon's assistant mayor, was elected Vice-Chair of the Coalition. Mr. Below is the primary author of the legislation enabling Community Power. "Community Power Aggregation is a deliberate double entendre," said Below. "We will be providing electric power in aggregate to our communities, with the goal of lowering costs and expanding access to renewable energy and other innovations. But the Coalition also aggregates the political power of communities so their interests may be better represented in state policy decisions that impact energy."

The 13 city and town members of the Coalition represent more than 210,000 residents, or about 15% of the population of New Hampshire with a potential default service load larger than Liberty Utilities' default service, approximately equivalent in size to both Unitil and the New Hampshire Electric Coop, and all of which are smaller than Eversource (New Hampshire's largest investor-owned distribution utility).

State law directs the Public Utilities Commission to adopt rules governing the relationship between Community Power programs and distribution utilities with regard to metering, billing, access to customers data and other aspects of programs. Prior to incorporation, Coalition members collaborated with the PUC, utilities and other stakeholders to draft regulatory rules. The Coalition intends to continue to collaborate with state regulators and utilities on rules that enable an expeditious launch of New Hampshire's Community Power market.

Electric distribution utilities continue to own and operate the local electrical grid, while Community Power programs serve as the default electricity supplier within the municipality. The programs operate on a competitive basis and are self-funded through the revenues received by participating customers, who can choose to take default service from their distribution utility or from a Competitive Electric Power Supplier.

The Coalition aims to begin providing electric power supply for initial communities in 2022. For more information or to be involved, visit www.cpcnh.org or email info@cpcnh.org. ♻

Derry, NH Solicits Bids on 2.2MW Solar Farm

Governor Sununu Signs HB315, Expanding Municipal Solar Capacity to 5MW

Craig Lazinsky

Taking advantage of signed New Hampshire legislative bills HB315 and SB91 by Governor Sununu at the Derry Fordway Transfer facility on August 26, 2021, the Town of Derry solicited bids for a 2.2MW (megawatt) solar farm to be erected on ten acres of unused town-owned solid waste landfill on Kendall Pond Road. Bids for the 10-acre solar farm are currently being evaluated following the submittal deadline of September 1.

Governor Sununu surrounded by members of New Hampshire legislature, Derry Town Council, NetZero Energy Committee and community members as he signed two renewable energy bills at the Derry Transfer Station on Aug 26, 2021. (governor.nh.gov)

This bidding process, including the Request for Proposal (RFP) is coordinated by Derry Director of Operations, Mike Fowler, with technical assistance from the Derry NetZero Task Force under the direction of Committee Chairman Jeff Moulton. The 2.2MW system would be sufficient to provide the electrical needs of municipal facilities including police and fire stations, water department, Municipal Center, public street lighting, Taylor and Derry Public Libraries, Marion Gerrish Center and Opera House, among other facilities. Additional capacity for powering public schools may be added in a future option with approval from the School Board, adding approximately 2.7M kilowatt hours of electrical capacity. According to NetZero Chairman Moulton, "Town municipal electrical energy savings may be anticipated up to $3.5 million over the expected solar farm's lifespan of twenty-five years, with potential payback in under twelve years."

By limiting the total solar output to under 5MW, the Town is maximizing benefits of two bills recently passed by the NH Legislature and signed by Governor Sununu, who characterized the two bills as "…a 603 win for clean energy." House Bill 315 increases the current group net metering cap of 1MW to 5MW for NH cities and towns, enabling significant revenue generation and renewable energy investment. Senate Bill 91 is an omnibus renewable energy bill requiring the state to adopt rules about energy storage, as electrical storage batteries are becoming more commonplace in homes, businesses and industrial applications.

Derry Director of Operations Mike Fowler said, "The solar installation at the Fordway Town Transfer Station that was installed in 2018 is operating above its expected capacity. Production has met the promised annual target of 150,000 kWh, and produced nearly $50,000 in energy savings over 2-1/2 years of operation, with expected payback in just 9-1/2 years. Projected out through its expected 25-year life expectancy we anticipate about $370,000 in total electrical energy savings for the Town."

Bids for the 10-acre solar farm will now be evaluated. The winning bidder will agree to build the solar farm over the existing landfill in compliance with NHDES and NH-PUC guidelines, providing a lease-to-own or outright purchase option, for consideration by the Town Council.

Craig Lazinsky is the vice chairman of the Derry Net-Zero Committee, craiglazinsky@comcast.net, https://www.derrynh.org/net-zero-task-force ♻

This 86kW solar facility at Derry's Transfer Station has returned nearly $50,000 in electricity savings since 2018. (Craig Lazinsky)

When It Comes to Nuclear Power, "Advanced" Isn't Always Better

A detailed UCS technical analysis raises safety, security, and sustainability concerns around new reactor technologies.

Elliott Negin, Senior Writer for Union of Concerned Scientists (UCS)

Nuclear power proponents have long been prone to wishful thinking. Back in 1954, Atomic Energy Commission Chairman Lewis Strauss famously predicted that nuclear-generated electricity would ultimately become "too cheap to meter." Today, nuclear power is among the most expensive forms of electricity.

Strauss's successor at the commission, Nobel laureate Glenn Seaborg, projected in 1971 that nuclear power would produce nearly all the world's electricity by 2000. Today, nuclear energy's share of worldwide electricity is only 10 percent. In the United States, it produces about 20%, and about a third of the country's fleet of aging reactors is struggling to compete with cheaper electricity sources.

Even so, there is growing interest in expanding the role of nuclear power to address climate change. As a low-carbon electricity source, it has obvious advantages over natural gas and coal. But besides being uneconomical, conventional reactors—called light-water reactors because they use ordinary water to cool their radioactive cores—are beset by serious safety and security issues and generate radioactive waste that has to be sequestered for hundreds of thousands of years.

ENTER "ADVANCED" REACTOR DESIGNS

Undaunted, some nuclear energy developers are now promoting what they call "advanced" reactor designs as a solution. Unlike light-water reactors, these non-light-water designs rely on materials other than water for cooling, including liquid sodium, helium, and molten salt. Some developers contend that these reactors, which are still in the concept stage, will solve all the problems that plague light-water reactors and be "ready for prime time" by the end of the decade.

The siren song of a cheap, safe, and secure nuclear reactor in the offing has attracted the attention of Biden administration officials and some key members of Congress, who are looking for any and all ways to curb carbon emissions. But are so-called advanced reactors merely the latest version of nuclear wishful thinking? A comprehensive Union of Concerned Scientists analysis of non-light-water reactor concepts in development suggests they are. Published in mid-March, the 140-page report found that these designs are no better—and in some respects significantly worse—than the light-water reactors in operation today.

SAFETY, SECURITY, AND SUSTAINABILITY

The report, titled " 'Advanced' Isn't Always Better," assesses the pros and cons of three main types of non-light-water reactors: sodium-cooled fast reactors, high-temperature gas-cooled reactors, and molten salt–fueled reactors (see box). It rates each type on three broad criteria: safety; nuclear proliferation and terrorism risks; and sustainability, which refers to how efficiently they use uranium and how much long-lived nuclear waste they generate. (You can find the full report online at www.ucsusa.org/resources/advanced-isn't-always-better.)

"If nuclear power is to play a larger role in addressing climate change, it is essential for new reactor designs to be safer, more secure, and pose comparable or—better yet—lower risks of nuclear proliferation and nuclear terrorism than the existing reactor fleet," says report author Dr. Edwin Lyman, a physicist and director of nuclear power safety at UCS. "Despite the hype surrounding them, none of the non-light-water reactors we reviewed meet all those requirements."

Russelville Power Plant in Arkansas. (Edibobb/Wikpedia)

At the end of 2020, the US fleet of nuclear power plants consisted of 93 light-water reactors. This was 11 fewer than in 2003 due to a number of factors, especially aging infrastructure and the inability to compete against natural gas as well as wind and solar, which are now the cheapest source of electricity in most countries around the world.

To try to slow its decline, the US nuclear industry promoted a "renaissance" in the early 2000s, and in 2005, Congress provided nearly $20 billion in federal loan guarantees for new nuclear reactors. The industry's multimillion-dollar PR campaign has resulted in only two new Westinghouse AP1000 light-water reactors, which are still under construction in Georgia with price tags of $14 billion apiece—double their estimated cost—and taking more than twice the estimated completion time.

Given this struggle in building even standard-sized (1,000-megawatt) light-water reactors, the industry has turned to two other strategies to try to secure a bigger market share: small, modular light-water reactors, which would produce even more expensive electricity than conventional reactors; and non-light-water reactors, which are largely based on unproven concepts from more than 50 years ago.

OUTSIZED CLAIMS

The new UCS report takes a close look at unsubstantiated claims developers have been making about these non-light-water designs. With little hard evidence, many developers have maintained they will be cheaper, safer, and more secure than currently operating reactors; will burn uranium fuel more efficiently, produce less radioactive waste, and reduce the risk of nuclear proliferation; and could be commercialized relatively soon.

One of these reactors, TerraPower's 345-megawatt Natrium, a sodium-cooled fast reactor, received considerable media attention earlier this year when TerraPower founder Bill Gates touted it during interviews about his new book, How to Avoid a Climate Disaster. In mid-February, Gates told 60 Minutes that the Natrium reactor will produce less nuclear waste and be safer and cheaper than a conventional light-water reactor. In fact, according to the UCS report, sodium-cooled fast reactors would likely be less uranium-efficient and would not reduce the amount of waste that requires long-term isolation. They also could experience safety problems that are not an issue for light-water reactors. Sodium coolant, for example, can burn when exposed to air or water, and the Natrium's design could experience uncontrollable power increases that result in rapid core melting.

"When it comes to safety and security, sodium-cooled fast reactors and molten salt–fueled reactors are significantly worse than conventional light-water reactors," says Lyman. "High-temperature gas-cooled reactors may have the potential to be safer, but that remains unproven, and problems have come up during recent fuel safety tests."

Fast reactors have another major drawback. "Historically," the report points out, "fast reactors have required plutonium or [highly enriched uranium]-based fuels, both of which could be readily used in nuclear weapons and therefore entail unacceptable risks of nuclear proliferation and nuclear terrorism."

UNREALISTIC TIMETABLE

Timing is also an issue. Some developers claim they can demonstrate, license, and deploy their non-light-water reactors on a commercial scale within as little as six years, enabling them to address the climate crisis in the near term. Last fall, for example, the Department of Energy (DOE) gave TerraPower and X-Energy, developer of a high-temperature gas-cooled "pebble-bed" reactor, $80 million each to begin operating first-of-a-kind commercial units by 2027, most likely at the Columbia Generating Station site in Washington State.

From concept to a commercial unit in six years? The new Westinghouse AP1000 light-water reactor provides a cautionary tale. It took more than 30 years of research, development, and construction before the first one was built in China and began to generate power in 2018. According to the report, if federal regulators require the necessary safety demonstrations, it could take at least 20 years—and billions of dollars in additional costs— to commercialize non-light-water reactors, their associated fuel cycle facilities, and other related infrastructure.

"One of the new reactor designs being considered, the 'breed-and-burn' reactor, has the most potential because it doesn't require reprocessing—or recycling—spent nuclear fuel, which poses unacceptable proliferation risks," says Lyman. "But the concept is still saddled with considerable technical obstacles and safety hazards due to the fact that fuel would remain in the reactor longer than in a light-water reactor, allowing fission gases and pressure to build. That may be the reason why TerraPower suspended work on a breed-and-burn reactor design in favor of the Natrium."

NEXT STEPS

The Nuclear Regulatory Commission (NRC) may have to adapt some regulations when licensing reactor technologies that differ significantly in design from the current fleet, but Lyman says that should not mean loosening standards that protect public health and safety. He finds no justification for the claim that "advanced" reactors will be so much safer and more secure that the NRC can exempt them from fundamental safeguards. On the contrary, because there are so many open questions about these reactors, they may need to meet even more stringent requirements.

The report recommends that the DOE suspend its advanced reactor demonstration program until the NRC determines whether full-scale prototype tests will be required before any designs are licensed for commercial deployment, which the report argues are essential. The report also calls on Congress to require the DOE to convene an independent commission to review the technical merits of all proposed nonlight-water reactors and approve only those projects that have a high likelihood of commercialization and are clearly safer and more secure than the current fleet.

Finally, the report recommends that the DOE and Congress consider spending more research and development dollars on improving the safety and security of light-water reactors, rather than on commercializing immature, hyped non-light-water reactor designs.

"Unfortunately, proponents of these non-light-water reactor designs are hyping them as a climate solution and downplaying their safety risks," says Lyman. "Given that it should take at least two decades to commercialize any new nuclear reactor technology if done properly, the non-light-water concepts we reviewed do not offer a near-term solution and could only offer a long-term one if their safety and security risks are adequately addressed." Any federal appropriations for research, development, and deployment of these reactor designs, he says, "should be guided by a realistic assessment of the likely societal benefits that would result from investing billions of taxpayer dollars, not based on wishful thinking."

Reprinted with permission from the spring 2021 issue of Catalyst*, UCS's quarterly magazine.* ♻

Online Guide from CESA Explores States' Efforts to Achieve 100% Clean Energy

On August 19, 2021, The Clean Energy States Alliance (CESA) released a *Guide to 100% Clean Energy States* (https://bit.ly/CESAStateGuidetoCleanEnergy). The Guide includes information about the goals, timelines, legislation, and plans of 18 states, plus the District of Columbia and Puerto Rico, that have adopted 100% clean electricity goals. Together, these jurisdictions represent 44 percent of the US population and almost half of U.S. GDP.

The online Guide makes it easier to track what is going on at the state level related to zero-carbon electricity.

"This new Guide will help state officials and other stakeholders to learn about state actions on the path to 100% clean electricity," noted CESA Executive Director Warren Leon. "States can easily find information that will be useful as they develop their own plans and implementation strategies."

The Guide is divided into five parts:

- **A table** listing all the states with 100% clean energy goals, specifying the nature of each goal and how it was established
- **A map** and timelines showing the states and their goals in visual formats
- **Summaries** of seven states' plans for meeting their goals, with each report's key conclusions and CESA's identification of key "takeaways"
- **A visual comparison** of the seven plans showing the analytical scopes, technologies, and policies covered by the different states
- **Links** to the legislation, plans, reports, and other documents related to all 20 jurisdictions' goals.

The Guide was produced for the 100% Clean Energy Collaborative, an initiative to assist states that have zero-carbon goals, as well as states that may seek to establish such a goal. Through the Collaborative, the states have been sharing their plans and experiences so that they can learn from each other in order to make more rapid progress towards carbon-free power. CESA manages the Collaborative, in partnership with the U.S. Climate Alliance. Although state agency officials are the primary Collaborative participants, other stakeholders and the general public can attend free webinars and receive a free monthly newsletter that reports on activities across the country.

In conjunction with publishing the Guide, CESA is also releasing *How Wholesale Power Markets Work*, the first in a series of short white papers designed to help state officials and other stakeholders understand wholesale electricity markets, as well as to provide suggestions for how to influence regional decisions related to wholesale markets.

The author of the paper, Bentham Paulos, principal of PaulosAnalysis, points out that: "The current structure of wholesale electricity markets, which were designed for conventional dispatchable generation, represents a barrier to achieving carbon-free power. State policymakers, many of whom may not have engaged previously on wholesale market issues, can benefit from better understanding how they can monitor and influence regulatory decisions that could impact the achievement of zero-carbon electricity goals."

The Guide to 100% Clean Energy States was produced by a team of CESA staff and consultants: Bentham Paulos, Charles Hua, Warren Leon, Wafa May Elamin, and Samantha Donalds. It was developed with support from and in collaboration with the US Climate Alliance. The Guide will be updated regularly to ensure it remains accurate and current.

About Clean Energy States Alliance.

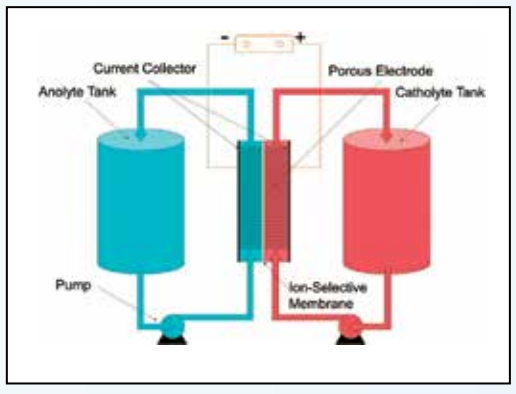
Clean Energy States Alliance (CESA) is a leading US coalition of state energy organizations working together to advance the rapid expansion of clean energy technologies and bring the benefits of clean energy to all. Established in 2002, CESA is a national, member-supported nonprofit that works with its members to develop and implement effective clean energy policies and programs.

For more information contact Samantha Donalds, Communications Coordinator for Clean Energy States Alliance at 508-654-5813 or email: sam@cleanegroup.org. ♻

Agora Energy Technologies — Not Your Average Flow Battery

George Harvey

Transitioning to renewable energy and eliminating the use of fossil fuels will be far easier if we have really good battery technology. The technology we have today is vastly superior to what there was around fifty years ago, but it will almost certainly get better. A large number of people are doing the work to find better solutions.



Redox flow battery. Image by Colintheone (www.bit.ly/3m0sFF3), CC-BY-SA 4.0 (www.bit.ly/38OKcvg).

As things stand now, there are more kinds of batteries out there than most people might imagine. One kind that is particularly promising is redox flow batteries. These are too bulky to be used in a cell phone or a car, but they can really shine for applications involving a lot of energy. For utility-scale energy storage, flow batteries have some great advantages.

According to an article that appeared at *CleanTechnica*, Agora Energy Technologies (AET), which is based in Vancouver, British Columbia, has come up with an ingenious design for a redox flow battery that goes beyond just storing electricity. The chemical reactions in the battery use carbon dioxide (CO_2) and can sequester it in any of a number of useful and valuable chemicals (www.bit.ly/co2-flow-battery).

Manufacture of some of these chemicals has historically been based on processes that emit abundant amounts of CO_2. Now, they can be by-products of AET's battery storage technology, delivered in a highly pure form. That fact is one of the reasons that the design has already won a number of awards.

Redox flow batteries are very different from the batteries in cell phones, flashlights, or cars, and they look very different. The operation of most such flow batteries depends on ions flowing through a membrane that separates two liquids.

At the core of most flow batteries is a membrane stack, where electrons move between liquids by passing through the membrane. The liquids flow past each other in the stack and are otherwise held in tanks. With a given chemistry, the working surface area of the membrane stack determines the power in the battery, which could be measured in kilowatts (how many toasters you can run). The amount of energy stored, however, depends on the volume of the tanks, and this could be measured in kilowatt-hours (the energy to run all those toasters for some amount of time).

So, if you need more power, you use a bigger membrane stack. But if you need more energy, you use bigger tanks. One way or another, the system is normally closed, and the chemicals are used over and over again. It is not unusual for a flow battery to be expected to go through 10,000 charging cycles without much change in performance.

The thing that makes the AET design different from other flow batteries is the fact that its design uses CO_2 as a chemical in its reactions. When the battery is charged, the CO_2 is stored in solution, and when the battery is providing energy by being discharged, the CO_2 is released.

The AET design goes further than that, however, because the system does not have to be closed, with the same chemicals reused constantly. It can be used in an open configuration, drawing CO_2 from an external source, and releasing it externally.

While this might not sound like an advantage offhand, the implications are huge. The CO_2 can be drawn down, possibly from products of combustion, instead of being released into the atmosphere, where we don't want it. It can then be used in the battery and released in a different form, as part of a different chemical that we can use. There are many chemicals made from CO_2. Bicarbonate of soda is just one small example.

Another advantage of the AET battery is that it is inexpensive. The components of the battery are safe, inexpensive, and abundant, though some of the specifics are proprietary, so far. Cost analysis puts the AET battery as storing electricity at a price that is well below that of other batteries.

So, what we may have, if AET can commercialize the design successfully, is a way to store energy from renewable sources that draws down CO_2 as it does so.

Agora Energy Technology's website is agoraenergy.ca. ♻

Vanadium redox flow battery with a capacity of 1-MW, 4-MWh. UniEnergy Technologies (www.bit.ly/3o6EJaA), CC-BY-SA 4.0 (www.bit.ly/38OKcvg).

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

• The federal investment tax credit (ITC) for most technologies, including solar, wind, heat pumps, and fuel cells, is 26% of expenditures through 2022. 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

• Biomass heating systems Tax Credit: 26% of the purchase and installation costs (with no cap or lifetime limit) for tax years 2021 and 2022; reduces to 22% of purchase and installation costs in 2023 (under Sec. 25D of the U.S. tax code)

• Electric Vehicles - Tax credit for qualified plug-in electric drive vehicles including passenger vehicles and light trucks. For vehicles acquired after December 31, 2009, the credit starts at $2,500 and goes up to $7,500 based on the battery specs.

USDA RURAL DEVELOPMENT PROGRAM

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

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

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

BIOREFINERY ASSISTANCE PROGRAM

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

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

• Increase energy independence

• Promote resource conservation, public health, and the environment

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

• Create jobs and enhance economic development in rural America

• For more information go to www.rurdev.usda.gov/BCP_Biorefinery

REGIONAL

NEW ENGLAND GRASSROOTS ENVIRONMENTAL FUND

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

• Must be volunteer driven or have up to 2 full time paid staff or equiv.

• have an annual budget up to $100,000

• "Seed" grants of $250-$1,000 and "Grow" grants of $1,000-$3,500

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

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

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

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

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

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

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

• **More into at at 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

In Rutland & Bennington 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 Efficiency Vermont incentives for a total of $7000; $250 for qualifying pellet or wood stove installed by a qualified installer. This can be added to stove offers from CEDF and Efficiency Vermont.

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

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

• GMP rebates available through December 31, 2021

VT TAX CREDITS

• Vermont offers an investment tax credit for installations of renewable energy equipment on business properties and wood and pellet heaters with at least 75% efficiency. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit from 2011 to 2016. For solar, small wind, and fuel cells this constitutes a 6.24% 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.

Lighting

• Special pricing on select ENERGY STAR® LED fixtures 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 $1,000. Moderate income Vermonters get 50% off up to $3,000.

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

Appliances (must be ENERGY STAR)

• Dehumidifiers: $25 - $40 rebate

• Clothes Dryers: $200-$400 rebate

Heating/Cooling/Water Heating

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

• Advanced pellet or cord wood stove: $200 discount at participating retailers for replacing an old stove.

Heat Pumps:

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

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

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

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

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

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

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

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

• Electric utility rebates may also be available.

Residential New Construction

• Enroll to receive a home energy rating, expert technical assistance, and incentives – Efficiency Vermont Certified™ projects receive up to $4,000 cash back

• Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives

Other Opportunities to Save

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

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

Contact your utility for more information.

Incentives for Pro-environment Agriculture Behaviors

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

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

Electric Lawn Mowers

• Incentives for commercial and residential battery-electric lawn mowers and some tools are now offered by all of VT's electric utilities, including:

• VEC (www.bit.ly/VT-mowers-VEC);

• WEC (www./bit.ly/VT-mowers-WEC);

• BED (www.bit.ly/VT-mowers-BED);

• VPPSA (www.bit.ly/VT-mowers-VPPSA);

• Stowe Electric Company: (www.bit.ly/ VT-mowers-SEC);

• GMP (www.bit.ly/VT-mowers-GMP).

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NYSERDA

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

NYSERDA currently has a $1,500 per ton incentive on geothermal for residential systems.

Visit NYSERDA's new website. It is user-friendly and a one-stop learn-all site: https://www.nyserda.ny.gov/ny/PutEnergyToWork/Energy-Program-and-Incentives.

Extended Federal Tax Credits for Renewable Energy

Good news for renewable energy and climate action!

A budget package has finally been developed that begins to address the climate crisis.

Making local renewable energy more affordable, this bill translates directly into good jobs, less climate pollution and more resilient communities.

Among the most significant measures are extended tax credits for renewable energy.

• SOLAR: The investment tax credit (ITC), which was scheduled to drop from 26% to 22% in 2021, will stay at 26% for two more years.

• ADVANCED WOOD HEAT: For the first time, a 26% investment tax credit applies to the installed cost of home heating and hot water systems that utilize wood pellets, chips and cordwood at efficiencies greater than 75 percent high heat value.

• GEOTHERMAL HEAT PUMPS: The 26% tax credit was also extended for geothermal heat pump projects that begin construction in 2021 and 2022. Overall, the bill includes $600 million for wind energy, $1.35B for solar, and $1.35B for grid-scale energy storage. It also includes a plethora of stimulus measures for small businesses.

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.

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

Effective March 6, 2020, incentives are limited to 25% of the total project cost or $10,000 if less than the AC incentive payment otherwise calculated, whichever is less. The Program is available to non-residential structures with a commercial electric meter located in New Hampshire.

Incentive levels for PV systems are as follows:

- $0.20/watt (lower of AC and DC) for new solar electric facilities.
- Expansions to existing solar systems are not eligible.
- Incentive levels for solar thermal systems are as follows:
- $0.12/rated or modeled kBtu/yr for new solar thermal facilities fifteen collectors in size or fewer; $0.07/rated or modeled kBtu/yr for new solar thermal facilities greater than fifteen collectors in size;
- Expansions to existing solar systems not eligible.

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

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

Residential Solar/Wind Rebate Program

-Currently closed, this program offers rebates to qualifying NH residents who install photovoltaic (PV) or wind turbine electrical generation systems. Rebate levels are $0.20 per watt of panel rated power up to $1,000, or 30% of the total facility cost, whichever is less. ***Check for updates for ALL Rebates at http://www.puc.state.nh.us/Sustainable%20Energy/RenewableEnergyRebates-SREG.html***

Residential Solar Water Heating Rebate Program

- Program is currently closed:

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

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

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

Residential Wood Pellet Boiler/Furnace

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

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

LOCAL INCENTIVES

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

- *These are offered on a town-by-town basis.*
- The state also has passed PACE (property-assessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes
- Information at www.nh.gov/osi/energy. for more information.
- Plug-In Hybrid Electric Vehicles (PHEV), and $300 on Electric Motorcycles.

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

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

NHEC offers incentives for Level 2 Electric Vehicle Charging Stations.

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

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

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

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

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

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

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

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

ENERGY STAR Heat Pump Water Heater – (Must meet or exceed 2.3 energy factor) $750 rebate on 40-80 gallon heat pump water heaters

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

NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the Home Heating Index (BTUs of heating fuel / conditioned square feet / heating degree days). Must provide at least 12 months of heating fuel history. Once qualified, eligible homes get a $450 value comprehensive energy audit for $100 (rebated if improvements installed), and 75% instant rebate for eligible weatherization improvements up to a $8,000.

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

NH ENERGY STAR Homes

- Incentives for new homes which meet ENERGY STAR guidelines. Incentives include
- HERS rating fees paid by the utility, rebates for ENERGY STAR lighting, appliances –up to $4,000 based on the HERS score.
- Visit www.NHSaves.com/newhome for more details.

NHSaves Residential ENERGY STAR ® certified Products Program

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

- Refrigerator/freezer recycling is available – unit must be in working condition (10 – 30 cubic feet in size), program includes free pickup and $30 rebate. For program requirements and scheduling information go to www.NHSaves.com/recycle.
- Instant rebates available on select ENERGY STAR® certified LED light bulbs purchased through participating NH retailers(offers vary by retailer, see store associate for details) Visit: www.NHSaves.com/nh-rebates.
- Rebates are available to residential electric customers of the four NHSaves utilities.

NHSAVES Online Store

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

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

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

NHSaves: 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.

Community Development Finance Authority (CDFA) Clean Energy Fund

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

to support energy efficiency and renewable energy projects.

Small Business Energy Audit Grants

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

Community Facilities Energy Assessment Grants

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

Find out more at: nhcdfa.org/energy.

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

MAINE

EFFICIENCY MAINE

Efficiency Maine is a division of the Maine Governor's Office of Energy, provides information and rebate opportunities online and by phone (efficiencymaine.com, 1-866-376-2463) for Maine homeowners, businesses and municipalities.

Rebates included through Efficiency Maine's programs include a wide variety of approved :energy efficient devices and services that cut energy costs and lower greenhouse gas emissions. Standard rebates range from $50 to $7,500 or more, available through pre-approved businesses, dealers and contractors. Low income eligibility options are available.

Appliances: Clothes dryers, clothes washers, dehumidifiers, dishwashers, freezers, refrigerators, retail store discounts, room air purifiers.

Weatherization, HVAC, Inulation: Air sealing and energy assessment, circulator pumps, electric vehicles, gas heaters and boilers, geothermal systems, heat pumps, heat pump water heaters, gas heaters and boilers, insulation, pellet boilers

Financing: Energy upgrade loans, up to $15,000 at 4.99% over 10 years.

Federal Tax Credits: Also available for EV chargers; gas, propane and oil furnaces, boilers and heaters; pellet and wood stoves; solar systems (no cap, 26%),

Learn more at efficiencymaine.com.

GREEN ENERGY TIMES' TEAM

Cont'd from p.2

pump for heating and cooling, heat recovery ventilator for ventilation, only drive electric cars, induction range and buy only energy star products, bike as much as we can, use rain barrels for irrigation, compost to enrich soil and reduce the energy it will take to cart this valuable resource away and waste the energy it took to produce this waste in the beginning, low carbon footprint building materials, no chemicals in our garden and landscape, no fossil fuel engines such as lawn mowers, weed whackers etc., and grow as much food as we can. Every electron and calorie counts. The best way to save energy is not to use it. A little story. I bake a lot of cookies, and I scrape the bowl each time and squeeze out one more cookie. If I do that just once a week, that is 52 more cookies in a year. Would you want to waste 52 cookies?"

***G.E.T.* comments**:

Save me some cookies, Joanne!

Our readers will doubtlessly recognize the names of **Joanne and Paul Coons**, which often come up in our by-lines. We suggest that readers **visit page 24 to read an article Joe Parsons wrote about a house Joanne and Paul renovated for themselves, "Historic Home in New York Goes 100% Renewable Energy."**

In our next issue, we will bring our readers more about how those who work to G.E.T. the word to you, and who work to sustain and heal the planet for a safe and comfortable future. ♻

Sustainability and the Arts at Sage Street Mill

Bennington, Vermont

George Harvey

The Sage Street Mill (the Mill) is a historic industrial site in North Bennington, Vermont. It is not something that a lot of people notice. Houses were built around it, and they are much more in the everyday view of most people.

Several industries have operated at the Mill, but they seemed destined, sooner or later, to fall on hard times. One produced buttons, but it is long gone. Most recently, the Mill was used to make ball valves, but the company that was doing that was so far from prosperous that it went ten years without paying its taxes. In the end, taxes were not the only problem, and it went out of business. And with that, the Mill was empty.

In 1993, the Mill went up for Sheriff's auction. Buildings ranged from needing some tender loving care, at best, to irretrievably run down. There was a very small environmental mess that needed cleaning up, involving spilled oil. But there was one real mess that needed to be put under control immediately. It was the financial mess of all the back taxes.

The Mill in North Bennington, Vermont is bringing solar and arts to the area with the power of the sun. (Courtesy images)

The courtyard at the Sage Street Mill in North Bennington, Vermont.

In 1993, Patricia Pedreira bought the Mill at auction, assuming its outstanding financial burdens in the process. Over the first ten years, she had to learn a lot, and she had to put in a lot of effort to get the buildings that were worth the effort into stable condition. In addition, of course, she had to keep paying not only the taxes and other expenses, but the back taxes that she had assumed, though she had not incurred them.

Patricia is a woman with a remarkable background, which is matched by an equally remarkable vision. She is the daughter of an Irish-American mother and a Brazilian father, and she embraces both heritages. It may be a result of this that she is able to see possibilities that others miss.

Sometime early on, in her work at the Mill, she found that nature seemed to add an unusual support to her dream. It came, oddly enough, in the form of migratory birds that come each year to nest at the Mill. There is a large flock of chimney swifts that nest in a large, disused chimney. The chimney is no longer connected to any building that would be heated, so it is theirs alone, and it is big enough for the whole flock. The swifts' winter home is in South America, so Patricia feels a tie to them that is almost familial.

Of course, the buildings that are in use at the Mill have required attention for weatherization, efficiency, and cleaner energy. This is an ongoing process that is somewhat complicated by the fact that the buildings have very large and old windows. Other issues include energy, and Patricia has been working out plans for solar power with Power Guru's, Karen Jernigan. The rooftop solar system will start at 32 kilowatts, though there is a probability that more will be coming, along with alternative solar applications.

The issue of greatest interest, however, is one that has to do with education and spreading the word about this new, forward-looking sustainability hub. While the Mill is offering workspaces and living quarters, and improving its own sustainable programming, it is also spreading the word in novel ways that are designed to draw engagement for sustainability from the wider community.

This is an issue that both Patricia and Karen commented on as an example of the goals established by Power Guru's founder, Bhima Nitta. Bhima's vision and true passion was to see that people learned about the importance of energy efficiency, and then solar energy.

The Mill regularly has events supporting sustainability and the arts. Currently, there is a "Pop-up" year-round alternative market every Friday from 4:00 to 7:00 PM. In development and curation-mode, is a multi-media art exhibit, called "Re-envision Renewables," which will open on October 27, featuring artists who are combining sustainability with nature in harmony.

The Mill has a website, where anyone can learn more about this exciting sustainability hub. There are a number of rental spaces available for living and working. The Sage Street Mill's website is www.sagestreetmill.com. ♻

There is a large flock of chimney swifts that nest in this large, disused chimney, as their summer home.

Greenvest Named "Best for the World" B Corp for 2021

Ranking in the Top 5% of Certified B Corps Worldwide.

Craig Walker, Financial Advisor and Todd Walker, Founder and Senior Advisor. (Greenvest®)

After little more than a year since being approved as a B Corp™, socially responsible investment firm Greenvest® has been named a Best for the World™ B Corp for their exemplary performance beyond commercial metrics. Specializing in clean impact investment management for individuals, trusts and employee retirement plans, Greenvest®'s main offices are located in Vermont – Montpelier and Wells – with additional offices in the Boston and San Francisco Bay areas.

Ranking in the top 5% of all B Corps in their size group worldwide for sustainable business practices, Greenvest® earned this honor because of customer initiatives such as in-depth investment social screening so clients know the social track record of their investments, personal financial planning at no extra fee, complete digital forms processing for more convenience and reduced environmental impact, comprehensive community investing that supports local organizations, and shareholder activism services such as proxy voting guidance.

"We're honored and thankful to be recognized as a Best for the World B Corp after just a year as a B Corp," said Todd Walker, founder and senior advisor. In the over fifteen years we have specialized in socially responsible investing, we have always put our clients' financial and social goals first, including working for our shared environment, which is the essence of the B Corp mission. And now we must all work harder as climate change has become undeniable."

The Best for the World recognition is administered by B Lab®, the global nonprofit network that certifies and mobilizes Certified B Corporations®, which are for-profit companies that meet the highest standards of verified social and environmental performance, legal accountability, and public transparency to balance profit and purpose. Today there are more than 4,000 Certified B Corporations across 77 countries and 153 industries, unified by one common goal: transforming the global economy to benefit all people, communities, and the planet. (https://bcorporation.net)

More than 800 B Corps from more than 50 countries were named to the 2021 Best for the World lists. The 2021 Best for the World lists are determined based on the verified B Impact Assessments of Certified B Corporations. The full lists are available on https://bcorporation.net/.

Greenvest® provides personal consulting on socially responsible investing and creates custom investment portfolios that align with each client's individual social values and financial goals. They offer among the largest arrays of socially responsible investing services and product choices available, ranging from exclusionary (fossil-free portfolios) to positive and inclusionary (gender-lens investing) to green company retirement plans. Learnmore about Greenvest®at greenvest.eco. ♻

Now that Climate Change is Here, How Do You Invest?

Todd M. Walker and Craig R. Walker

We've been warned since the '70s, of course. --although scientists and environmentalists called it "The greenhouse effect" back then. Over the years the debate raged over whether the impact from man-made gases would be warming or cooling until a consensus emerged that while it might affect various regions differently, one thing would be constant: if we did not reverse the process, our weather would become increasingly extreme no matter where you live.

Still, even as average temperatures increased as predicted and wildfire seasons lengthened and droughts deepened, doubt and debate continued over the new term "climate change" – from outright denial, to acceptance something was happening but it was just a natural cycle, to suddenly a remarkable sea change in public opinion this summer, and we hope a defining moment of our time.

Faced with a 1-2-3-4 punch of over-the-top destructive worldwide weather – from unprecedented heat, drought, and fires of our Great West, extreme flooding in Germany and China, and finally seeing just remnants of a hurricane doing more damage to our east coast than direct hits have, the reality of the climate crisis finally hit home. By the end of the summer the press was no longer wondering "if" climate change is real, but the 'what can be done?' and how quickly. We believe the age of climate reversal has begun.

What We Are Telling Our Clients

Certainly, compared to saving civilization on our planet, we recognize that savings and investments are not the highest global priority. But people are understandably concerned about their nest eggs as we enter this unknown and we are getting more and more questions on this. So, here's our current thinking, including some good news.

- **Don't Panic, but Don't Wait.**

As Al Gore coined in 2006, climate change is an inconvenient truth, but it will not be the end of the world. We've lived with the prospect of nuclear holocaust for far longer and prospered. People and economies will continue to function, mankind will find solutions and adapt to the new reality as it always has. So, we advise not to sell all your investments to cash. This was the wrong answer in the Great Depression, 2000 and 2008 and it's the wrong move now. On the other hand, don't waste any more time to act, now that public opinion has changed. Like all things financial, the trend is your friend.

- **The Tools Are at Your Fingertips.**

Fortunately, one branch of the investment industry started worrying about the environment and climate change as early as the 1980's and has built up an effective way you can help, simply by investing. We are referring to the socially responsible investment (SRI) industry, also known as sustainable, impact or green investing, or most recently "ESG" – investments that factor in environment, social and corporate governance factors.

Above: There's no denying climate change any longer after the recent rash of climate events. (researchleap.com); below: There will be many new SRI/ESG investment opportunities in the age of climate reversal. (alcse.org)

SRI grew steadily through the 80s and 90suntil it really took off in the new millennium. Today the industry remains the fastest growing financial sector. In fact, more than one out of every three dollars under professional investment management in the U.S. is now involved in SRI.[1]

Plus, SRI/ESG investment choices continue to grow: The number of sustainable funds available to U.S. investors grew to almost 400 in 2020 — up 30% from 2019 and a nearly fourfold increase over a decade, according to Morningstar[2].

- **How You Invest Can Make a Big Difference for the Planet.**

How do socially responsible investments help against climate change? In a two-pronged way: first by choosing to reject some industries for your portfolio, such as fossil fuels, you and many others squeeze off the capital they need to grow, survive (and pollute). Second, by redirecting that capital (investments) to planet-conscious industries such as clean energy, you foster their growth. Get enough people to do that and the impact can be dramatic, as the coal industry discovered over the last five years.

- **But Will You Sacrifice Performance?**

This is an old myth about SRI/ESG and the answer is no. In fact, according to Price, Waterhouse, Coopers ESG-aligned funds cumulatively outperformed their traditional counterparts by 9% over a period from 2010 to 2019[3]. Of course, as always past performance is no guarantee of future results.

- **Play both Defense and Offense – and Sectors We Like Now.**

Responding to climate change as an investor is the same as with any disruptive news. First, you want to review your portfolio to sell holdings in harm's way, in this case sectors like fossil fuels, waterfront real estate companies, casualty insurance, winter sports, travel, etc. Then you want to reposition money into sectors positioned to benefit, such as renewable energy, home energy solutions, green utilities, internet conferencing, electric vehicles, lithium & batteries, infrastructure construction, smart agriculture, etc. There are many mutual and exchange traded funds today that can help you pinpoint these areas, or you can work with a personal investment manager who can create a custom portfolio for your individual situation.

People are understandably concerned about their nest eggs as we enter this unknown.

- **Stay the Course**

Yes, we know this is the usual mantra from investment people but to understand the sound thinking behind it, you have to realize two major points about the stock market. 1) In summary, what you are adding to your portfolio with stocks is the power of innovation. Bonds, CDs and fixed annuities promise a stated rate of return, but no more than that. Innovation has no bounds for shareholders – think Apple, Tesla. Of course, fixed income securities are designed to pay back your principal at maturity. They each play a role in your finances, but without the stock innovation piece you cannot keep ahead of inflation and generate real wealth over time. 2) The press typically focuses on the bad news, chasing some people out of the market. But smart investors know that good news can also break out at any time and you must stay in the market to capture the 50% of the time that happens. Which is why the market hasn't collapsed so far from the combined impact of Covid and climate change. History is on the side of eventual innovation and solutions.

And that's also why the major change this summer on accepting climate change in a way is good news. It finally allows the U.S. and the world to coordinate resources behind a common goal and really start doing something. It's happening already, and we believe will become one of the central themes of this age and offer some of its best investments.

Todd and Craig Walker are Financial Advisors at Greenvest®, a Vermont-based personal asset management firm specializing in socially responsible investing since 2004, and a certified B Corporation®. www.greenvest.eco

[1] *Source*: The Forum for Sustainable and Responsible Investment -- Trends Report 2020*

[2] *Source*: Morningstar, U.S. Sustainable Funds Continued to Break Records in 2020, 2/25/2021*

[3] *Source*: 2022: The growth opportunity of the Century; Are you ready for the ESG Change? © 2020 PricewaterhouseCoopers, www.pwc.com*

** Information contained from sources believed to be reliable but we cannot guarantee its accuracy or completeness. Past performance is not a guarantee of future results.* ♻

CLIMATE CRISIS... CHILDREN – Cont'd from p.1

Young people rally to stop climate change. (Callum Shaw)

"Children are more vulnerable than adults to extreme weather, droughts and floods. They cannot control their level of exposure in the same way adults can, and are less able to survive the impacts of these events," the report's authors write.

Moreover, children have a greater susceptibility to "diseases that will proliferate with climate change, such as malaria and dengue. Nearly 90% of the global burden of disease associated with climate change is borne by children under the age of five."

The American Academy of Pediatrics (AAP) has made similar observations, using data from Southern California to note a 56% rise in the rate of hospital admissions for asthma among five- to 19-year-olds in the aftermath of a major wildfire, for instance.

The AAP has also highlighted the particular hardships experienced by children displaced by extreme weather events, which cause "irreparable harm through devastation of [their] broader social context," as evidenced by the public school system in Louisiana, which reported a disproportionate number of "problems related to attendance, academic performance, [and] behavior" among students who fled Hurricane Katrina.

Even in regions that have yet to see significant destruction, parents and psychologists have begun to speculate upon the mental and emotional burden shouldered by young people as they contemplate their climate future. How should a child deal with feelings of hopelessness, anger, or betrayal by their elders, not to mention a fearsome political call to arms?

Timothy Walsh Whitney, a mental health counselor in Brattleboro, VT, treats primarily kids between the fourth and 12th grades. He cautioned that parents and caregivers should avoid apocalyptic prognoses ("scare tactics," as he put it), which could hamper young people's ability to meet the real problems of climate change as they emerge.

"I think one way to try to manage that fear is to honor where we're at in time and what we can do, and also to stay present and not lose our sense of humor and our humanity," he said.

In his experience, however, kids today still tend to dwell far more upon the stressors of their immediate environment than upon the specter of climate change.

"In all honesty, in the past 16 or 18 months, Covid has definitely taken front stage in terms of anxieties about scary things," he observed. "I think the impacts are more direct and day-to-day."

Twelve-year-old Brette Fialko Casey, of Burlington, VT, learned about climate change in the third grade, when her teacher "did a whole lesson on, like, 'This is what a carbon footprint is, and this is energy efficiency, renewable energy, windmills, sustainability, all that,'" she recalled.

In the classroom, the science of climate change comes up often and at length, but Burlington's elementary and middle school curricula don't delve much into "the economic or political side of it," Fialko Casey reported.

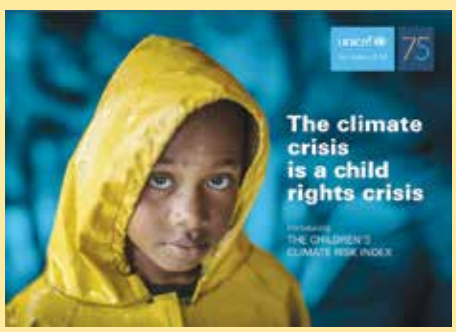
The politics of climate justice may begin later, as exemplified by older adolescents like Sweden's Greta Thunberg, who addressed the 2018 UN Climate Change Conference at age 15. In the U.S., the Sunrise Movement – a self-described "youth movement to stop climate change" – has drawn attention for its sit-ins and other protests.

Volunteer Jesse Scarlato serves as the hub coordinator for Sunrise Montpelier, a small chapter of the nationwide organization. She spoke of the anxieties that inform young activists' sense of urgency.

"When I think of saving money for a house, I think, what good is that going to do if there's so much flooding and erratic weather in the future? When I think about how long it would take to go to college or go to graduate school, it's like, 'I should be spending that time organizing around climate, because we have so little time to turn things around,'" she explained.

"I think dealing with climate change is pushing us out of an individualism frame," she added, "because things like that – owning a home or getting a degree – they aren't going to save us. They aren't going to make our lives better if we're dealing with a level of climate catastrophe that we very well might be in the future."

Brett Yates is a contributing writer for Green Energy Times. He lives in Burlington, Vermont. ♻



The cover of UNICEF's new report shows a victim of Hurricane Iota in Nicaragua. (The United Nations Children's Fund)

DOE Invests $61 Million for Smart Buildings that Accelerate Renewable Energy Adoption and Grid Resilience

On October 13, 2021, the U.S. Department of Energy (DOE) announced $61 million for 10 pilot projects that will deploy new technology to transform thousands of homes and workplaces into state-of-the-art, energy-efficient buildings. These Connected Communities can interact with the electrical grid to optimize their energy consumption which will substantially decrease their carbon emissions and cut energy costs. This project will help achieve the Biden Administration's goal of reaching a net-zero carbon economy by providing a model for reducing the building sector's contribution to the climate crisis.

"From our homes to workplaces, this groundbreaking, grid-connected building technology will help reduce our impact while cutting energy bills, maximizing convenience, and propelling our efforts to reach a carbon-neutral, clean energy economy by 2050," said U.S. Secretary of Energy Jennifer M. Granholm. "These projects will help universalize technology that can maximize the efficiency and sustainability of America's nearly 130 million buildings and make significant headway in the fight against climate change."

Connected communities of grid-interactive efficient buildings (GEBs) use smart controls, sensors, and analytics to communicate with the electrical grid, reducing the amount of energy they require during periods of peak demand. This capability is used to optimize buildings and distributed energy resources to maintain the comfort of the building occupants, lowers utility bills, and reduces grid system costs.

A recent DOE study estimated that by 2030, GEBs could save up to $18 billion per year in power system costs and cut 80 million tons of carbon emissions each year. That is more than the annual emissions of 50 medium-sized coal plants or 17 million cars. DOE's first two connected communities in Alabama and Georgia have already demonstrated this potential by using approximately 42-44% less energy than today's average all-electric home.

"Lowering energy bills through energy efficiency and energy efficient systems is the best way to lower our carbon emissions and lower costs for businesses, renters, and homeowners," said U.S. Representative Mike Doyle (PA-18).

The 10 projects selected today will further demonstrate the capabilities of GEBs across a wider range of technologies, locations, and building types. The teams selected to manage these projects represent a cross-section of the buildings industry that include utilities, local governments, homebuilders, and end-users. Numerous projects plan to bring the economic benefits of GEBs to low-income communities who need it most. The selectees are:

- Electric Power Research Institute, Inc. (New York City, Seattle, San Diego) will transform multi-family buildings in affordable housing developments into GEBs that will demonstrate different ways to decarbonize buildings, make them more resilient, and reduce utility bills. (Award amount: $5.27M)
- IBACOS, Inc. (NC) will deploy a coordinated control program to optimize the energy use of a comprehensive mix of distributed energy resources in 1,000 new and existing homes, including single-family and multifamily homes and both owner-occupied and rental properties. (Award amount: $6.65M)
- Open Market ESCO Limited Liability Company (MA) will bring the benefits of efficiency, demand flexibility, renewable generation, and energy storage with more affordable renovations in up to 20 low-to-moderate-income apartment communities. (Award amount: $6.65M)
- PacifiCorp (UT) will establish a program to manage solar photovoltaic, batteries, electric vehicle charging in a diverse community of all-electric buildings and a mass transit transportation center, equipped with the latest market-leading efficient technologies to optimize their collective energy use and provide grid services at scale.(Award amount: $6.42M)
- Portland General Electric (OR) will renovate over 500 buildings in North Portland's historically underserved neighborhoods to reduce their energy burden with numerous energy efficiency measures and connected devices that provide the grid with a range on energy services. (Award amount: $6.65M)
- Post Road Foundation (ME, NH) will investigate the capacity of a novel Transactive Energy Service System to harmonize communications and optimize energy use among the distributed energy resources, local energy markets, and buildings of three rural communities. (Award amount: $6.65M)
- Slipstream Group Inc. (WI) will convert approximately 15 facilities in Madison, Wisconsin into GEBs that connect with nearby electric vehicle charging stations to establish a scalable business model for utilities to install demand flexibility and energy efficiency upgrades across multiple building sizes in public and private sectors. (Award amount: $5.18M)
- Spokane Edo LLC (WA) will unlock demand flexibility up to 2.25 megawatt (MW) using flexible loads in residential and commercial buildings augmented by distributed energy resources within Spokane, Washington's Opportunity Zones of vulnerable populations. (Award amount: $6.65M)
- SunPower Corporation (CA) will build tomorrow's homes today in two communities of all-electric homes in Menifee, California that meet DOE's zero-energy-ready home qualifications and feature solar energy, home energy management systems, and community-scale battery storage. (Award amount: $6.65M)
- The Ohio State University (OH) will investigate the capacity of Ohio State's existing on-campus connected community to provide essential but overlooked ancillary grid services from a diverse range of grid-interactive technologies in a cyber- and data-secure environment. (Award amount: $4.2M)

The Connected Communities funding opportunity is led by DOE's Building Technologies Office in collaboration with the Solar Energy Technologies, the Vehicle Technologies, the Office of Electricity and Lawrence Berkeley National Laboratory. Applicants who were not selected through this highly competitive funding opportunity could still be eligible for DOE funding through DOE's Loan Programs Office, which provides access to debt capital for the commercial scale-up of innovative technologies like grid-interactive efficient building communities. Learn more at Energy.gov.

Links available at www.energy.gov/doe-61-million-buildings-renewables-grid. ♻

Accepting Innovation and Change—What's the Process?

Janis Petzel, MD

People accept new ideas at different rates. We see this clearly in current events involving both climate change and Covid vaccines. Some people jump in early; others change only if they are dragged kicking and screaming. It doesn't matter what the innovation happens to be: a public health measure, climate adaptation, or a consumer fad, the process is similar. A body of research stretching back to the 1960s explains how change creeps into human behavior (or stalls).

Diffusion of Innovation by Everett Rogers, first published in 1962, describes why some ideas flop and why some succeed. When a new idea arrives in a community, people decide very early, before they have much experience, if they are for or against the innovation. The new idea diffuses into the community in phases Rogers calls Persuasion, Decision, Implementation and Confirmation. Eventually, the innovation sticks, or it dies.

Rogers' original work involved a public health outreach effort in the Andes Mountains aimed at convincing villagers to boil their water to reduce intestinal diseases. But in the worldview of the local people, heating water, even if it was cooled before use, would cause health problems, not prevent them. The public health worker from the city was not a good change agent. The only villagers who followed her advice were a couple of women the locals considered odd ducks.

You can imagine the resistance to change in that Peruvian village, the in-groups, gossip and cliques. But we're no different--look at the vaccine stalemate across our country! Just because you can see that an innovation provides an obvious benefit, doesn't mean that someone else will see it that way.

New technology such as the solar panels or electric vehicle shown here, increases the likelihood that someone near you will adapt similar technology. (Dave Petzel)

New ideas have to feel compatible with a person's values and are more acceptable if they come from a trusted source. Acceptance (aka "diffusion") is smoothest between people with shared interests. A neighbor can be a great change agent. Seeing you take the plunge with solar panels or carpooling or insulating your home may give your neighbors the courage to give it a go. Taking the action you want others to take also eliminates the resistance's hypocrisy argument: if it's so important, why aren't you doing it?

Advertisers are expert at manipulating an emotional sense of shared experience to create an urge to buy new things. They are also good at simplifying technology that is difficult to understand or that people can't try before they buy—situations that slow down acceptance according to Rogers' work.

We can create a genuine, positive emotional reaction by being good examples, by listening and by searching for shared interests, even if at the beginning it's only that we both like mustard on our hot dogs. Words matter. Talking about "severe weather events" may open more conversations than talking about "climate change."

It's also useful to assess where the other person is on the bell-shaped curve of phases of change. Rogers' succinct group names and descriptions paint a clear picture: Innovators (2.5% of population) are "Venturesome," Early Adaptors (13.5%), "Respectable." The Early Majority (34%) are "Deliberate," the Late Majority (34%), "Skeptical." And my favorite descriptor: Laggards (16%), are "Dogmatic, Fatalistic or Traditional."

Diffusion of innovation takes longer as you go from the beginning to the end of this list. Trying to convince Laggards may be a waste of breath. Late Majority folks come in late because by then, they have to work harder to say no than to say yes. Early Majority people learned from the experiences of the Early Adapters, who caught the change bug from the early Innovators.

For the things I care most about, climate adaptation, and Covid vaccinations, our country is at different stages. For vaccines, the Innovators (clinical trial volunteers), Early Adaptors (older people and healthcare workers) and Early Majority (all of us who jumped at the chance), and some of the Late Majority have been vaccinated (about 56% of eligible people in U.S have both doses as of 9/23/21). We're down to the most skeptical and the Laggards. It may take mandates to get these people vaccinated.

For solar panels, electric vehicles, clean energy grids, etc., we appear to be moving from Early Adaptation into Early Majority. We should see rates of clean energy technology use picking up quickly. Keep talking and keep connecting. It's important. Fingers crossed, our government sees fit to fund the needed incentives that will get interested people over the buy-in hump.

Janis Petzel, MD is a physician, grandmother and climate activist whose writing focusses on resilience, climate, and health. She lives in Islesboro, Maine where she strives to walk the walk to a fossil-fuel free future. She serves on the Islesboro Energy Committee and is a Climate Ambassador for Physicians for Social Responsibility.

Source: https://usafacts.org/visualizations/covid-vaccine-tracker-states/ Accessed 9-24-21. As of 9-23-21, more than 55% of eligible people in the U.S. have received two doses of Covid vaccine, and close to 65% have received one dose. ♻

Air Pollution

Cont'd from p.1

from wildfires. There are emissions of deadly air pollution in places where land is cleared with fire, such as Indonesia and Brazil. There are other problems associated with land use and industry. But the biggest culprit, according to the AQLI Annual Update, is undoubtedly combustion of fossil fuels.

According to a study by the American Lung Association in California in 2016, the societal cost of burning a gallon of gasoline is about $1.30 per gallon. That cost is over and above the purchase price. It comes in terms of damage to property, the environment, the climate, and health (www.bit.ly/lung-costs). This is the cost of the damage we do by driving gasoline-powered cars. The societal costs of diesel oil and heating oil are similar.

A child playing near industrial stacks innocently breathes the polluted air. (Adobe stock/40753847/fcWihr).

The FAQ pages at the Energy Information Administration site, eia.gov, includes the question, "How much gasoline does the United States consume?" For the year 2020, the answer is 123.73 billion gallons. Doing the math, that means the societal effects, including health care, death, loss of livelihood, environmental damage from floods, storms, and wildfires, and so on, come to nearly $160 billion per year, which is partly paid for by the people who suffer, but also by taxes and higher insurance bills.

That is just gasoline. It is not all of the societal costs of our use of fossil fuels. It does not include diesel oil, natural gas, coal, or propane, all of which increase the costs even more.

The fact that fossil fuels are tied to both climate change and to deaths and sickness from air pollution gives us an advantage with both problems. We have to slow and stop climate change and we also have to reduce use of fossil fuels to reduce deadly pollution. Any action that will address one of these problems is likely to do proportionate work reducing the other. We have economic and social reasons to deal with both.

Part of the good news is that multiple studies show that it really is possible to replace fossil fuels completely, while reducing costs for energy and increasing reliability. One such study led by Mark Z. Jacobson at Stanford University in 2017, published in *Energy and Environmental Science*, provides a road map for states (www.bit.ly/ees-study). And the really good news is that when we make that transition, we will not just address climate change; we will be healthier and wealthier in the process. ♻

Solar Farms

Cont'd from p.12

be possible otherwise. And it provides an alternative for home properties that have less than the roof or land installation area needed, poor solar orientation, or are densely wooded, all of which would prevent or limit onsite home solar.

But solar farms are also limited by the amount of power they can generate and number of subscribers they can serve. There are also environmental drawbacks and limitations. One of them is that the clean energy generated doesn't go directly to its subscribers or customers, but is exported to the grid and its random mixture of fossil generated fuels from all the power companies supplying electricity to the national system. Community solar energy generated in New England may end up anywhere grid demand requires, powering the homes and factories in California, Texas. Ohio, or New Hampshire. Other concerning drawbacks include the loss of farmlands, forest, open spaces, and wild habitats.

The only systems that can deliver guaranteed clean solar energy are those that are off-line and not tied to the grid. The same applies to hydro and wind, which are also diluted as soon as they mix with carbon-emitting, fossil-fueled energy supply sources like gas. oil, or coal, which still provide most of the nation's electric power.

Fatalists argue that the climate change solutions of the 2015 Paris Accords are an impossible dream, or a pipe dream at best, and that will continue to be true as long as the grid continues to distribute mixed power. Even so, solar farms can be a good match for people whose needs fit their service capabilities.

All four states where *Green Energy Times* is distributed – Maine, New Hampshire New York and Vermont – have solar farms. A little online research and a few phone calls can provide the information that leads to where they are and the services they provide. It seems clear that they just might be the answer to those who want to meet their goal to save money, have a personal impact on offsetting greenhouse gas emissions, and contribute to building their state's infrastructure and economy.

This is the introductory article, and follow-up articles are planned for December and February in this green power series. Next, we will focus on what solar innovators, developers, installers and others are doing to advance solar farms in Maine, New Hampshire, New York, and Vermont. Input is invited from solar farm professionals located in those states, via email, at ccc.isles@gmail.com.

Toby Martin lives in Islesboro, ME, where he works locally and statewide to strengthen Maine's clean energy sustainability. A founding member of the Islesboro Energy Team and the Islesboro Energy Committee, he also coordinates the Islesboro Energy Conference, and he contributes to Green Energy Times *as a writer and member of its new Maine distribution team.* ♻

Froling Energy's New Dry Wood Chip Processing Plant

Jim Van Valkenburgh

Froling Energy just celebrated the grand opening of their new precision-dried wood chips (PDC) processing plant in Keene, New Hampshire where they have both expanded their output of dry chips and improved their processes. The goals for this move were to assure their customers of better fuel quality, improve production rates, reduce their own carbon footprint and to increase available inventory to overcome market fluctuations.

Froling's new precision dried wood chip facility in Keene, NH (All courtesy photos)

In January 2020, Froling Energy purchased 10 acres in Keene and began construction of a new, larger and more efficient dry wood chip refining plant. Soon after, Covid-19 shut down normal business activity in the Northeast, but Froling Energy crews persevered. One year later, the first batch of Froling Energy's PDCs was processed in Keene. This was perfect timing as their supply of PDCs made six months earlier at their old Peterborough plant, was just running out.

What are PDCs? Precision Dried Wood Chips—a locally sourced renewable heating fuel that Froling Energy delivers to customers in New Hampshire and Vermont. PDCs start out as random sized, green bole wood chips with about 45% moisture content. They end up with 25% moisture content and are no larger than 1.5" x 1.5" x .5". With these qualities, PDCs burn efficiently in specialized dry wood chip boilers. PDCs come from managed forests within a 50-mile radius of Keene where logging is directed by foresters who prioritize forest health and sustainability.

The new Schmid UTSR steam boiler has a maximum output of 5.33 million Btu/h. The steam is pushed into a steam turbine generator which generates enough electricity to run the whole plant.

What advantages do PDCs have over green chips? PDCs are blown into and stored in low-cost, above-ground steel silos (without freezing into a solid mass when it's -10° F outside). PDCs provide more heat per ton, and dry wood chip boiler systems are much less costly than comparable green wood chip systems.

PDCs are currently delivered to over 20 customer sites consisting mostly of public and private schools, but also some large commercial and industrial sites and a 100-unit apartment complex. The use of PDCs reduces heating costs and keeps many more fuel dollars in Northern New England. Last winter, Froling truckers delivered 6,500 tons of PDCs to customers which offset the burning of 608,500 gallons of #2 fuel oil and saved their customers at least $1 million a year, in total.

Froling Energy's Peterborough, NH plant was operational for seven winters, processing ever more chips each year, finally reaching a high limit. It was on a land-locked site so expansion there was impossible.

Cogeneration is the most significant improvement at the new plant where a 100-kilowatt steam turbine generator provides all of the heat and electricity required in the chip screening and drying processes. How it works: A Schmid wood chip-fired boiler (5.6 million BTU/hr) produces high-pressure steam that spins the turbine generator, creating electricity. Then low-pressure steam exits the turbine and condenses in a heat exchanger which transfers all remaining heat energy into a 3000-gallon buffer tank which supplies heat into the chip dryer.

Green (wet) wood chips are fed into one end of a continuous belt dryer that is six-feet wide, sixty-feet long. Chips come out as dry PDCs just 45 minutes later. A 3.4 million BTU/hr Viessmann wood chip-fired hot water boiler is also available as a back-up to provide heat to the dryer.

In Peterborough, the unprocessed chips were stored out in the open, vulnerable to rain and snow which added even more water that had to be driven out in the PDC drying process. In Keene, green bole wood chips will be dropped off and stored in a large paved and covered structure, keeping them out of the weather and reducing the amount of heat required by the dryer.

At Froling Energy's old plant, chips needed to be moved three times by a diesel loader from one stage to another. In Keene, chips are moved by a loader only once, every three hours, into the feeding system. From there chips are passed from process to process with no human intervention--significantly reducing the use of diesel fuel.

With the entire dry chip making process indoors, no longer are the screener, re-chipper or chip dryer exposed to winter wind, ice and snow. Machinery works better in a warm and dry environment and employees should be happier, too.

The future is bright at Froling Energy as they strive to make biomass a secure and efficient part of the renewable energy mix in Northern New England.

Jim Van Valkenburgh is the Vice President of Marketing at Froling Energy. ♻

Dried and finished wood chips in the warehouse ready to be trucked to a customer.

Efficiency Vermont's Efficiency Excellence Network (EEN): *New Ground-source Heat Pump Group*

Contractor Spotlight: GSK Climate Control, Inc.

Interview with Greg Kristiansen, President of GSK Climate Control, Inc.

G.E.T. Staff

Efficiency Vermont started a new ground-source heat pump technology sector for its Efficiency Excellence Network (EEN). The first member is GSK Climate Control, Inc. A spotlight on this company was done in *Green Energy Times*' June 2020 issue (see https://bit.ly/GET_June2020_EENSpotlight). This interview focuses on GSK Climate Control's work with heat pumps.

How did you get into the heat pump business?

Our background is in HVAC and refrigeration. Heat pumps operate in a similar fashion as any refrigeration and air conditioning appliance with a few additional controls to reverse the cycle.

How long have you been installing ground-source heat pumps?

Since 1985.

How does this technology work?

It uses electricity to power a refrigeration system that transfers "free heat" to a place that needs it. In the case of cooling, it removes heat and transfers it to another location. The cost to transport the heat is the electricity used to power the refrigeration system. This "free heat" that we are paying to transport will typically be four to five times more efficient than electric heat by itself.

What are some things one should look out for as both a customer and an installer?

Customers should ask for references of similar installations. As an installer you should start with a properly sized and designed system. The air and water systems need to provide the proper flows required by the manufacturer to provide a long-lasting efficient system. These flows both on the air and water side need to be measured and verified.

What are the benefits of ground-source heat pumps?

No outdoor equipment, a single appliance to provide heating and cooling, and no fossil fuels.

What are the benefits of being part of the newly formed EEN group for ground-source heat pump technology?

Being part of the EEN group brings people with like mind-sets together with the common goal of increased efficiency and reduction of carbon emissions. ♻

HISTORIC HOME IN NEW YORK GOES 100% RENEWABLE ENERGY

Exemplary Clifton Park, NY net-zero retrofit is equipped with solar, geothermal, high efficiency building envelop and much more.

Joe Parsons

Historic home gets a 100% renewable energy retrofit in Clifton Park, NY. (Courtesy photo)

Paul and Joanne Coons had envisioned taking a vacant historic farmhouse in Clifton Park, New York, and making it both livable and carbon-neutral. Their three goals were historic preservation, renovating green (which means no VOC), and having a net-zero build.

They were not new to the eco-friendly restoration process. Years earlier, they had restored a neglected 1852 Greek Revival home conducting an energy retrofit, providing them with hands-on experience. That knowledge aided them in their decision to purchase, restore, and live in the Peters-Lockrow property occupying two acres. The site boasts an adjacent bike path that leads to the town center and the park-and-ride lot for commuting in the tri-city area anchored by Albany, New York's capital.

The 1830s' home qualified for participation in the NYSERDA (New York State Energy Research and Development Authority) program to assist with compliance for green home building ratings and programs. The Coons opted to purchase a barn-style garage plan from architect Donald J. Berg that matched the home's style which also replaced the 1960s-era garage. Throughout the restoration process, the team worked closely with the Town of Clifton Park Historic Preservation Commission.

Renovation exposed hidden challenges

in the long-abandoned building: structural column damage, inadequate roof structures, missing and compromised foundation, rotted sill plates, and structural members. In addition, the Coons had to correct the 1960s-era re-model. But they stayed dedicated to their vision, reusing interior trim, or replacing it with locally milled copies, as well as restoring the tin ceiling which had been concealed by a drop ceiling in the living room. The Coons say they feel very fortunate because the entire ceiling was still there.

Most material that was "demoed" was recycled or reused. Old kitchen cabinets became storage in the barn, concrete was recycled, even nails were reused or recycled. Clippings and debris removed from overgrown trees and bushes were chipped to become ground cover and materials that could not be reused or recycled on-site were donated to Albany Historic Foundation or Habitat for Humanity.

After checking out all options for modern heating and cooling, Paul and Joanne knew geothermal was clearly the right choice for their retrofit project. The house's system was in dire need of an update. There was a gas line at the road, but it had never been connected to the house, because the property was so old that it used an existing oil tank.

The place was essentially gutted and fitted with energy-efficient windows, doors, and insulation. In 2010, the Coons installed a ClimateMaster™ Tranquility ground-source heat pump, a heat recovery ventilator, and a whole-house dehumidifier. Renewable energy is provided by pole-mounted 11.7 kW photovoltaic (PV) and solar hot water (SHW) systems in the rear yard.

Paul, retired state director of environmental health and safety for the office of Mental Health, and Joanne, a high school environmental science teacher, were thrilled to achieve their net-zero goals. In 2011, they received the Town of Clifton Park Historic Preservation award, Town Conservation Easement, LEED Platinum, NAHB Certified Green Building Emerald awards, and an NYS Energy Star rating.

"For the first year, the local utility paid us for our excess electricity. We are now using the excess carbon-free energy generated to power a 2012 Nissan Leaf and a 2018 Tesla 3 to help cover our transportation carbon footprint." Paul said.

The family has been living in their comfortable and energy-efficient historic home since January 2011. With the addition of the electric cars, their sellable surplus is down, and most American utilities offer weak incentives for sizing a system to achieve better than net-zero, because they buy back power at only about 20% of the price for which they sell it. So, these owners still pay a monthly bill: a customer-service charge of $16.93 a month.

The three-ton ClimateMaster™ geothermal heating and cooling system cost approximately $22,000 but saves $2,400 a year on HVAC costs.

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Many thanks to our section sponsor:

CLIMATEMASTER

HISTORIC HOME

Cont'd from p.24

The comfort, consistency of temperature, and clean air in their historic home is more than the Coons could have hoped for. "When they told me not to open the windows and I'll still have fresher air I was skeptical at first," said Joanne. "But it's true. The ClimateMaster™ Tranquility unit Merv 13 filters keep the air in our home so clean and comfortable removing pollen, particulates, and pollutants. The outdoor air is brought in by our heat recovery ventilators and then filtered by our ClimateMaster unit."

The Coons have given back to the community by providing an educational program outlining and presenting their project to several organizations and have opened their home for local and national tours.

Joe Parsons has worked in the renewables and environment industry for over 40 years. Joe is the Residential Product Manager for ClimateMaster, Inc. He is a founding member of NY-GEO and is the treasurer of the California Geothermal Heat Pump Association. ♻

Heating, Lighting & Refrigeration Upgrades Available for Long-term Care Facilities in Maine

Efficiency Maine Introduces Funding Opportunity for Long-term Care Facilities to Upgrade Heating, Lighting, and Refrigeration

Efficiency Maine has introduced a limited-time promotion that will help long-term care facilities across the state upgrade their heating, ventilation, and air conditioning (HVAC), LED lighting, and refrigeration systems to high-efficiency equipment.

The offer launched on October 1, 2021, with an application deadline of January 31, 2022. Accepted projects must be completed by July 1, 2022. Detailed incentive information on the qualifying equipment can be found at www.efficiencymaine.com/at-work/long-term-care/. Eligible facilities, such as assisted living program facilities, continuing care community centers, and nursing homes, are eligible to apply for incentives under this funding opportunity.

"A comfortable, well-lit, and efficiently ventilated environment is especially important to the residents and staff of a long-term care facility," said Rick Meinking, senior program manager for commercial initiatives at Efficiency Maine. "Many of these facilities operate 24/7, putting added usage on these important systems. We hope this special promotion will help them improve resident comfort and reduce energy costs associated with their operation."

Interested parties can learn more about this opportunity by attending one of three webinars Efficiency Maine is conducting on October 21, 26, and November 4. Registration information about these sessions can be found at www.efficiencymaine.com/long-term-care-upgrades. More general information about energy efficiency for long-term care facilities can also be obtained by attending a session led by Efficiency Maine titled "Solutions to Increase Energy Efficiency in Your Facilities," during the virtual 2021 Maine Health Care Conference & Expo (www.mehca.org/fallconference) on Wednesday, October 20, from 1 p.m. to 2 p.m.

Hospitals and independent living facilities are not eligible for this specific opportunity but may qualify for other incentives offered through Efficiency Maine, and are encouraged to visit the Efficiency Maine website (www.efficiencymaine.com) mto learn more about the Commercial and Industrial Prescriptive Program, energy efficiency solutions, and how to get started.

To learn more about the Efficiency Maine Prescriptive Program and how to maximize its benefits visit www.efficiencymaine.com/prescriptive-incentive-program. ♻

IPCC Solution Consensus: A Price on Carbon Is Required

John and Katharine Gage

Climate Science and Politics

The recently released (August 2021) Sixth Assessment Report from the UN's Intergovernmental Panel on Climate Change (IPCC) provides the most definitive statement about global warming science can offer. It is unequivocal that the consequences of human-caused climate change are widespread, rapid, and intensifying. The Earth's surface has warmed 1.1˚C since 1900 and will reach or exceed 1.5°C in the next two decades. What we do now (business as usual or rapid emissions reductions) will be discernible in global temperatures in that timeframe. The report identifies a path to limit warming to 1.5˚C as needed for a relatively safe future: reduce global carbon emissions to net-zero by 2050.

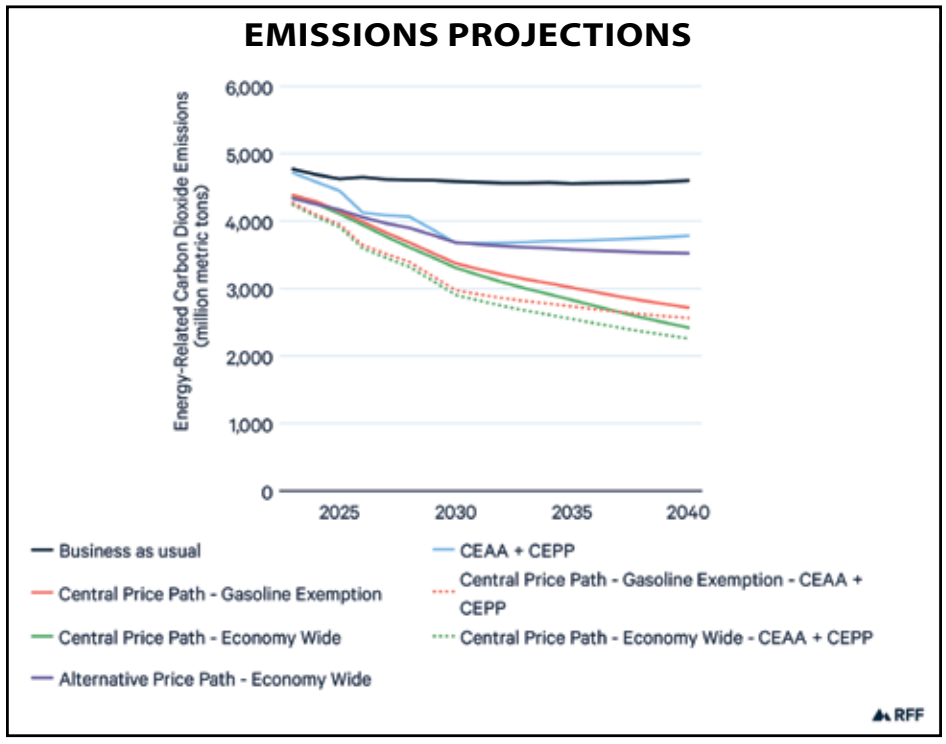
On a wave of public concern due to escalating natural disasters, costs, and national media that has started connecting the dots, President Biden made addressing climate change a national priority and set goals in line with IPCC recommendations. Work on federal climate legislation is now underway. But will it pass, be durable, and effective?

Experts Agree: Carbon Pricing is Required

A price on pollution "incentivizes" people and businesses to reduce it. Economists agree that a carbon tax paid by fossil fuel producers and importers where coal, oil, and natural gas enter the economy offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary.

- In the Special Report on Global Warming of 1.5˚C, the IPCC notes that, "Explicit carbon prices remain a necessary condition of ambitious climate policies."
- Richard Newell, president of Resources for the Future, said, "A price on carbon, such as a carbon tax, provides the economic incentive for the quickest, cheapest and most comprehensive emission reductions across the entire economy."
- US Treasury Secretary Janet Yellen said, "We cannot solve the climate crisis without effective carbon pricing."

The price matters. *A study in Nature* finds a carbon price rising to $100 per ton of CO2 emitted by 2030 will put the U.S. on a net-zero by 2050 path. That aligns with global targets from the IMF ($75), World Bank, and UN High-Level Commission on Carbon Pricing. The U.S. is one of just two developed economies not already pricing carbon. Many countries' prices are too low, but the EU and Canada are on track to exceed $100 by 2030.



Projected emission reductions of climate policy alternatives under consideration for the reconciliation package. Hafstead, Marc, et al. "Emissions Projections under Alternative Climate Policy Proposals." (Resources for the Future, 16 Sept. 2021, www.rff.org/climate-proposals)

Citizens' Climate Lobby and Carbon Fee and Dividend

For over a decade, the grassroots organization Citizens' Climate Lobby (CCL) has worked to create the political will to enable Congress to legislate a carbon pricing policy that nearly all leading U.S. economists agree uses the most cost-effective and equitable emissions-reductions approach. CCL's Carbon Fee and Dividend with Border Carbon Adjustments policy has three parts:

1. Carbon Fee: A fee is placed on fossil fuels at the source (well, mine, or port of entry). This fee starts at $15 per ton of CO2 equivalent emissions and increases steadily each year by $10;

2. Household Dividend: All of the money collected from the carbon fee (minus administration costs) is rebated each month to all households on an equal, per-capita basis; and

3. Border Carbon Adjustments: Like a tariff, the carbon price is applied on imports and rebated to exporters in trade of energy-intensive goods with countries that do not have a matching price on carbon. This keeps U.S. businesses on a level playing field in competition both at home and abroad.

"Fee and dividend are essential for rapid phaseout of CO2 emissions. Without it, we are in an unwinnable game of whack-a-mole, trying to stop new uses, somewhere, of cheap, dirty, fossil fuels." – Dr. James Hansen

This fee schedule drives carbon emissions down in line with the goals of President Biden and the IPCC, and when combined with complementary policies puts us on a path to net-zero by 2050. The cash-back dividend protects family budgets from temporarily higher prices from the fee, making the policy durable. Two-thirds of all households will receive more money in their dividend checks than they will pay in higher prices due to the fee, and low-income families will disproportionately benefit due to their smaller carbon footprints.

Border carbon adjustments strongly incentivize trading partners to match the carbon price. The EU will be the first to implement border carbon adjustments, starting in 2023. Canada, the UK, and Japan are considering them also. If the U.S. is not pricing carbon soon, our businesses will begin paying other countries for our free pollution in trade, putting them at a competitive disadvantage in those markets.

Two Paths Through Congress

The Carbon Fee and Dividend policy has been introduced in Congress as the Energy Innovation and Carbon Dividend Act, a standalone bill with over 80 cosponsors.

When Congress decided to group major climate priorities into the budget reconciliation package this year, CCL made an effort to get carbon pricing included there. The idea got traction in the Senate. On the House side, although proponents of energy efficiency and a Clean Energy Payment Program dominate, these measures alone don't meet U.S. goals without adding carbon pricing. Both chambers are drawing up their versions of the bill, and will merge them in the hopes of presenting a final version to President Biden soon.

Time for Serious Climate Solutions

It is time for effective climate action, and we cannot afford to leave carbon pricing out of the mix. It is reasonable to say that COP26 will not be considered successful unless it achieves a commitment for a global base-level carbon price. The US can help by implementing the necessary price and working with the EU and other countries to create a border carbon adjusted trade zone. This would re-establish our position as a global leader in climate solutions, and strongly encourage global compliance.

Dr. James Hansen, one of the U.S.'s leading climate scientists and the former head of NASA's Goddard Institute of Space Studies, said, "Fee and dividend are essential for rapid phaseout of CO2 emissions. Without it, we are in an unwinnable game of whack-a-mole, trying to stop new uses, somewhere, of cheap, dirty, fossil fuels."

Congress needs to hear from citizens, leaders, and businesses to help them do what is required. We can each make a difference in whether the U.S. will take the necessary step of including carbon pricing in its efforts to address climate change. Citizens can email Congress at cclusa.org/write and the President at cclusa.org/white-house. Businesses can include asking for carbon pricing to be in the reconciliation package when they lobby, and endorse the Carbon Fee and Dividend bill at energyinnovationact.org/endorse.

John Gage is the State Coordinator for Citizens' Climate Lobby in New Hampshire. Katharine Gage is co-leader of a Citizens' Climate Lobby chapter in New Hampshire. ♻

Carbon, Cars and Canaries

Randy Bryan

This is my final regular column for Green Energy Times discussing electric vehicles in New Hampshire. I am signing off with some regret as the issues around driving electric in NH only get larger and more important. In parting, I offer issues and thoughts for your consideration. Please bear with me as some are bluntly stated.

In the last 800,000 years of ice and temperate ages, 290 parts per million (ppm) of CO2 in the atmosphere was conducive to the cause of current natural (temperate) climate, and 190 ppm coincides with a mile of ice over our heads (ice age). We've had eight to 10 ice ages in that time, in repeatable intervals and ppm ranges. That's a 100-ppm difference between a full-on ice age and 1900s climate. The world atmosphere now has 410 ppm carbon dioxide, last seen nine million years ago. This change has been caused by us in only the last 50 to 100 years. We are more than 100 ppm over the 290 ppm and already 1°C over 1900s temperature norms. From 1900 to 1950 sea level rose about 2 to 3 inches. Since 1950, sea level has risen about 8 inches. When last at 400 ppm, the sea level was (20m) 50 feet higher than now. Note that ppm counts change air temperature quickly and remain in the air-water for centuries-millennia, sea level and other environmental consequences of temperature change take hundreds and thousands of years to play out. At the era's ppm and temperature maximum (30 million years ago) sea level was about 200 ft higher than now (all the coastal plains were flooded). We have compressed thousands of years of natural climate disruption into decades, and the consequences will play out over the centuries or millennia.

There are very long-term consequences to this greenhouse gas accumulation, where leveling or even stopping carbon combustion won't stop the coming train wreck but can only make it less severe. We have all seen the climate changes and more severe weather in recent decades. But that is a drop in the bucket compared to what we have consigned our great-great grandchildren and their progeny to live through. It has been estimated that even if we stop all carbon combustion now, the sea will rise seven to 10 feet over the coming few hundred years (only two to three feet by 2100). What will become of coastal cities? Weather and climate disruptions will likely follow the same course. Every year we don't stop using carbon energy, we increase the future damage. All because we won't recognize and correct our addiction to carbon energy.

As Bill McKibben and 350.org so poignantly tell us in the article "Global Warming's Terrifying New Math, Rolling Stone", the global oil, gas, and coal carbon energy industry has at hand over five times the amount of proven carbon reserves than is needed to create the 1.5°C global temperature increase limit recommended by global

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THE SKIN OF OUR TEETH

John Bos

The phrase Thornton Wilder used for the title of his play, *The Skin of Our Teeth*, comes from the King James Bible, Job 19:20, "My bone cleaveth to my skin and to my flesh, and I am escaped with the skin of my teeth."

Written in 1942, less than a month after the Japanese attack on Pearl Harbor on December 7, 1941, Wilder broke from established theatrical conventions and walked off with the 1943 Pulitzer Prize for Drama. *The Skin of Our Teeth* "spoke" to its audience at the time.

Combining farce, burlesque, satire and elements of a comic strip, Wilder depicts an Everyman Family as it narrowly escapes one end-of-the-world disaster after another, from the Ice Age to flood to war. This was the message I asked our graphic designer to capture for the program book cover for the 1965 production of The Skin of Our Teeth at Arena Stage in Washington, DC where I was the publicity director.

Wilder also wrote "the whole world's at sixes and sevens, and why the house hasn't fallen down about our ears long ago is a miracle to me." If he were still writing today, he would be speaking to the big one – our climate crisis.

People have different ways of comprehending the future. Climate scientists not only seek certifiable clues about the future of our environment, but compare those clues to the reality of the past. For millions of climate refugees seeking a more hospitable climate, it's one day at a time. They don't need "proof" that their world is at sixes and sevens. Nor does the fossil fuel industry want proof that their world is at sixes and sevens. Those are not good numbers for the bottom line.

So, that world of extraction at the expense of our environment has found a new way to fend off those pesky climate scientists by greenwashing. While spending millions on campaigns trumpeting token low carbon projects, these companies have worked to rehabilitate the environmental image of fossil fuels while continuing to expand their core businesses of oil, gas and coal.

They publicize "net-zero" ambitions and sustainability targets that rarely align with the Paris Agreement goals. They have invested in reputational advertising that shifts the conversation to action by consumers and governments, positions them as trusted partners to wider society and promotes a misleading image of the role fossil fuel companies might play in the climate solution. The role these corporations have actively played in America's failure so far to meet the Paris Climate Agreements of 1.5°C (2.7°F) target viable has transnational repercussions.

The Paris Agreement's long-term temperature goal was to keep the rise in mean global temperature to well below 2 °C (3.6 °F) but still above pre-industrial levels. It really wanted to limit the increase to 1.5 °C (2.7 °F) as soon as possible and to reach net-zero by the middle of the 21st century. That would be 2050.

A caveat. As someone who spends a lot of time researching and writing about the multiple challenges facing America today, I know the world has, by and large, adopted the "net zero by 2050" as its de facto climate goal. But I see two fatal flaws in the language of this goal. The first is "net zero." The second is "by 2050."

Net zero is a phrase the represents our fervent belief that technology will somehow suck up all that nasty CO2 while allowing we the people and the fossil fuel industry to continue business as usual. Nothing I can find tells me that this nascent technology can come close to capturing the amount of greenhouse gases from the continuing use of fossil fuels for transportation, heating and electric power production.

The program book cover John Bos designed for the play, The Skin of Our Teeth *,as publicity director for Arena Stage in Washington, DC in 1965.(Courtesy photo)*

The second flaw, to my way of thinking, is the phrase "by 2050." This "deadline" feels way, way in the future to me. If you are reading this as a 50-year-old person, you will be 81 come 2050, one year shy of 30 years from today. I'm guessing that many people reading this article will no longer be living in 2050. So how does a date three decades from now deliver an immediate call-to-action? If I'm not going to be around in 30 years, why worry now about what may or may not happen to our environment after I'm gone?

I believe that 2050 is a "convenient" future date that allows the fossil fuel industries to keep on keeping on with the extraction of CO2, methane and other greenhouse gases while gaslighting the general public with its greenwashing marketing campaigns.

Charles Dicken's famous first line in his classic *The Tale of Two Cities* wraps up the climate conundrum with his famous first line in, "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to Heaven, we were all going direct the other way."

In what direction do you think we are heading? I believe we are living today in the world by the skin of our teeth.

John Bos writes his bi-weekly "Connecting the Dots" column for the Greenfield Recorder *and is a contributing writer for* Green Energy Times. *He is the editor of a new children's book* After the Race. *He can be reached at john01370@gmail.com.* ♻

CARBON, CARS AND CANARIES – *Cont'd from p.26*

climate scientists. We're already at 1°C higher from pre-industrial levels. Make no mistake, the global carbon energy industry intends to sell those carbon reserves since they are the basis for their corporate valuations (stock value, salaries and bonuses, expertise, credit-loans, capital and operating budgets, etc.), including their material suppliers and service contractors. Allowing even half of these reserves to be combusted will raise the earth's temperature by over 5°C.

As I look for canaries in our mine shaft, consider these continuing developments:

The UN IPCCC has now labeled global warming as an URGENT matter.

The Arctic and Antarctic ice shelves are melting faster than expected.

The ocean currents like the gulf stream are slowing (less temperature difference from equator to poles).

Climatic (temperature) bands are moving northward at about 35 miles per decade. (NH could be like NC is now by 2100, then hotter still).

U.S. wildfire and flooding damages are 4 times and 20% respectively ahead of just a decade or two ago.

The U.S. still has a federal flood Insurance program.

We (population increase and global warming) are causing a global sixth great extinction event.

GM, Ford and Chrysler chose to only market and make SUVs and trucks (more polluting and profitable). What do you drive?

Tesla is the only car company making money making electric vehicles.

NH is the only state in New England not aligned with the NESCOM/California zero-emission vehicles (ZEV) mandate.

New Hampshire lags all other New England states in the deployment of charging infrastructure.

Europe now averages 25% of new cars sold being plugins, while the U.S. and NH average about 2.5%.

Flames approaching Highway 50 during Caldor Fire in California. (Adobe Stock Photos/kcapaldo)

I repeat: the worst effects of what we do today will be left to our children and their progeny to deal with. That we haven't changed aggressively, speaks poorly of our generation. There is lots to do to make our lives more sustainable. I salute everyone working to make NH and our planet more so. We need to expand our outreach quickly. We need solutions. We need a more favorably inclined NH populace and government. Please G.E.T. involved.

Thank you all for your continued interest and readership.

Randy Bryan is one of the co-founders of Drive Electric NH. Bryan has been an advocate for electric cars since 2006. His company, PlugOut Power (formerly ConVerdant Vehicles), has converted vehicles to plug-in hybrids and currently develops and sells inverters that turn electrified cars into mobile generators. ♻

A Net-Zero Multi-Family Community

Barb and Greg Whitchurch

We've lived two miles back into the woods on a dirt road in north central Vermont for several decades now. In our experience, some people move to this area, build a long driveway, and "cocoon" themselves with little interest in their community or their neighbors. In fact, "next door neighbors" here often never meet. (This is especially true now with the waves of wealthy "climate migrators" who are turning real estate sales here into bidding wars.)

Ariel view of the net-zero multi-family community in Newburyport, MA. Credit: Hall and Moskow.

Most Americans have neither the opportunity nor the inclination to avoid neighborly relationships. Just north of Boston, the Hillside Center for Sustainable Living (bit.do/hcfsl1) is designed to encourage community and neighborliness. It is a multifamily community built to proven, internationally recognized engineering standards, targeting affordability and comfort --rather than some architect's or builder's opinions of what makes sense.

The Hillside complex contains 48 one-, two- and three-bedroom apartments. Units have front porches, EV charging stations, and individual garden plots. There is also a solar canopy where one can charge vehicles for free. Built to encourage long-term renting, the complex is targeted toward homeowners who are seeking to downsize. An eight-unit building and a ten-unit SRO (single room occupancy) with a shared kitchen, for deeply affordable housing, are also designed to Passive House (PH) standards. (Now don't be scared away here. This was accomplished at market rate!)

Hillside's 4.5-acre Newburyport, Massachusetts site had long been a toxic coal ash dump, and then a vehicle scrap yard. It took over two years to acquire the permits, and the cleanup was aided by a $400,000 loan from the state of Massachusetts.

Passive House and Net Zero. The first concept behind this project is energy efficiency. Passive House buildings are easy to bring to net zero using renewable energy. For those of you who are unfamiliar with Passive House look here: bit.do/ph-90. Among other comfort and financial benefits, PH eliminates the need for traditional heating equipment.

Beware: some people use "net zero" to mean that one produces as much energy as one uses. It can allow for the use of oil and gas - so long as one produces the same amount of renewable energy. So, it is possible to "net zero" a code-built, fossil-fueled "McMansion" simply by putting several acres of solar panels next to it. But on top of the fossil fuel pollution is the cost of all that extra land, solar panels, shipping, manufacturing,

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labor and maintenance, which have their own environmental and societal costs.

To minimize those impacts, one should start with the most sustainable, energy-efficient structure practicable, and then bring it to net zero through the addition of a very small amount of renewables. This is what the Hillside Center has done, with Revision (RevisionEnergy.com/) providing the 400kW of solar PV.

Briefly stated, Passive House is a great path to net zero because when you start with an energy-efficient building, you need fewer renewables to power it. Plus, you're getting the cheapest, lowest-maintenance, and most comfortable and healthy living space.

Shared Space at Hillside. The second concept behind this project is that of neighborliness. Alongside a commitment to the environment, Hillside acknowledges and fosters the importance of building community, or fellowship with others. With open green space, the community building, and greenhouses, Hillside residents are provided the space to gather, play, eat, explore, and invite.

However, once inside their own apartments, the residents remark often about the quietness and serenity provided by PH construction as it isolates them from outside and neighboring apartments' sound.

Sustainable Living Elements. The third and most important goal at Hillside is to address the three largest contributors of CO2 emissions: food, housing, and transportation. Collectively, these components create 79% of greenhouse gas emissions.

By providing net-positive energy homes, growing food on site in their year-round greenhouse, and using shared electric vehicles powered by their solar panels, Hillside has created a replicable model of successful sustainable living.

The North End Wall was built with hundreds of thousands of pounds of recycled material from the Whittier Bridge demolition.

Aerial view showing the rooftop solar arrays on the apartments and carport. (Courtesy photos: Hillside Center for Sustainable Living)

Although we've not the space here, we will mention that the Sanden heat pump water heater (bit.do/475-sanco2) was a godsend for this project (as it has been for many others); the Mitsubishi cold weather mini split (bit.do/mb-hp) provides the heating and cooling; Zhender provides the continuous fresh, filtered air (bit.do/za-erv); indoor air quality is monitored by Awair units (getawair.com), Eco Windows (bit.do/eco-windows) provided the Bildau & Bussmann PH triple-pane windows, and Siga membranes and tapes (SigaTapes.com/) provided the PH-level air barrier. A detailed presentation of this readily replicable project is available at bit.do/hcfslyt, starting at 43:45.

The Common House contains a commercial kitchen, a large gathering space, a quiet space and reading area, a mail room, a laundry room, and a patio with an outdoor kitchen.

Food Production. With an edible landscape, urban gardens, and year-round greenhouse, Hillside recognizes the positive impact that small-scale agriculture can have on the environment. (Industrial agriculture and its associated processes are responsible for one third of the world's greenhouse gas emissions.)

Residents can produce food in their own individual garden patios, and/or participate in site-wide agriculture programs. Anything grown in communal spaces is foraged by residents and put in the Common House kitchen for residents to take what they need. Green roofs are part of the permaculture (fruit trees, berry bushes, etc.) Whole Systems Design (bit.do/wsd-vt), permaculture experts, planned the living landscape. The result is a resilient community with a small carbon footprint.

Transportation. According to the EPA, the leading cause of greenhouse gas emissions is transportation. Hillside is strategically situated within minutes of the MBTA commuter rail, bus services, and the beautiful Clipper City Rail Trail, providing access to downtown Newburyport. Hillside also provides shared electric vehicles.

All of Hillside's components -- housing, electric transportation, farming, community amenities, and residential suites - are powered by 400kW of solar power generated on-site, which exceeds all the energy needs for the homes and electric vehicles.

Final notes. Having shown what can be done affordably and with a low carbon footprint, one might wonder what are the arguments for maintaining the status quo? Hillside has met the Passive House standard and LEED Platinum. Hall and Moskow (bit.do/hcfsl) are the architects, project developers, builders and long-term owners. They collaborated with Siegel Associates who provided the structural engineering design for this ground-breaking net-zero project. The press weighs in here: bit.do/hcfslp.

The Whitchurch's net-zero Passive House in Middlesex, Vermont also powers their LEAF and NIRO EVs, lawn, garden and chainsaw tools. (bit.do/phc-vtbiz2; bit.do/gkw-li!) ♻

Concord Housing Authority Building Retrofit

Saving Energy, Money and Improving Comfort

George Harvey

There is a point where managing a project is not something that can be done on the back of an envelope. The large-scale heating system for the Crutchfield Apartments in Concord, New Hampshire definitely represents such an occasion.

The building has 116 apartment units. It was built in the 1970s using prefabricated modules, each about the size of a railroad car. It was a modern approach in those days, with the modules made of concrete. The heating system was also of a modern design, for that time. It was clean and efficient electric baseboard heating.

Crane lifting units to the rooftop. (Dana Nute, President of Resilient Buildings Group)

We really could defend the choices made in those days rather easily. But the fact is, times have changed. Concrete has its problems, and we can use electricity better for heating than resistance-type electric heating, despite the fact that it converts electricity into heat at what appears to be a perfect rate of about 100%. It happens that using electricity to move heat, as is done by heat pumps, delivers far more energy to a building than converting electricity to heat.

As we get more conscious of energy needs, it makes sense to look into improving our use of resources. And so, the time came to update the heating system of the Crutchfield Apartments. It was a job that could not be executed properly without careful planning and engineering.

The job was undertaken by Resilient Buildings Group (RBG), also of Concord. RBG provides a wide range of services aimed at efficient energy use and conservation. Prime among these is management. And among other things, management means making sure that the best people and organizations are chosen to do the job at hand.

RBG assembled a team for the Crutchfield Apartments project that included four other organizations. TFMoran did the structural engineering. The electrical work was done by Irish Electric. Shift Energy provided heating, ventilation, and air conditioning (HVAC), using equipment provided by Homans, a Mitsubishi distributor.

Some barriers for the project deserved extra attention. The fact that the building is constructed of concrete modules, presented difficulties that could not be addressed without careful planning, including detailed investigation of the structure. The concrete floors include cores and steel prestressing strands, which needed to be located. Some of the installation required drilling holes in the floors, walls, or ceilings, and drilling through prestress strands can compromise an entire building.

The new heating system was to be mounted on the roof, and so this placement required additional planning to verify that the roof was properly reinforced to manage the weight.

The new HVAC system and heat pumps are based on technology that is really worth looking at, especially since it is not usually covered in articles that appear in Green Energy Times. Heating and cooling are done by using a variable refrigerant flow (VRF) system. This is a ductless system that is a bit unlike the heat pumps used in most people's homes. The VRF name refers to the fact that the flow of the refrigerant can be varied to improve efficiency. The advantage of VRF technology is that the heating and cooling of each apartment unit can be varied according to specifics of the thermostat and conditions.

A very interesting technology, VRF can deliver heating and cooling at the same time. If the apartments on the south side of the building need to be cooled because of bright sunshine, while those on the north side need to be heated because of cold outside air, this particular design can take warmth from the south side to deliver it to the north side, and at the same time move some of that cooling from the north side to the south.

Modeling shows that the new heating system should save 282,408 kWh per year. According to Dana Nute, president of RBG, this saving is from the combination of heating and cooling. The savings are not the only advantage of the system, however. With intelligence built into thermostat controls, heating can be monitored remotely. The problem of the heater and the air conditioner being on at the same time is no longer an issue.

The Crutchfield Apartment project came about with the support of Unitil and rebates from one of its NHSaves programs. NHSaves is a collaboration of New Hampshire's electric and natural gas utilities working together to provide NH ratepayers with information, incentives, and support designed to save energy, money and the environment. The project cost of $950,000 will realize a payback by a reduction in energy usage.

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Many thanks to our sponsor:

SHIFT energy

NEW ITHACA ENERGY CODE MAKES HISTORY!

Dan Antonioli

On May 5, 2021, the city government of Ithaca, NY made green building history by passing an ordinance requiring all new buildings to be energy-efficient above and beyond the NY State Energy Conservation Construction Code - 40% or more efficient, to be exact. Also known as the "Green Building Policy," the Ithaca Energy Code Supplement (IECS) is an overlay to the state energy code that increases the energy efficiency of buildings and effectively reduces the greenhouse gas (GHG) emissions they cause. With climate change wreaking havoc on the planet, Ithaca seized the opportunity to do something about it with the development of a built environment that aims to be carbon neutral by 2030. This is good news!

As of August 4, 2021, the IECS is the new energy standard and all new construction and major renovations have to comply with it. By 2023 the required reduction in GHG emission ratio will go up to 80%, and by 2026 the benchmark will be net-zero with no fossil fuels used for heating buildings.

The larger goal is to achieve community-wide carbon neutrality by 2030, and since the built environment contributes globally to 39% of GHGs, it will have to be part and parcel of a net zero, carbon neutral economy. The energy code supplement thus contributes substantially to Ithaca's Green New Deal agenda. Ithaca mayor Svante Myrick proclaimed that the passage of this ordinance is "history-making."

HOW DOES IT WORK?

To achieve code compliance, the IECS offers two pathways: the Easy Path, which is a customized points-based system, or the Whole Building Path, which is a performance-based system. When you pull a permit for a new building, addition, or major renovation, the permit application will now come with a checklist and set of guidelines demonstrating how that building will meet the new energy standards. The application submittal will be just like any other permit application, with the addition of calculations and measures to achieve the higher GHG-reducing standard.

On the list are: electrification of buildings, heat pumps for space heating and domestic hot water, efficient lighting, proper scaling and design of buildings, renewable energy (both on and off-site), efficient window-to-wall ratios, and additional measures such as walkability, EV charging stations, and adaptive reuse. The Easy Path system will award points for each measure, and the Whole Building Path will certify compliance based on measurable performance of the green improvements noted above and/or voluntary adoption of several third-party green rating systems, such as LEED and Passive House.

On June 14, 2021, the Town of Ithaca (the larger geographical jurisdiction of Ithaca and a joint collaborator of the IECS) followed suit and passed a nearly identical Energy Code Supplement. Building sustainability in this neck of the woods is thus now the law. Moving forward, every new building is a step in the direction of a sustainable future where the built environment reduces greenhouse gases, is energy-efficient, and affordable.

VISION AND LEADERSHIP

The IECS has been and will continue to be a community collaboration of the Ithaca Sustainability Coordinator, Director of Sustainability, Planning and Building Department, Mayor's Office, and a host of local green building professionals. Ithaca is a progressive community with a commitment to a socially just and sustainable future, and the vision of a carbon neutral economy is a strong cultural value. When cities and towns across the globe demonstrate leadership in sustainability and social justice, it encourages other places to follow suit. Ithaca is truly a leader in manifesting a green future by showing how to turn vision into reality.

Ithaca Town Hall. (Wikimedia Commons/Kenneth Zirkel)

HOW IT WILL GET DONE

Hot off the press, the IECS is in a transition and training period where the state code standards move into the new Ithaca energy code supplements. Construction is where the community collaborative effort is poised to help projects meet the new standards and stay within budget. And as they saying goes, one step at a time, and by 2026 Ithaca will have some of the highest green building standards in the country.

WHAT'S IN A CODE?

What are codes and why are they important? The next time you drive through a city or suburbia just imagine if the buildings were all green-certified and net-zero energy. Why aren't we building the world green? While there are many answers to this question, energy codes largely determine what standard of sustainability will be achieved, or not achieved, and that's why codes are important.

In principle, codes protect public health and safety. Earthquakes, fires, hurricanes, tornadoes, and floods (to name a few) wreak havoc on the built environment, so codes are enforced to protect buildings and their inhabitants.

When we move into energy codes, we're in the domain of saving energy, protecting the environment, and now combating climate change.

We will quote green building pioneer David Eisenberg: "Building codes are based on a societal decision that it is important to protect the health and safety of people from the built environment. If, inadvertently, these codes actually jeopardize everyone's health and safety by ignoring their impacts on the environment, resulting in the destruction of the ecosystems that sustain us all, then we are obligated to reinvent the codes from that larger perspective. Certainly, it cannot be more important to protect individuals in specific buildings than to protect all of us and all future generations on this specific planet."

The IECS represents what's possible in our code infrastructure and distinguishes the codes as a means to a sustainable future. Let's do this everywhere!

To learn more visit http://www.ithacagreenbuilding.com/news and https://www.cityofithaca.org/746/News-Notes

Dan Antonioli is a green developer, licensed general building contractor, and permaculture designer based in Ithaca, NY. His company, Going Green, is available to assist in a wide variety of green building projects. Visit www.going-green.co. ♻

Backyard Parks: The New Building Landscape Trend

Casey Williams

Imagine opening your door to a yard filled with wildflowers and teeming with butterflies and songbirds. Imagine yard maintenance transformed from the joyless tasks of mowing and pruning into a simpler, more rewarding role of nurturing and curation. Imagine creating a landscape design that is not just ornamental beauty, but becomes a back yard nature preserve all your own.

Careful management of the building site permitted construction of this woodworking shop and art studio without disturbing the root system of nearby mature trees.

If you think about it for a moment, you'll realize we've been building 'wrong' for decades. We find a beautiful parcel in some location just right for a dream home. We pick a home plan or hire a designer. Then, to build the home, we tear open a scar in that beautiful parcel, build, and then cover the remains of the scar with lawn and landscape plants chosen for eye appeal. In doing so, we lose something precious: we've disturbed and altered the original biosphere, introduced plants that don't belong, and created a desert island in the local food chain. In essence, we've destroyed the very thing that drew us to buy that beautiful parcel. But it doesn't have to be that way.

Geobarns has been building homes, utility buildings, and commercial venues for more than three decades, often in locations with strict conservation standards. Over the years, Geobarns has developed a robust process of 'site stewardship' to minimize the impact of construction and restore the natural landscape after completion. While the process is specific and unique to each of the clients' building sites, the Site Stewardship principles can be applied anywhere.

Our foundational principle for conservation is simple: no matter what property any of us may own, we are all merely temporary caretakers. We must be good stewards of the land, to disturb it as little as possible, and to conserve and nourish it for future generations to enjoy as much as we do.

– Casey Williams

Geobarns believes that the design of buildings and the experience of living within them is linked to the health of the land surrounding them. Our wellbeing is dependent upon nature, the resources it provides, the forms of life it supports and the food it generates. Therefore, landscaping isn't something done afterwards; it becomes an essential design element as important as siting, drainage, floorplan, and finishes. And it isn't just 'landscaping,' it's restorative landscaping: repairing the impact of construction and restoring the original ecological web of species and relationships. This is essential to being a good steward of the land, whether a home owner, builder, or designer.

Here are eight principles from Geobarn's Site Stewardship process you can implement yourself:

- Incorporate a diversity of native plants, which provide habitat and food sources for insects at the bottom of the food chain.
- Minimize lawn and diversify these areas with clover, thyme and other low-growing herbs and legumes, which minimize fertilizer demand and provide nectar for local pollinators.
- Plant natural plant communities or guilds that are multifunctional and are naturally found growing together. These plants provide the benefits of natural fertilizing, repelling pests, attracting pollinators and other beneficial insects, creating mulch, and suppressing grass.
- Reduce use of pesticide, herbicide, soaps, driveway sealants and de-icing salts that are toxic to both terrestrial and aquatic ecosystems.
- Manage stormwater, minimize erosion, and enhance soil quality by adding compost, incorporating native plants, preventing compaction, and maintaining or establishing pathways and areas for infiltration.
- Conserve water by hydrozoning plantings and collecting rooftop water for nonportable uses, such as irrigating gardens, livestock, recreation, etc.
- Limit use of exterior lighting and incorporate "Dark Sky Lighting" to protect the night skies from light pollution, shield glare, and avoid disruption to circadian rhythms and insect populations.
- Become an advocate for plant and insect conservation by helping to increase awareness and appreciation of insects and countering negative perceptions. This can also involve getting involved in local politics, supporting science and voting!

Gutters collect and filter roof rainwater for irrigation of landscape plantings and a small herb garden. A single inch of rain on a small dwelling can save enough water to fill up to fifteen bathtubs.

Too often, we think of human activity and wildlife habitats as forces in conflict. This doesn't have to be true. Although human activity is negatively impacting our planet in many ways, we are a native species like any other. We can resolve the conflict.

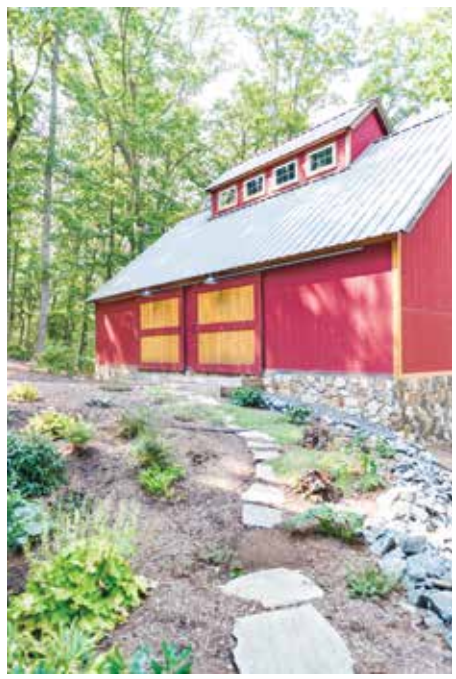
The solution is to use our knowledge, science, and technology not simply to mitigate negative impacts, but to build a harmonious relationship between our human dwelling places and the natural environment where we build them. Your property and your home can be part of the solution while still providing the lifestyle you want. With forethought and planning, the natural environment and your home can flourish together.

Geobarns is based in White River Junction, Vt. Learn more at Geobarns.com.

Resources Geobarns recommends:

- Nature's Best Hope by Doug Tallamy, Professor and Chair of the Department of Entomology and Wildlife Ecology at the University of Delaware
- Audubon Native Plants Database: www.audubon.org/native-plants
- Backyard Parks: www.HomegrownNationalPark.org

Casey Williams is a Partner with Geobarns in charge of Site Stewardship and Conservation. Casey holds a Bachelor's degree in Environmental Science and a Master's degree in Urban and Environmental Planning, both from the University of Virginia. Her previous experience includes natural resource management, environmental education, community collaboration, and permaculture design. She lives with her husband and twin daughters in Charlottesville, VA and spends every moment she can outside studying and absorbing the beauty around her. ♻



Choosing a variety of native plants restores damage to the local food chain from construction by ensuring a broad range of pollen and food sources for insects and birds. (Courtesy images)

NH School District Strives for Net-zero Emissions

John S. Webster

A school district in New Hampshire is taking big steps toward net-zero--or even net-positive--power consumption. Oyster River Cooperative School District in Durham is nearing completion on a new middle school, and large parts of the project focus on solar power and geothermal heating and cooling. This is notable, not only due to the cost to its $45 million budget. In addition, it required approval by a small-town school district whose goals included building a school that would eliminate serious drawbacks in the existing middle school but would also put it ahead of a number of emissions-related initiatives in the state and the New England region.

Rendering of the new Oyster River Middle School in Durham, N.H. (Lavallee Brensinger Architects)

To achieve this, the district had to address problems of heat and noise, undersized classrooms, and inadequate storage and performance space for its growing music program. But the district also wanted to build an energy-efficient building that would save money in the long run, and at the same time, contribute to reducing its carbon footprint and effects on climate change.

The school district contracted Bauen Corporation of Meredith, N.H., for the project. The company has a 30-year history of construction management in New England, and strong ties to subcontractors who provide photovoltaic panels and geothermal heating systems. The architectural firm Lavallee Brensinger is the architect.

Andre Kloetz, project manager says Bauen was selected as the construction manager due to the company's history with both the school district and around the region. For one, the company has experience in LEED contracting and the principals, including Kloetz, Adam Downs and Jeff Parks intend to continue in that vein.

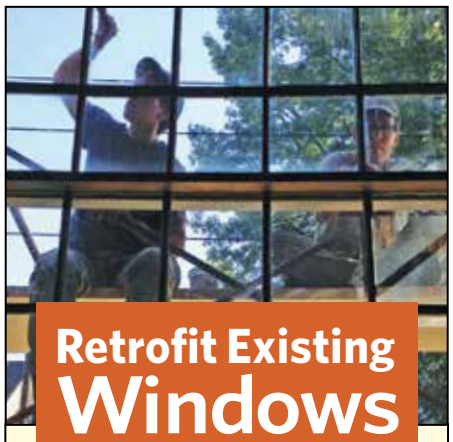
"This is our seventh project for the Oyster River Cooperative School District," said Kloetz. "We were asked to submit our qualifications to the school district, and we were selected after interviews with the finalists were held by the building committee. We have worked with Lavallee Brensinger for thirty years, and we hope the middle school project will be our second LEED gold project."

According to Steve Laput, Lavallee Brensinger project architect, even though one of the school district's primary goals was to build a net-zero facility, it will in fact be net-positive upon completion, due in part to use of low-energy LED lights, smart-light controls and natural daylight. The building's energy infrastructure underlying these components is even more important.

"A high-performance exterior envelope combined with the geothermal system substantially reduces the building's heating and cooling loads which results in a smaller mechanical system and therefore reduces energy usage. Furthermore, an extensive solar photovoltaic system consisting of roof-mounted solar panels and a structured solar array over a parking lot will generate and send power back into the electrical grid," said Laput.

Building began in October 2020, with completion of the structural steel shell. Bauen contracted several companies to handle the infrastructure. ReVision Energy, with locations in Maine, New Hampshire,

Cont'd on p.38



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: aceee.org

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

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

Carbon Tax: carbontax.org

Clean Energy NH: www.cleanenergynh.org/

CO2.Earth: See emissions harms, scientific advice, and pathways to follow. www.co2.earth

Consumer Guide to Home Energy Savings, Heating, Appliances, Refrigerator Guide, Building Envelope, Driving: http://aceee.org/consumer

Dept. Public Svc. (CEDF): publicservice.VT.gov/energy/ee_cleanenergyfund.html

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

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

Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov

Energy Guide: Unbiased advice about today's energy choices. Find ways to save, lower your bills & help the earth's environment - **www.energyguide.com**

Energy Star Federal Tax Credits: www.energystar.gov/about/federal_tax_credits.

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

Fossil Fuel Freedom: Group working to make Vermont's energy plan 100% free of fossil fuels:

To join this group go to: **groups.google.com/group/fossil-fuel-freedom-**

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

IREC/ Interstate Renewable Energy Council: RE educational info. **www.irecusa.org**

NABCEP/ North American Board of Certified Energy Practitioners: This organization that tests & certifies PV system installers. Individuals are Certified, companies are not. **www.nabcep.org**

NESEA/ Northeast Sustainable Energy Assoc.: www.nesea.org

National Association of Energy Service Co. (NAESCO): www.naesco.org

National Renewable Energy Laboratory (NREL): www.nrel.gov

NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.org**

New York Solar Energy Industries Association/NYSEIA www.nyseia.org

New York Solar Energy Society (NYSES): www. nyses.org

NFRC independent rating & labeling system for the windows, doors, skylights **www.nfrc.org**/

NH Energy Divison: www.nh.gov/osi/energy/index.htm

Renewable Energy World: www.renewableenergyworld.com

Renewable Energy Vermont: www.revermont.org

SEIA/ Solar Energy Industries Association: The SEIA Tax Manual to answer your solar related tax questions. **www.seia.org**

SmartPower: www.smartpower.org

Solar Components: www.solar-components.com

Solar Jobs: Listed by city, state, and district, **SolarStates.org**

Solar Power Rocks: Impressive data and info ,including per state. www.solarpowerrocks.com/

Solar Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. **SolarStoreofGreenfield.com**

Tax Incentives Assistance Project (TIAP): www.energytaxincentives.org

The Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - **www.eere.energy.gov**

Vermont Energy and Climate Action Network (VECAN): works to start and support town energy committees as a powerful, people-powered response to realizing a clean energy future. www.vecan.net.

VPIRG: understand the clean energy resources available to VT - **www.vpirg.org/cleanenergyguide**

VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - **www.veic.org**

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

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CONCORD HOUSING

Cont'd from p. 30

Unitil EE Program Coordinator Ben Stephenson said, "Unitil was proud to partner with Concord Housing on this large scale, first of its kind, project in the state of NH. There are so many benefits to an energy efficiency upgrade like this one starting with improved comfort for the tenants, management and overall efficiency of the system, and the large dollar/kwh savings realized year over year. RBG did a fantastic job pulling this project together and managing all aspects.".

HVAC feeds in the 6th level hallway ♻

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ELMORE ROOTS' PERMACULTURE KNOW-HOW

What is Seven Feet Tall, Smells Like Chocolate and Wasn't Visible a Few Weeks Ago?

David Fried

Sometimes the earth around us is covered in leaves. Sometimes in snow. Right now, the entire land seems to be covered in Jerusalem artichokes.

This is a good thing. This is food for the body and food for the soul. The golden blossoms have a chocolate scent, and the stalks are strong and make a great privacy screen from the town road. Rabbits run freely here and porcupines (our northern sloth) walk through the deep waves of green to get out of the intense sun of September.

Jerusalem artichokes grow at author's house. (David Fried)

In the fall, we pull up and dig up these plants to get to their rich satisfying tubers. They store remarkably well in a bucket or sack filled with moist sawdust, or even better in a root cellar or fridge. All winter we make soups and stir fries with them. We also bake them and then dip them in garlic butter once they are soft, which does not take very long. They soften quickly in the coals of a woodfire, too, so they are good on a camping trip or cookout. They are low in calories and low in saturated fat. Our guinea pig likes them, too, so we give him a raw one now and then for a treat. We grow tan Jerusalem artichokes and rosy Jerusalem artichokes. Some people call them "sunroots" or "sunchokes" and just over the border they call them "topinambour. " Jerusalem artichokes are in the sunflower family and probably got their name from the Italian word "girasole" which means "sunflower." They may have reminded our ancestors of artichokes because when they are cooked and soft, they have many uses, like artichokes do. They are native to North America and the northeast and could be grown and enjoyed a lot more.

A warning: do not plant them in your garden, as every little rototilled piece will grow into a seven-foot plant. Do plant them in their own patch and mow around them. They will screen a propane tank quickly and give you a thick hedge in two seasons. They are also good under roofs where snow slides off or along driveways that get plowed, for in the fall and winter and spring they go back into the earth. Back into their root tubers, where they store their energy for summer's fast fling of growth and flowering.

Yesterday, I wanted to go upstairs to have lunch on the deck, and I was surrounded and blocked by a lot of Jerusalem artichokes that were not there earlier. I carefully walked between them, this way and that. They have no thorns, no rough edges, nothing to hurt you with to discourage passage. But I did not want to mar their beauty by crushing them or breaking them. Finally, I made it through triumphantly to the steps! These are strong garden fellows. I have a lot of respect for them now. They go from a small two-inch tuber to an eight-foot sturdy flowering corn stalk-like plant in a few months. Of course, corn does this from a small kernel. But these masterful Jerusalem artichokes do it every year and without me having to plant them or till them or weed them or feed them. A true perennial food.

It is known that in 1816 summer never came to Vermont, as much of the northern areas here and globally, had reduced sunlight. It was just cold from spring to summer to fall and back to winter. Most crops did not grow, or do much of anything. How did the farmers and local people survive? (This was before Shaw's and food coops and mail order). The people lived on Jerusalem artichokes! A true survival food. Plant some just in case, but pray we never have another winter like 1816. Plant them once and enjoy them as a perennial vegetable and be surrounded by their flowering prowess each September, year after year.

David Fried is a writer, grower and Vermont horticulturist. ♻

Ingredient of the Month

Life in the Age of Unintended Consequences

Larry Plesent

We often speak of science and technology in the same breath. And there is logic to this as science can lead to changes in technology. The growth of technology is so basic to modern society that our financial system is largely based on investing in it, and in the predicted profits from its ongoing role in our evolving society.

For this article, we will narrowly define technology as toolmaking and its end products. Keep in mind that technology is often immediately used for making ever more complex tools, and for novel applications of these new tools as they emerge. I'm a big fan of technology and of tools, which I use constantly throughout the day to multiply my physical force and to increase efficiency of action. For the record, technology is not my primary focus in life.

Certainly, our to-do list is defined by the tools we keep. But is it sane and realistic to define our essential selves strictly by the technologies we manipulate?

Technology is like a birthday. Every once in a while, you actually get something you want that is useful and relevant in the life you are currently living. Often, it's just another mess to clean up.

Now it gets really interesting.

EVERY technology brings with it unexpected and indeed often unintended consequences. Gone are the days of believing that the earth will always clean up our messes for us. OK. It will. But most of us will probably be wishing that we just did things differently from the start.

In many ways we are truly living in the Age of Unintended Consequences.

The easy way out of all this is to believe a very powerful and persuasive myth. Here it is. Tomorrow's technology will save us from the consequences of today's technology. Powerful words, and important to the continuation of financial markets and economies worldwide. Without a financial future, why bother investing at all?

While tomorrow's technology will surely solve SOME of the hard issues inherent in older technologies, we are still just talking about a better way to bake a cake. Or power our factories. Or travel across the world. Or say hello to our neighbors.

I do not believe that the advance of technology will stop the portion of the current warming cycle that we are all directly responsible for. Not in any of our lifetimes. The entire financial system our lives revolve around depends on ever increasing production. What is needed, however, is most likely just the opposite.

I believe that what is required here and now is a more biological approach to meeting the needs of busy humans. Like building with mushrooms on the exterior surfaces that heal their own cracks. A mass conversion to organic farming which nurtures mineral rich soil which holds carbon. Converting uranium fueled reactors to 90% thorium fueled reactors. The use of enhanced micro-organisms to clean up toxic waste sites. We already have this stuff and more. Check it out.

On a local level let's have more gardens and homesteads and far fewer lawns. Less nationalistic fervor and more sharing of culture and perspectives. How about a world-wide weather show that illustrates how weather is a worldwide phenomenon and that we are all affected by it? Weather doesn't stop at the border, just on my weather application.

And while we are at it, here is a plug for a nonprofit group that brings you over eight thousand radio stations from around the world you can listen to for free. Rotate the globe and pick a region. Use the search feature to narrow your choices or choose stations geographically. What a great way to develop empathy with humans across the globe! Look up Radio Garden in Ecosia or use your favorite search engine. Ecosia plants one tree for every forty-five searches you do. Now there's an easy way to make a difference!

This is the Soapman wishing you all a happy, healthy autumn. Start drinking your chaga tea when the leaves fall off the trees. And don't be afraid of the vax.

Larry Plesent is a writer and human being living and working in the Green Mountains of Vermont. Learn more at www.reactivebody.org. ♻

Harvest Time: How to Build a Root Cellar at Home

Scott Bish

Root cellars have been used to store food for centuries. They're typically underground or partially underground cavernous cellars, where fruits, vegetables, nuts, seeds, legumes, and gourds can be kept safe from heat and light and stored for days or even months at a time. Root cellars are nothing new, but with more people interested in natural ways to preserve foods, they're making a comeback.

A basement root cellar (tractorsupply.com)

Root cellars can take different forms, some of which are relatively easy to build. These tips will get you on your way to storing your homegrown produce in no time.

Root cellar basics

Regardless of which type of root cellar you add to your home, these key elements will determine your success: temperature, humidity, ventilation, and darkness.

Temperature. To work properly, a root cellar should stay between 32-40ºF. Harmful bacteria thrive in the warmth, so keeping your cellar cool helps crops stay fresh and safe for longer. A good root cellar is designed to borrow cold from the cool ground or soil, but it will also not freeze your produce in winter weather.

Humidity. Humidity levels inside your cellar should be between 85-95% to prevent the cellar from losing moisture through evaporation and to keep produce from withering. If your cellar is above ground, you can achieve the right humidity level by simply having a dirt floor. Soil naturally has a good amount of moisture. If your cellar is below ground, you should not have to take special measures to maintain the proper humidity. However, if you do need more moisture, you can spread damp—not wet—burlap bags over your produce or pack your produce in damp moss, sand, or even sawdust.

TIP: *Equip your root cellar with a hygrometer and thermometer to track humidity and temperature. Check both daily.*

Ventilation. Since warm air rises, you'll need to ensure proper ventilation to prevent moisture build-up, which can lead to moldy produce. Make sure your cellar has both an air intake and exhaust vents to keep the air circulating. The incoming air vent should be low to the ground and the outlet vent should be higher, close to the ceiling. For best results, the two should be on opposite sides of your cellar space. This will let cool, fresh air in from outside and allow stale air to be exhausted out.

Darkness. Light can cause freshly picked crops to continue sprouting. So, you'll want to keep the cellar as dim as possible. This means covering up windows that let sunlight in and ensuring cellar lights are off when no one's inside.

Cont'd on p.37

Got It Covered? Cover Crops to the Rescue

Jessie Haas

What if you could protect your farm crops or vegetable garden from drought, flooding, weeds, and insect pests, all in one fell swoop? What if that method could also build soil, sequester carbon, and feed beneficial insects and pollinators?

No, it's not fairy-dust. You don't have to squeeze your eyes shut and believe. Instead open them, follow the research, and start planting cover crops.

Cover crops are a popular option to protect the soil over the growing season. (www.mncorn.org)

This is more important than ever for large-scale farmers, as many weeds have developed resistance to herbicides. Crops are getting overrun with these unwanted plants, and the ever-increasing cycle of spraying is just not working anymore. Science predicted this, just as it predicted the wild weather we are getting with global warming, but 'I told you so' isn't going to pay the mortgage or feed the world.

One solution is cover crops. These are plants like buckwheat, clover, rye, and many others, planted thickly to suppress weeds. Corn and soybean farmers who add cereal rye into their rotation have been able to eliminate the problem they were having with certain resistant weeds. Seems like a win, but farmers worry about finding a market for their rye. One solution is to graze it down, thus converting it to beef or lamb. But most corn and soybean farmers no longer raise livestock, and cover crops that "only" break the weed cycle seem wasteful, making it a hard sell.

But there are many other reasons to use cover crops. Keeping the soil continually covered with living plants is a key element to increasing soil carbon and fertility. It builds the spongy quality of soil that allows it to absorb excess water during heavy rains and to retain that moisture for crops during times of drought. Recent research at Cornell University has shown that a rolled cereal rye cover crop can increase water infiltration 63% over conventional tillage-based production. Farmers plant rye in the fall, then terminate it in late spring and plant soybeans, all in one pass, saving 34% on labor and 26% on fuel, a major win for the environment.

Other benefits: Soil containing a lense of water creates what's called "sensible cooling." That means, you can feel it. Cover cropping in the Midwest has been shown to decrease local summer temperature measurably; that's good when the planet is heating up.

Some cover crops, like mustard and brassicas, produce chemicals that kill nematodes. Most, if allowed to flower, feed bees and butterflies; if planted early, buckwheat and cowpea cover crops also provide food for predator insects and cover for beetles that will later feed on destructive pests. Cover crops also feed the soil organisms that create healthy plants and sequester carbon.

Vineyards in California are experimenting with planting cover crops between the vines. Sheep are then grazed between the rows, eating the cover crop and weeds. They are trained to ignore grape leaves, but when grazing in hop-yards, they are actually encouraged to eat the lower leaves of the hops, which creates better air flow and prevents diseases. Sheep are a better choice than cattle for this work, as they are smaller, easier to transport, and cause less soil compaction.

Cover crops in orchards can also reduce pest damage. A mix of rye and crimson clover grown between transplanted trees reduced flatheaded appletree borer damage by up to 95% in one recent study, as effective as using insecticides. The Rodale Institute has demonstrated that rolled cover crops are effective at weed suppression compared to black plastic, and greatly reduce plastic waste on the farm. Finally, legume cover crops provide soil nitrogen, and grass cover crops can take up excess nitrogen. This allows a farmer to grow healthy crops without paying for chemical fertilizer, which is a big greenhouse gas emitter and a big expense.

All this benefit just from growing more plants? If it seems improbable, remember that plants, over millions of years, created the atmosphere that makes our civilization possible. The more we find ways to partner with them, the more likely we are to keep it.

Source links available in the posting of this article on the Green Energy Times *website.*

Jessie Haas has lived in an off-grid cabin in Westminster West, VT for 36 years. She is the author of 40 books for children and adults, most recently The Hungry Place. ♻

Root Cellars – *Cont'd from p. 36*

Two of the most common types of root cellars are basement and trash can cellars.

Basement root cellar

This option provides the convenience of having your fruits, veggies, and other bounty easily accessible within your home's basement. Having a packed earth or gravel floor is best, however a concrete basement floor can also work.

1. Choose a dark, cool, dry corner of your basement as your root cellar space, with a window for ventilation.
2. Cover the window with exterior-grade plywood to block the sunlight. Cut vent holes through the plywood using a multi-tool. A 4-inch intake vent and 4-inch exhaust vent should be adequate for an 8-by-10-foot room. If your space is larger, consider adding additional vents. Cover vent holes with mesh screen and tack to keep critters out of your cellar.
3. Place wood shelving 3 inches away from the walls so that air can circulate. Wood shelves will keep temperatures more consistent than metal shelves.
4. Add wood crates or bushel baskets on shelves to house your produce.
5. Add your produce in each crate or basket. Add one layer of food, then one layer of straw. Keep layering to the top. This method will help prevent fruits and vegetables from resting against each other, which can cause rotting.

Trash can root cellar

This method involves a bit of digging. A trash can root cellar uses the soil's naturally cool, moist conditions to create the environment of a refrigerated produce bin.

1. Pick your spot. If your region gets snow, choose a sheltered location so you don't have to dig to reach your produce. Beneath a porch and inside a dirt-floor shed are great options.
2. Dig a deep hole with your round point shovel large enough to insert a 20-gallon galvanized steel trash can, leaving four inches of the can above the soil line.
3. Line the floor of the dirt hole with gravel to drain rainwater away from the can.
4. Drill ventilation holes all around the bottom of the can, roughly six to twelve inches apart from each other.
5. Fill the can with produce, layering in straw, and cover it with the galvanized steel lid.
6. Pile twelve inches of straw on top of the closed lid.
7. Cover the cellar with a waterproof tarp to keep the straw in place and to stop rain from seeping into the can.
8. Top with a cinder block to hold the tarp down and keep foraging wildlife out.

Adapted from How to Build a Root Cellar in Tractor Supplies' Life Out There *blogsite. (www.tractorsupply.com/life-out-here/build-a-root-cellar)* ♻

Grazing Reduces Fire Fuels and Fire Danger

Jessie Haas

Our relationship with fire is one of the things that makes us human. Scientists theorize that fire helped us become homo sapiens; cooked food allowed us to shrink our gut over the millenia, and increase the size of our brains. We also have an ancient history of cooking the landscape, using fire to create habitat favorable to the animals we wanted to hunt and the plants we wanted to gather. The last people to come into an environment unaltered by humans were the First Nations people who entered the Americas. Since their arrival they have shaped nature, often using fire. The smoke that whitened our skies this summer is suggestive of the haze that hung over the northeast in past centuries when the tribes west of us were burning the prairie.

European settlers had a different relationship with fire. For centuries theyhave been suppressing it, which allows excess fuel to build up and makes wildfires hotter. Everyone knows that indigenous people prevented this by yearly burning, but it's hard to see how we could do that now without massive societal disruption.

An alternative may be managed grazing. It's already being done in California. For instance, the Bay Area Transit Authority (BART) clears 35 of its 100 trackside acres using 700 goats leased from Living Systems Land Management. Goats are agile and voracioius, eating not only grass, but brush and branches. This removes the fine fuel which could feed fires. The goats work steep hillsides where humans can't use machines; they fertilize the land, never spark wildfires, as mechanical equipment occasionally does, and they are quiet. The neighbors love to have them.

Goat grazing. (Flickr/Feather River Land Trust)

Sheep are being grazed in some California vineyards for similar reasons; they graze down weeds and cover crops between the vine rows. All this helps keep the flame length below four feet, which allows firefighters to work a blaze without needing to bring in heavy equipment.

A recent study at UC Berkely funded by California Cattle Council has looked at grazing cattle to accomplish some of the same goals. The study sought to quantify how much fuel cattle need to remove per acre to keep flames under four feet, using figures from 2017, when 1.8 million beef cattle were pastured in the state. That's 57% below the peak in the 1980s; ranchers have reduced stocking numbers due to drought. The study found that cattle grazing already plays an important role in reducing fine fuel and can also prevent brush encroachment; brush increases fire hazard and intensity. There's room for cattle to do more of this work, but important environmental balances need to be stuck. Ranchers need to leave enough forage ungrazed to prevent erosion and support future growth.

All this points at managed grazing. It's not enough to simply turn some cows loose on the free range. They must be cycled through the landscape according to a plan that bears all this in mind.

The good news is that thoughtfully managed grazing animals have a great capacity to restore the water cycle. Ranchers all over the world have used it to build soil and increase biodiversity. When soil structure improves and the ground is more lushly covered with grass, long-dry springs and brooks revive, rehydrating the land and reducing the risk of fires. The long partnership of grazing animals and the plants they eat can and must be renewed in the dry, fragile parts of our world. If we do that, sensitively and thoughtfully, we stand a chance of turning 'fire season' into a distant memory.

Source links available in the posting of this article on the Green Energy Times *website.*

Jessie Haas has lived in an off-grid cabin in Westminster West, VT for 36 years. She is the author of 40 books for children and adults, most recently The Hungry Place. ♻

Ring Out for Climate!

Bells of Fun – Action for the Planet

Saturday, October 30, 2 pm

On Saturday, October 30th, a worldwide environmental and climate action event is happening. It is relatively simple to do and also a lot of fun. You are invited to chime in!

Here's the action: At 2 pm (your time zone) on Saturday, October 30th, church bells, shofars, gongs, etc. ring for ten minutes. Everybody joins in with drums, hand bells, howling voices, pots and pans. (Rain date: Sunday, Octoberober 31st, 2 pm)

Here's the reason: COP26 starts on October 31 in Glasgow, Scotland, (a city on target to be carbon neutral by 2030). COP26 is a global event, sponsored by the UN as the 26th Climate Conference.

A church bell ringer Edward Gildea of East Anglia, UK initiated this idea, calling it Ring Out for Climate. He and his comrades are aiming to get all the church bells in the UK to ring out for 10 minutes at 6 pm October 30 (which is 2 pm EST). It's an entrenched part of English culture that when their island nation is under threat, all the church bells sound the alarm to activate the people to protect their land, which is what we all need to do now!

Mr. Gildea is thrilled that we in the U.S. are chiming in. This is being spread to pro-climate groups throughout the world. A couple of local examples are: Elders for Future Generations of Maine are joining in; New Paltz Climate Action Coalition is taking this on and developing hand-outs and press releases.

Please invite everyone in your circle to join in. This is something that can and should be done all over the planet.

If any participating group has the means to do so, please share your live-streamed video far and wide.

Bear in mind that this idea is very adaptable. It can consist of a few people making noise on a street corner, or a larger rally with music, percussion, street theater, and visuals leading up to the main sounding, along with simple hand-outs and willingness to engage with intrigued passers-by.

To follow up after the event, we need to educate the public and encourage citizens to contact the White House and other elected officials. It is time to demand the need to get really serious, real fast about stopping fossil and nuclear fuel projects and support sustainable energy and production practices.

Feel free to be in touch with Barbara Kidney, in the Hudson Valley of NY for assistance at 845-744-5824 or stonypoint55@ipsecinfo.org. ♻

A seagull flies over the ancient alarm bell of Chersonesos, Crimea. (AdobeStock_76303108/Shchipkova Elena)

NH School Net-zero Emissions

Cont'd from p.33

and Massachusetts, handled the solar panels; Cushing and Sons, based in Meredith, N.H., handled well drilling and the geothermal system; and Granite State Plumbing and Heating in Weare, N.H., was the mechanical contractor.

Construction rendering of the new Oyster River Middle School in Durham, N.H. (Lavallee Brensinger Architects)

For its part, according to ReVision, since 2017 the school district has looked beyond academics in order to also invest in the entire community's future. Prior to the Oyster River Middle School project, the company installed a 79-panel solar array on the roof of the district's maintenance facility. It will produce more than 27,000 kilowatt hours of electricity each year, offsetting the equivalent of driving more than 50,000 miles in a gas-powered car.

In addition, the district financed the solar array through a Power Purchase Agreement, in which an investor owns the array. while the district pays monthly fees for the power generated. This way, the district is responsible for reduced energy costs, without paying anything up front, with the option to buy the solar array in the future at a significantly reduced price.

ReVision calculates that carbon emissions reductions total more than 29,000 pounds per year.

John S. Webster is a freelance writer based in Brattleboro, Vermont. ♻

Husqvarna: Sustainable Chainsaws (And a world of outdoor equipment)

George Harvey

Those of us who know the editor of *Green Energy Times*, Nancy Rae Mallery, come to expect her energy and enthusiasm. That being the case, we are probably not terribly surprised to find that she has three chainsaws to keep herself supplied with firewood, all of which she uses. This year, she was in need of some new chains and a bit of servicing for all three.

She went to a local chainsaw shop, Woodsville Power Equipment (WPE), in Woodsville, New Hampshire, to get the work done. Her chainsaws include an 18-inch Husqvarna®, powered by gas, and two Greenworks® battery-powered saws, one 16 inch and one 14 inch. WPE, it turned out, could service the Husky and had new chains and knowledge about all three saws. This family-owned business sells and can service both of these brands and others as well. Much of their expertise, however, is with Husqvarna equipment.

According to the history page at Husqvarna's website (husqvarna.com), the company was actually started as a government-owned plant in 1620. Though the years, its product lines have been expanded to the point that it made everything from typewriters to lawnmowers. The company was privatized long ago, as product lines evolved and changed. As it stands now, Husqvarna is a company that makes and sells all sorts of outdoor equipment, built in America. It would be a great starting point for anyone who is looking for leaf blowers, lawn mowers, chainsaws, or just about any other outdoor equipment.

Husqvarna is serious about sustainability. Last year, it adopted a program called 'Sustainovate and reports of its progress have already appeared. Its "2020 Sustainovate Progress Report" said the company had reduced its CO_2 emissions by 32%, compared to 2015 (www.bit.ly/Husqvarna-1). Husqvarna had earlier become a member of the Climate Leadership Coalition (www.bit.ly/Husqvarna-2).

Tommy Powley, general manager of WPE, the local Husqvarna shop, spoke of the progress Husqvarna is making on sustainable practices, both in its operations and for its products. "Husqvarna is a great company," he said. "We see what they are doing with the battery products and it seems like their footprint is smaller than many other companies out there. We appreciate that."

A wall full of just the Husqvarna® chainsaws and supplies at Woodsville Power Equipment in Woodsville, New Hampshire. (Courtesy image)

The owner, Ronson Smith, showed Mallery the newest battery-powered chainsaw they have in stock. This is an impressive chainsaw. He pointed out the 2.5 hours in eco-mode option, and that the battery will run for a solid 1.5 hours during heavy usage. Backup batteries are available in a variety of sizes for the Husqvarna equipment. For example, 40-volt batteries are available in 2.5-amp, 5-amp, and 9-amp sizes. Conveniently, the spare batteries can be hooked to a tool belt. Powley noted that keeping chains sharp increases battery life.

Husqvarna has five battery-powered electric chainsaw models available. It has many models of gas-powered chainsaws, as well. We would like to make note that all of their products are produced with sustainable practices. Its other outdoor equipment includes leaf blowers, riding lawn mowers, snow blowers, pressure washers, trimmers, etc. And we might especially mention robotic lawn mowers. *G.E.T.* will enlarge on this in the spring.

As we mentioned, WPE sells and services a wide range of products, not all Husqvarna. Greenworks and Echo equipment are available through the shop. Smith commented on Mallery's Greenworks chainsaws, noting that the models she had chosen were of commercial quality. WPE also sells Echo battery products, Generac products, and outdoor apparel from Timberland Pro and Arborwear.

Husqvarna is on the leading edge of sustainable equipment, and Woodsville Power Equipment is a great example of the local dealers helping them get there. Husqvarna now offers many options for electric equipment with more coming.

Mallery comments that she appreciates Husqvarna because they are possibly the greenest manufacturer out there, noting a past label on her last chainsaw boasting this. She has used their chainsaws for over 40 years. "I am happy with the performance of my new Greenworks battery-powered saws, but I do think the quality of the Husqvarna is superior. If I had known about their battery-powered options, I would have chosen one of them. However, I am thrilled that WPE can service all of my chainsaws and get parts when needed. I am pleased to have this local shop available to fill my needs.

Woodsville Power Equipment's web site is woodsvillepowerequipment.com. ♻

Code Red for Humanity – Cont'd from p. 1

Massive Dixie California wild Fire forcing thousands of people to evacuate their homes, wildfires spreading rapidly, escaping to save their lives, destroyed silhouette, natural calamity. (Gajendra/Adobe stock photo)

leadership on his first day in office. But we are so far behind in taking action. Activist Greta Thunberg is expected to come and once again say, "Why are you relying on a teenager and my generation to save the Earth when you are unwilling to keep your promises?" Extinction Rebellion will also be there to promote with compassion the voices of all those who are suffering from climate change across the globe.

An ongoing issue is that governments and the media refuse to discuss the real truth that the rich and powerful fossil fuel companies have controlled policy for decades. The Exxon senior scientist James Black identified and modeled correctly the impact of doubling CO2 on global climate in 1978, more than 40 years ago. He gave the company five to 10 years to change direction. Exxon suppressed his report and started insidious campaigns of deceit to confuse the public and politicians that are still going on. I have called this lying group of fossil fuel companies and their business colleagues the "Fossil Empire." They pretend that it is the responsibility of the government to deal with climate change. However, in the U.S. Congress, it costs the Fossil Empire a mere $61 million to bribe 139 Republicans to publicly lie and deny climate change. So, we have the catastrophe that the Fossil Empire is allowed to destroy much of life on Earth to protect its vast annual profits.

Let us review the science very briefly. CO2 in the atmosphere has increased by 40% in less than a century. This reduces the cooling of the Earth to space and the energy imbalance warms the oceans. More water evaporates and its greenhouse effect is a large positive feedback that triples the warming from CO2 alone. Many complex changes follow in the forests and vegetation over land, the ocean currents and the polar and high mountain snow and ice sheets. For example, the reflective Arctic Sea ice is melting, so the Arctic is warming twice as fast as the tropics. The jet stream wave patterns in the westerlies are slowing down and getting larger in amplitude as the south-to-north temperature gradient decreases. We cannot forecast these quasi-stationary patterns that drive extremes a month or two ahead.

Since evaporation goes up steeply with temperature, rainfall rates are also going up steeply. With slower moving weather systems globally, this means that heavy rain periods can now last much longer and drive extreme flooding. The extreme mid-July floods in Europe and China stunned people and many were drowned. On August 21 as Tropical Storm Henri approached, Central Park in Manhattan saw a new record rainfall rate of 1.94 inches per hour and a new daily record total of 4.45 inches -- only to see this record shattered ten days later on September 1 as the remnants of Hurricane Ida crossed the Northeast. The new Central Park record is 3.15 inches per hour with an event total of eight inches. Many died in the massive flooding of NYC and New Jersey. Despite the warning of Hurricane Sandy in 2012, the unprotected subways again flooded, and people drowned in cars and basement apartments.

Some forecasts a week ahead have been simply hard to believe. Oregon, Washington and British Columbia have typical summer high temperatures in the 70s or 80s, but in late June 2021 extreme temperatures as high as 110oF occurred with a stationary ridge of high pressure. The small town of Lytton in southwest BC was warmer three days in a row (by more than 2oF) till it reached 121 oF. Imagine Death Valley temperatures in a northern forest. On the 4th day, it simply caught fire and burnt down. This extreme broke the all-Canadian temperature records set during a drought in southern Saskatchewan 80 years ago by an unimaginable 8 oF (4.6 oC). By August of this year, carbon emissions from the Siberian fires (larger than all the fires in the world combined), exceeded the annual carbon emissions from Germany. Two massive California wildfires, the Caldor and Dixie Fires, have burnt across the Sierra Nevada Mountain range as the mountain snowpack shrinks and the soil dries.

The truth is that the living Earth system is clearly in charge, not human power and greed. If we do not choose the Earth over the Fossil Empire, global climate change will destroy many industrial societies.

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