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## The Decline and Fall of Fossil Fuels

FERC projects that natural gas capacity will not grow in the next three years.

Nearly 100% of net generating capacity growth is expected to consist of renewables.

George Harvey

The SUN Day Campaign released its January 2023 analysis of data and projections from the Federal Energy Regulatory Commission (FERC), and *Green Energy Times* is reprinting it on page 3. Here, however, we want to look at the same report from a slightly different angle.

We should start with a note on the past. On July 15, 2020, just two and a half years ago, *G.E.T.* posted a little news item at its web site, "Fossil Fuels Are Failing, FERC Data Shows." (<https://bit.ly/FFAF-FERC>) That post said the United States had finally reached the important point that fossil fuels had entered an overall decline for generating capacity of electricity.



The 2,490-megawatt Bruce Mansfield Power Plant in Pennsylvania has closed. (Drums600, CC-BY-SA 4.0, [bit.ly/CC-by-sa-4](https://bit.ly/CC-by-sa-4))

The post looked at projections by FERC about highly probable construction of new generating plants and retirement of old ones, from June 2020 to May 2023. It showed that the net change in combined capacity of the fossil fuel plants would fall to less than zero in that time. The reason was that coal-burning power plants were no longer being built, and the net capacity growth of gas-burning power plants (capacity of new plants minus capacity of plants being retired) was insufficient to replace the capacity of coal plants being retired.

Specifically, FERC projected that from June 2020 to May 2023, there would be a net growth of 17,480 megawatts (MW) of natural gas generating capacity, a net loss of 20,696 MW of coal capacity, and a net loss of 3,982 MW of oil capacity. So combined capacity of fossil fuels generating was expected to fall 7,198 MW by May 2023 (<https://bit.ly/May-2020-data>).

Now, in late January 2023, we can see how well FERC did with its

Cont'd on p.12

## TRANSFORMING OUR FUTURE

# THE CLIMATE ECONOMY BOOM

Sara Gutterman

Big tech behemoths Microsoft, Apple, Amazon, Meta, and others may be laying off employees in droves while companies in the "climate economy" can't grow fast enough.

The Climate Economy is flourishing due to an unprecedented influx of private investment and public funding, and climate-friendly companies are quickly becoming a dominant driver of economic growth.

In 2021, a record \$850 billion was invested in companies developing climate change solutions, roughly equivalent to all global fossil fuel investments during the same timeframe.

In 2022, we hit a profound inflection point: climate investments actually exceeded fossil fuel investments.

This momentum is expected to continue into 2023 and beyond, spurred by the following.

- An \$800 billion infusion from the Inflation Reduction Act, expected to fast-track the transition to an all-electric, efficient, resilient, connected, clean energy powered built environment, transportation system, and grid infrastructure
- Meteoric venture capital investments, which reached 2.5x pre-pandemic levels in 2021 and continue to skyrocket year over year, funneled into companies with renewable energy, nature tech, water



processing, regenerative agriculture, and carbon sequestering solutions

- State-based actions, like California's \$54 billion stimulus package for climate solutions (expected to create four million new jobs and drop emissions by 60% by 2030)
- Carbon taxes that will generate revenue from polluters and channel those funds into innovative climate technologies
- Green bonds, which now represent

more than \$1.8 trillion in issuances, expected to exceed \$5 trillion by 2025

- Climate-focused Sovereign Wealth Funds (SWFs) like the One Planet Sovereign Wealth Funds network launched by President Macron, which now includes over 45 of the world's largest institutional investors and \$3 trillion in assets

Looking ahead, extraordinary opportunities exist to "decarbonize" even the most minute nooks and crannies of the global economy, including highly intensive

Cont'd on p.18

## COP15 Proves to Be Most Important UN Conference for Planet Earth

The UN Biodiversity Conference COP15 in Montreal Reaches Landmark Agreement



Alan Betts

One of the most important conferences on the survival of life

on Planet Earth was COP15 (Conference of the Parties) in Montreal in December, 2022. Representatives from 188 governments gathered in Montreal for two weeks and reached a landmark agreement to guide global action on nature through to 2030.

Chaired by China and hosted by Canada, COP 15 resulted in the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) on December 19th 2022. The GBF aims to address biodiversity loss, restore ecosystems and protect indigenous rights. The plan includes concrete measures to halt



The world is currently facing a human-caused extinction crisis. At COP15, the United Nations biodiversity conference, 196 countries are coming together to try to do something about it. ([pxhere.com/Peter Fischer](https://pxhere.com/Peter Fischer))

and reverse nature loss, including putting 30% of the planet and 30% of degraded ecosystems under protection by 2030. It also contains proposals to increase finance to developing countries for these purposes.

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port them. Say that you saw them in Green Energy Times. Now  
let's all G.E.T. moving ahead towards a clean, renewable future –  
one where our children & grandchildren will be able to breathe  
& grow, live & love on this beautiful planet where we live.

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bution emissions are also kept to a minimum, as well. With  
the wonderful help that we g.e.t. within many communities,  
it keeps our carbon footprint a lower. Hopefully our footprint is  
offset because we are 100% solar powered! Because all of our  
employees work from home, our carbon footprint is kept to a  
minimum. We grow most of our food organically and live as sus-  
tainably as possible. We DO walk our talk! **Peace!**

LETTER FROM THE EDITOR-PUBLISHER

As we approach another Earth Day on  
April 22, 2023, I have to again say that  
Earth Day is every day for Green Energy  
Times.

People on our team live sustainably.  
Most have solar power, many have  
electric vehicles or do not even own a  
car, choosing to walk or ride a bike or use  
public transportation to get around. We  
live in houses or apartments that have  
employed ways to save energy to keep  
our carbon footprint as low as possible.

As I can personally testify, you do not  
have to give up your creature comforts to  
accomplish this. I have lived for 20 years  
with no electric bill, but if you visited my  
home, you would not realize I was 100%  
powered by the sun. With a small 3.875kW  
solar system, solar hot water, passive  
solar gain in a well-insulated home, small  
things can add up to needing no more  
electricity than the solar system gener-  
ated. It all works! Solar power does work,  
and with a little more effort along with  
building and efficiency, it works seam-  
lessly. Some other time, I will explain  
how I did all this using only 10 gallons  
of propane in a year and a half, but still  
enjoyed modern conveniences like those  
most enjoy today. And on top of all that,  
I live in the warmest home of nearly  
anyone I knew. This lifestyle also included  
plenty of food grown organically, with-

out time-consuming efforts, I kept two  
acres mowed with electric robot mowers  
powered by the solar system, and I had an  
electric bike to do errands in town eight  
miles away.

I am not saying all these things to brag.  
I am saying them to point out that such  
a lifestyle is not just possible, it is com-  
fortable and convenient without heroic  
effort.

I just want to encourage all readers,  
new and old, to also live your lives as if  
Earth Day were every day. The pages of  
G.E.T. are designed to include the educa-  
tional information to help you navigate  
our path to a clean energy, fossil-fuel-free  
future that we hopefully can leave for our  
children. Our team works hard to try to  
bring you information about those who  
are doing it, and many options you have  
to help you all do your own part to get  
your emissions down, down, down. We  
cannot wait for someone else to do it for  
us. Yes, you can advocate for what we  
need, but it really starts with you acting  
in your own life. Your example will lead  
to others doing more. Together  
we can make the difference.  
Happy Earth Day every day to  
you all.

– Nancy Rae Mallery,  
Editor-Publisher-Founder,  
Green Energy Times ♻️



Kudos to the Green Energy Times Team  
Helping G.E.T. Save the Planet

G.E.T. staff

Todd and Tabitha  
Tucker purchased  
their current home  
in 2016 as their  
family was growing  
and they were look-  
ing to have a little  
more freedom to do  
what they could do  
with their property.  
Getting away from  
living in a condo to  
their own land, they  
were very happy  
to have dogs, cats,  
chickens, rabbits,  
and a garden as  
large as they wished.



Todd Tucker and his new electric Bolt that delivers GET with throughout the greater  
Burlington, VT region. (Courtesy photo)

In addition to a little “backyard farm”  
project, they wanted to bring the property  
more in line with their values of sustainable  
living. They were busy over their first couple  
of years installing solar panels on the roof,  
reducing the energy used from the grid by  
over 50%, and ditching an old oil furnace  
for an energy-efficient combination water  
heater and furnace, which reduced the  
energy cost by almost 20% and dramatically  
reducing its carbon footprint.

Their garden supplies much of their food  
during the warmer months and they can as  
much as possible to get through the colder  
season. The chickens provide eggs, and the

rabbits produced some of the finest fertilizer  
you could ever imagine (lol!).

Common practices in their house included  
composting, long before it was required.  
They recycle or repurpose just about every-  
thing. All their animal enclosures are made  
from recycled pallets. They garden organi-  
cally. The things they buy come from compa-  
nies that align with their values. Finally, just  
last summer they were able to buy their first  
fully electric vehicle, and Todd is proud to  
say this car is used to deliver G.E.T. to north-  
western Vermont. Not only are they reducing  
their emissions and saving money at the  
pump, but he is delivering the message from  
all the great people at G.E.T. ♻️

Late Breaking News

We are witnessing immense changes  
in energy and our ability to deal with a  
warming climate.

As we note on page 1 of this issue of  
Green Energy Times, the end of the era  
of fossil fuels is in sight, as even natural  
gas capacity is no longer growing, and  
all projected electric capacity growth is  
renewable.

Batteries are getting very inexpensive.  
A battery scheduled to be installed in  
Colorado at the site of the Comanche  
3 coal-burning power plant will store  
electricity it can deliver for 100 hours at a  
competitive cost.

A number of countries are closing in  
or at 100% carbon-free electricity. One  
report says the top five are Albania, the  
Democratic Republic of Congo, Iceland,  
Paraguay, and Norway. There are others,  
however. Costa Rica has been over 98%  
powered by renewable resources for years.

Not all news is good. The drought in the  
West is getting so bad that some scientists  
say it is probable that the the reservoirs at  
Lake Mead and Lake Powell will not refill  
during our lifetimes.

The good news is that opposing sides  
on issues are actually combining their ef-  
forts to improve things. ♻️

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# FERC Reports that Solar Will Provide Two-thirds of New Generating Capacity over 3 Years

Wind will provide another 15.4% as fossil fuel and nuclear capacity fall.

Ken Bossong

Based upon a review by the SUN DAY Campaign of data released by the Federal Energy Regulatory Commission (FERC) in mid-January, solar will account for nearly two-thirds (66.00%) of "high probability" additions to installed utility-scale generating capacity in the U.S. over the next three years.

According to the latest issue of FERC's monthly "Energy Infrastructure Update" (with data through November 30, 2022), "high probability" additions by solar to U.S. generating capacity between December 2022 and November 2025 will total 72,809 megawatts (MW). FERC foresees no solar capacity retirements during that time. Such growth would nearly double solar's share of total available installed generating capacity, increasing it from 78,880-MW to 151,690-MW. (And this does not include small-scale, distributed solar capacity. [1])

In addition, wind generating capacity would grow substantially, by 16,955MW, with just 140MW of retirements. Hydropower is also expected to increase by 819MW with 46MW of retirements.

While FERC projects 17,260MW of "high probability" additions by natural gas, that capacity would be almost entirely offset by 16,954MW of retirements. Similarly, an expected increase of 2,200MW in new nuclear capacity would be completely negated by 2,323MW in retirements. FERC foresees no new coal capacity over the next three years but does anticipate 17,385MW of retirements as well as a net decrease of 1,677MW in oil generating capacity.

Between "high probability" additions and retirements among all energy sources, FERC projects a net increase of 71,391MW in installed U.S. generating capacity. In effect, new solar would account for the overall net increase in the nation's total capacity while new wind capacity would roughly displace the net decreases in fossil fuel and nuclear capacity.

If FERC's data become reality, by November 2025, solar and wind will be nearly equal in their shares of U.S. generating capacity, 11.41% and 12.02%, respectively.



A hybrid solar and wind park provides renewable energy solution. (pxhere.com)

The combination of all renewables (i.e., including hydropower, biomass, and geothermal) will account for almost one-third (32.54%) of U.S. generating capacity - up from 27.19% today. Meanwhile, natural gas' share will drop from 44.15% to 41.80% while coal falls from 17.34% to 15.10% and nuclear from 8.14% to 7.69%. Contributions by oil and biomass would also fall.

Beyond "high probability" additions, FERC also provides data on "all additions" for each energy source that may be in the three-year pipeline. Solar dominates with 201,637MW, followed by 67,950MW for wind. By comparison, natural gas has only 33,547MW. Hydropower accounts for another 12,400MW. Consequently, it is conceivable that solar's expanding share of U.S. generating capacity over the next three years could be even larger.

The trend lines during the first eleven months of 2022 suggest the higher forecasts for solar and wind may well prove accurate. Through the end of November, renewable energy sources accounted for 72.83% of all new capacity additions in 2022 with solar in the lead (36.53%), followed by wind (35.68%) - each comfortably surpassing natural gas (27.02%). In the month of November alone, renewables were 98.11% of all new capacity additions with solar again taking the lead (727MW), followed by wind (665MW), and only 27MW of new gas.

As 2022 drew to a close, the share of the nation's generating capacity provided by utility-scale solar and wind totaled 17.63% (solar - 6.27%, wind - 11.36%). That surpassed the installed generating capacity of coal (17.34%) and greatly exceeded that of either nuclear power (8.14%) or oil (3.01%).[2]

"The combined generating capacity of solar and wind is now greater than either coal or nuclear power," noted the SUN DAY Campaign's executive director Ken Bossong. "Moreover, if the current trajectory persists or accelerates, generating capacity by the mix of all renewables should overtake that of natural gas before 2030 and possibly much sooner."

Ken Bossong is the SUN DAY Campaign's executive director. The SUN DAY Campaign is a non-profit research and educational organization founded in 1992 to support a rapid transition to 100% reliance on sustainable energy technologies as a cost-effective alternative to nuclear power and fossil fuels and as a solution to climate change.

Sources links available in the posting of this article at [www.greenenergytimes.org](http://www.greenenergytimes.org). ♻️



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# Toward a Greener Electric Car Battery

*As the transition to electric vehicles speeds up, the need for sustainable technologies moves to center stage*

Elliott Negin

The United States currently lags far behind Europe and China in its transition to electric vehicles (EVs), but that may be about to change. US EV sales hit a record high between April and July even as overall new vehicle sales slowed, and about half of the respondents to a recent Consumer Reports survey said they would be encouraged to buy an EV with a tax rebate—which Congress just extended. What's more, the Inflation Reduction Act that President Biden signed in August includes \$36 billion to incentivize EV purchases over the next decade.

More EVs on the road would certainly be good news for the climate and for public health. After all, the transportation sector is the largest US source of global warming pollution and also currently accounts for more than half of the country's toxic air pollution; more than 20,000 people in the United States died prematurely in the latest year for which data were available as a result of tailpipe emissions, which have been linked to asthma, birth defects, cancer, and heart disease. EVs have no tailpipe emissions, and as a new Union of Concerned Scientists analysis shows, their life-cycle global warming emissions are dramatically lower than that of gas- and diesel-powered vehicles.

For all the good news about EVs, however, the materials used in their batteries—including cobalt, lithium, manganese, and nickel—come with their own public health, environmental, and human rights challenges. So, despite EVs' considerable benefits, the burgeoning industry needs to clean up the material-sourcing process for its batteries to ensure a sustainable supply chain as countries worldwide transition to an electrified transportation system.



Lithium is produced in Salar de Atacama in Chile via salt-flat brine extraction. The process pumps brine from underground pools to shallow pools where natural evaporation occurs. (Wikimedia Commons/BenGoetzinger)

## Redesigning Batteries

Fortunately, scientists are on the case. They are altering batteries' chemistry to reduce reliance on some of these metals and devising ways to recycle and repurpose batteries to minimize the need for new raw materials altogether.

The Biden administration, which wants half of all new vehicles sold in the United States to be electric by 2030, has taken notice. In June 2021, it called for cobalt and nickel to be engineered out of batteries. In addition, the bipartisan infrastructure law that Congress passed last November recognized the need to recover key materials from EVs and dedicated funds to support battery recycling.

Automakers, too, are paying attention. Last fall, Nissan announced plans to introduce cobalt-free batteries by 2028, while Tesla said it will outfit two of its EVs with lithium-iron-phosphate batteries, which do not contain cobalt or nickel.

UCS is also playing a role. Our Clean Transportation Program, which has been documenting the benefits of EVs for years,

recently added battery expert Jessica Dunn to the team. Dunn earned her doctorate in energy systems at the University of California–Davis, where she served as a co-facilitator for a group that advised the California legislature on battery recycling.

## Extracting Lithium

Environmental issues related to EV batteries begin with the current processes for obtaining lithium. Nearly all the lithium worldwide is produced by either hard-rock mining or salt-flat brine extraction (i.e., solar evaporation). Hard-rock mining

involves excavating rocks containing lithium and transporting them for crushing, heating, and processing to recover lithium carbonate. These processes produce toxic wastes including sulfuric acid, uranium, lime, and magnesium, which threaten nearby wildlife and communities.

Brine extraction also emits toxins, but its main problem is that it requires fresh water in places where there is not enough to begin with. The process requires developers to pump brine from underground pools called salars to shallow pools where natural evaporation occurs. Because of the need for evaporation, facilities are generally sited in arid climates such as Salar de Atacama in Chile, often robbing local communities of their already taxed water supplies.

The United States has some of the world's largest lithium reserves, but it is not currently a leading lithium producer. That could change significantly due to a major new development in the works: a brine extraction facility at California's Salton Sea that investors are calling "one of the most promising and environmen-

tally friendly lithium prospects" in the country. The California Energy Commission estimates there's enough lithium in the lake to meet 40 percent of worldwide demand.

Also called "Lithium Valley," the Salton Sea project has the potential to supply 600,000 tons of lithium per year. The process would extract lithium as a by-product of geothermal energy, which has never been done at an industrial scale. Compared with pit mining and typical brine extraction, it would use less water and land, and emit less carbon pollution.

"If done right, the Salton Sea project has the potential to revive the local economy by providing sorely needed public resources and high-paying jobs," says Dunn. "But Salton Sea residents must have a seat at the decision-making table. It won't be successful without them."

## Reuse and Recycling

The Salton Sea's prospects notwithstanding, Dunn says the best source of lithium – and of all other battery materials – is what industries can recover through reuse and recycling.

The current generation of EV lithium-ion batteries will likely last 10 to 15 years, and some experts predict they could last even longer. But, when they reach the end of a typical EV's life span, they are still expected to have roughly 80 percent of their original capacity.

"All those batteries could be recycled," Dunn says, "and if they aren't damaged, they also could be repurposed for stationary storage, which is a less-demanding application that doesn't require higher storage capacity."

Repurposed EV batteries could provide backup for variable renewable energy, such as solar or wind power, which is vital for transitioning from fossil fuels. Manufacturers wouldn't have to produce brand-new batteries for the same purpose.

The key materials in EV batteries, including cobalt, lithium, manganese, and nickel, also can be

*Cont'd on p.5*

## NOT YOUR PARENTS' DIEHARD

Lithium-ion batteries are the most popular type of battery in use today. First commercialized in 1991, their cost has declined by a remarkable 97 percent over the last three decades, enabling the rapid growth of mobile phones, laptops, and more recently, electric cars. Global demand for these batteries is projected to increase dramatically by the end of

this decade as EVs are adopted around the world.

The lithium-ion EV battery is very different in function, materials, and size than the battery in a gasoline-powered car or truck. A vehicle with an internal combustion engine typically uses a 12-volt lead-acid battery whose main purpose is to provide power to start it. Weighing between 30 and 60 pounds,

lead-acid batteries can be easily replaced when they wear out. By contrast, the lithium-ion battery powering an EV typically takes up the entire base of the vehicle and weighs about 1,000 pounds.

A lead-acid battery mainly contains lead sulfate and sulfuric acid, relatively inexpensive materials that don't result in a very "energy-dense" battery, meaning they cannot store much energy per unit of material. In the early 1900s, elec-

tric car prototypes were powered by lead-acid batteries. They could only travel short distances and had long charge times. Conversely, lithium-ion batteries contain various materials that, while more expensive, give the batteries higher storage capacity, greater efficiency, and a longer life span. That's why they – and the materials they use – are in such demand. ♻️



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# AND WHAT ABOUT ELECTRIC TRAINS IN THE U.S.A.?

George Harvey

The rail systems in India, China, and the European Union are making major progress on electrification. India's rail system is 83% electrified, China's is at 72%, and the EU's is at 60%. All are working to achieve 100% electrification soon. By comparison, the railroads in the United States are barely making headway on transitioning away from diesel power, and the country is less than 1% electrified.

Several years ago, the Environmental and Energy Study Institute took a look at the question of electrifying the U.S. rail system in an article, "Electrification of U.S. Railways: Pie in the Sky, or Realistic Goal?" (<https://bit.ly/EESI-electrify-US>) It concluded that while electrified rail systems are very efficient, and electric locomotives cost 20% to 25% less to buy and maintain than diesel, the cost of adding electric lines at rail tracks to provide power would be very high. The companies that would make that investment would need some economic reason to do so.

There are good reasons why the U.S. would benefit from the change. In addition to issues of noise, pollution, health, and climate change, the transition would reduce costs in the long run. Another issue that shows potential benefit is security, because with renewable energy powering the system, the country would not be dependent on oil or gas, and the price fluctuations that those commodities often go through.

To understand this, it might be good to examine the history of rail transportation



Amtrak's Acela is electrified for part of its run. (Michael Kurras, CC-BY-SA 3.0, <https://bit.ly/share-alike-3>)

in this country. We could start by considering the nature of diesel and electric locomotives and their history.

In a diesel locomotive, the internal combustion engine powers a generator, which powers drive wheels, that could be on any set of cars in the train. The diesel locomotive carries its fuel with it. By contrast, electric rail systems usually use some external source of electricity, usually provided in overhead cables or third rails.

Looking at the history of rail systems in the different countries, we quickly see that railroads in the U.S. were in some respects very different from those in other countries. One difference was that U.S. transportation was built up early and went into decline during the 1920s.

Steam locomotives were fairly easy to

build but require a lot of effort to maintain. Diesel locomotives were much more expensive to build but much less costly to maintain. Both traction types work on the same tracks. By contrast, electric locomotives may be the least expensive to build and maintain, but they require sources of electricity that are available along the tracks, and such sources are very expensive.

In the U.S., oil was cheap, and the rail lines were long, presenting a high cost for electrification. For switching from coal-powered steam engines, the least expensive route was to go to diesel, because the only things changed were the locomotives and additional oil tanks.

In China, India, and Europe, oil was expensive and, the

shorter rail lines could be electrified at lower expense. In fact, Europe started electrifying in the 1920s.

Now, to avoid the problems with fossil fuels, the U.S. rail system needs a costly upgrade to a system that other countries had started working on many years ago. Rail companies really want to put off the upgrade, because it will be very costly.

With the Inflation Reduction Act, there are economic incentives for America to catch up with other parts of the world in many ways, but the potential for electrifying the rail system seems to have been largely left out. Transportation for America said this, "This bill will be the largest climate investment in U.S. history. However, when it comes to transportation, overall, the bill does almost nothing to counter the infrastructure law, which provided more funding for the same broken status quo approach that led to such high transportation emissions in the first place." (<https://bit.ly/T4A-on-IRA>)

We must do better. ☺

## Greener Car Battery – Cont'd from p.4

recycled. This "material circularity" could significantly reduce the EV's environmental impact. A recent study found that reusing materials recovered through hydrometallurgical processing (separating the cathode materials through leaching chemicals) could cut battery-related global warming emissions by 30%. Considering the problems associated with mining, using recycled material is a much preferable option.

Some EV batteries are already being recycled in the United States. Redwood Materials, for instance, a hydrometallurgical recycling plant in Nevada, reports it has been able to recover 95 percent of the materials from used consumer electronic and EV batteries. The company also plans to use recovered materials to manufacture new batteries.

According to a 2021 study Dunn coauthored, under optimal conditions, recovered materials could meet more than half of worldwide lithium-ion battery material demand by 2040. That would certainly make EVs greener.

### The Promise of New Technologies

Researchers are also working to develop alternatives to the lithium-ion battery. In January, for example, chemical engineers at the University of Michigan

announced that they have designed a lithium-sulfur battery that could quintuple EV ranges on a single battery charge. Meanwhile, the National Science Foundation recently awarded a grant to research sodium-ion batteries, because sodium is considerably cheaper and more widely available than lithium. And Solid Power, a Colorado company that has partnered with BMW and Ford, recently started a pilot project to produce solid-state batteries, which promise to significantly extend EV ranges.

Dunn is most excited about solid-state batteries because of their energy density – their ability to store more energy while using less material than lithium-ion batteries. "If solid-state batteries are commercialized, EVs would use fewer metals than they do now," she said. "That could be a win-win: less mining and the prospect that battery manufacturers could use a higher ratio of recycled materials."

Elliott Negin is a Senior Writer for Union of Concerned Scientists and writes about UCS-related topics for a range of news organizations. He holds a master's degree in journalism from Columbia University.

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# VERMONT STONE COMPANY RECEIVES FIRST VOLVO ELECTRIC WHEEL LOADER IN NORTH AMERICA

Cleary Stone has had their eye on sustainability for a long time. The Richmond, Vermont-based business provides rock products from gravel to large slabs to customers who care about the earth, so it simply makes sense.

"We work primarily with landscapers who love the earth and enjoy making it more beautiful," said John Cleary, founder and part owner.

So, when Volvo Construction Equipment announced that electric compact machines were available to order, the Cleary team was immediately interested. They told their dealer contact, Chris Palmer at Wood's CRW, that they wanted an electric machine, and he called them as soon as an L20 Electric compact wheel loader came in.

"He went above and beyond for us to get the machine, including working with the state on funding to help us buy it," said Cleary.

The machine was delivered in November, giving them the first fully electric wheel loader in North America.

"We are so happy that the first electric CWL went to a company like Cleary Stone, who is passionate about being a good steward of the environment," said Stephen Roy, president of Region North America, Volvo CE. "The work they and their customers do is perfect for this machine."

## From Humble Roots to Business Success

John Cleary, who is 82, did stone work as a side job in his younger days simply because it interested him.

"People wanted the stone that I didn't think was quite good enough to use, and it made me wonder: How much would they like the higher quality stone?" he



L to R: Alex Bergeron, John Cleary and Jean Brgrant with their new Volvo L20 Electric compact wheel loader. (Courtesy of Volvo Construction Equipment)

recalled.

So, he made it his full-time gig. As the business grew, he got a Volvo EC210 mid-sized excavator and became hooked on the brand.

"We used to rent another brand's excavator and felt like we were spending a lot of time and effort filling it up with fuel," he said. "When we switched to the Volvo, that seemed to be cut in half."

John's grandson, Alex Bergeron, began riding along with him in the skid steer at age three, and as the equipment got bigger, so did Alex's interest in the business. He is now part owner and will take over someday.

The family-owned-and-operated company employs six people during their busiest times of the year.

## Leading the Electric Evolution

In 2017, Cleary Stone purchased a

conventional diesel version of the L20 compact wheel loader. They loved its size, maneuverability, and versatility. So, when an electric version hit the market, the team was excited.

"It felt like a no-brainer because we see the industry moving in that direction and want to be on the forefront of that," said Cleary.

Bergeron added that the quality of the machine itself is enough of a reason to make the

switch.

"I would say it runs smoother than the diesel, and I like how easy it is to change attachments," said Bergeron. "Just this morning, I unloaded some pallets with a fork attachment, then switched to a bucket and loaded some crushed stone into a customer's truck."

The company already had some saws, a forklift and a Tesla running on electricity, so adding another outlet for charging the loader was simple and they were familiar with the charging process.

"I don't use it for a constant eight hours, so an overnight charge is plenty," said Bergeron. "And if I did need it all day, a lunchtime charge would be just fine."

He also noted the instant power the electric machine provides versus the slight delay felt on a conventional machine, as well as work modes that provide just the right power for each attachment.

## Funding the Future

Working with their electric company, Green Mountain Power, and Palmer at CRW, Cleary Stone was able to subsidize some of the purchase price of their new L20 Electric.

"The original amount they wanted to give us was not huge, but once Chris demonstrated to them how much power we would utilize, they increased their offer," said Bergeron.

Wood's CRW Corporation is a family-owned company that started in Burlington in 1961.

Other local and state jurisdictions offer incentives as well, and those interested in learning more are encouraged to learn more here: <https://bit.ly/Volvo-incentives>.

As alternatively powered equipment grows in availability and popularity, Cleary Stone is thrilled to be leading the way.

"There will be more and more options, and we are fortunate to be in the right place at the right time," said Cleary.

"Our customers think it's super cool too," added Bergeron. "We are hopeful more of these kinds of machines are sold so the growth and development continue. We would like to make those upgrades wherever we can."

Volvo CE is the industry leader in alternative power research and development among construction equipment manufacturers. They currently offer five compact electric machines (excavators and wheel loaders) with additional sizes and machines in development. The company also has a hydrogen fuel cell test lab in Sweden and is working to make that technology more scalable. ♻️

# LITTLETON, NH CHEVROLET'S NFPA'S ALTERNATIVE-FUEL-VEHICLES SAFETY TRAINING COURSE

*A far higher percentage of gas-powered cars catch fire than do EVs. ([www.bit.ly/veda-car-fires](http://www.bit.ly/veda-car-fires)) But it does happen. We discuss here how fire fighters learn to deal with this unlikely event. (see also [www.bit.ly/get-ev-dont](http://www.bit.ly/get-ev-dont)) – Ed.*

Russ Lanoie

LET IT BURN is often the response from firefighters when asked about how they'd respond to a fire in an electric vehicle (EV). In fact, that can sometimes be the appropriate course of action, but only after a sequence of protocols has been followed to determine just what the fire is and how to go about knocking it down. Is the fire actually in the electrical components or simply a "car fire" consuming the other flammable parts of the car instead? If the big battery that propels the car is on fire, can the fire be isolated and extinguished by the age old firefighter's friend, water? And how do firefighters determine in the first place if the vehicle is powered by gas, electricity, or a combination of the two?

More than fifty firefighters from Maine, New Hampshire and Vermont had these questions and more an-



Jason Emery of the National Fire Protection Association trains over fifty fire firefighters on how to handle an EV fire. (Russ Lanoie)

swered in an intensive day-long training session at Littleton Chevrolet and Buick on Saturday, January 21. The training was provided by Jason Emery of the National Fire Protection Association. He praised the dealership's general manager, Duane Coute for hosting the first such program ever at a car dealership. For me it was a bit of déjà vu, bringing back memories of my Air Force aircraft electrical training sixty years ago. The difference in technology from those old

days is staggering because the automotive industry is benefiting from recent developments in battery storage designed to transition our fossil-fuel-hungry society to renewable energy.

The program began with a short history of EV's pointing out that the very first electric vehicle was in the early 1800's with almost a third of automobiles at the turn of the century being electric. They gave way to cheap gasoline and Henry Ford's Model T and persevered until gasoline began to become scarce, and several makes and models of EV reappeared in the

late twentieth century. What made EV's able to compete, at least for some local driving at first, was the development of battery technology. Many of these early vehicle batteries were nickel metal hydride similar to the first rechargeable flashlight and other appliance batteries. Newer EV batteries are almost exclusively lithium-ion and are high quality and well protected from damage. They consist of a collection of many individual cells grouped together in a large, high

voltage pack that is controlled by a Battery Management System that protects the battery from operating outside of its safe area. This distances EV batteries from the similar type of battery that has caused hoverboard fires, giving lithium-ion batteries a bad name. In fact, EV's actually have a better track record in many crashes than Internal Combustion Engine (ICE) powered vehicles.

There are several types of vehicles that utilize electrical energy by storing it in batteries when it is driven. All vehicles have a battery to power start the engine and also to allow lights, radios and other conveniences to be used when the engine is not running. Hybrid Electric Vehicles (HEVs), have a much larger battery that allows the vehicle to be operated strictly electrically for short periods and then have the battery recharged by the engine when it is driving the car. The battery is also charged by regenerative braking that turns the electric motor into a generator, putting electricity back into the storage battery when braking, reclaiming energy that would otherwise be wasted as heat in a conventional vehicle.

HEVs can become plug-in electric vehicles (PHEVs) by adding a charging device that draws power from an outlet at home or from a charging station connection to fill the battery. The advantage to these vehicles is that they are using power from the "grid" that can be produced by solar, wind or hydro, usually

Cont'd on p.7





# A Vermont Solution to Fighting Climate Change: We need 100% Renewable Energy!

Peter Sterling

**It's 2023 and the question is no longer "is climate change here" but "what is Vermont going to do to stop it?"**

A proven way for Vermont to reduce our climate change-causing greenhouse gas emissions is to direct our utilities to stop purchasing electricity generated by burning fossil fuels and switch to electricity from local and regional wind, solar, and hydropower. We already have a law in place, the 2015 Renewable Energy Standard, that takes us part way there. The next step is for the Vermont legislature to take action aligning us with the other New England states that are working towards a 100% renewable energy future.

As part of this renewable energy future, Vermont must do its part and commit to generating more of its own electricity from in-state renewables. The interconnected nature of New England's energy grid means every kilowatt-hour of energy from a new solar panel built in Vermont replaces electricity generated by natural gas, coal or oil somewhere else. It's an easy way to fight climate change and failing to commit to building renewables in Vermont will slow the expansion of clean energy in the region and keep fossil fuel plants generating.

But there are other compelling reasons besides fighting climate change for why we should generate more of our own power here in Vermont.

## Jobs, Jobs, Jobs

When Vermont's renewable energy deployment peaked in 2016, 6,965 Vermonters were working directly in the renewable field around the state (by comparison, Vermont's largest private employer, UVM Medical Center, employs about 8,700 people). Importantly, the renewable sector employs people from a wide range of educational backgrounds – laborers, electricians, engineers and these jobs are geographi-



Power lines that move electricity throughout the grid. (Brett Sayles / Creative Commons)

cally dispersed throughout Vermont. The renewable sector is unique in that it supports broad-based growth for both the blue-collar and white-collar workforce across the state.

## Ending Environmental Injustice

In 2020, Vermont ranked 49th in the country in terms of the share of the electricity that it used that it generated within its own borders. Vermont does not have a single coal, oil, or natural gas fired power plant that contributes significantly to our energy needs- and none are planned to be built. So, when Vermonters do not rely on in-state renewables, we are asking our neighbors in Quebec, New York, and throughout New England to bear the environmental consequences of our need for electric-

ity- land flooded for hydropower, the danger of living next to a nuclear power plant, air pollution from coal, oil and natural gas fired power plants, etc.

## More Energy Independence

When we build new renewables, we further insulate ourselves from the price shocks that other states experience from the volatile fossil fuel market. Rising fossil fuel prices since the war in Ukraine began have caused electric rates to go up 8% nationally, and some residential ratepayers in New Hampshire have seen their bills go up \$70 a month. On the other hand, when a new solar project is built in Vermont, the rates are locked in for 10 to 20 years which means we know what we are going to pay for this power unlike the price of electricity

from fossil fuels which are affected by foreign politics, supply chain disruptions, freakishly cold winters, transportation costs and more.

Luckily, the Inflation Reduction Act (IRA) signed by President Biden this summer has given Vermont a once-in-a-generation chance to get hundreds of millions of dollars in federal money over the next decade to make the transition to renewables even more affordable and help us kick our addiction to electricity made from burning fossil fuels.

Even before the Inflation Reduction Act, Vermont was well on its way to meeting our existing goal of 75% renewables by 2032 while maintaining the second-lowest electricity rates in New England. Given the decreasing price of installing solar power over the last decade and the millions in tax credits available from the federal government to go solar, there is no reason to believe that creating a plan for sensibly sized and located renewables would cause a noticeable increase to our electric bills. Updating our Renewable Energy Standard now to get Vermont to a 100% renewable energy future would give an important signal to the marketplace that Vermont is serious about meeting the challenge of climate change.

*Peter Sterling is the Executive Director of Renewable Energy Vermont, the trade association representing the many businesses working to get Vermont to a 100% renewable energy future.*

Learn more at [www.revermont.org](http://www.revermont.org). ♻️



## NFPA's TRAINING COURSE

Cont'd from p.6

entitling the PHEV buyer to a substantial tax credit. That credit is not available to a hybrid purchaser because all of its energy is produced by fossil fuel.

PHEVs have a limited electric-only range compared to fully electric EVs but typically have a much longer total range because they also have a gasoline engine. When the battery power is exhausted, the vehicle operates just like its hybrid cousin, taking advantage of regenerative braking to increase its mileage over a gas only vehicle. EVs, or fully electric have the biggest batteries and a range that is that is increasing steadily as battery technology improves. The battery has to be recharged when exhausted or the vehicle will not go.

Any of these vehicles can have a fire and it is the first responsibility for a firefighter to approach it the same way any vehicle fire should be approached. Then it needs to be determined just what type of vehicle it is and, if it is an EV of any type, is the fire actually being caused by the electric components or strictly confined to the conventional part(s) of the vehicle. The next step for an EV fire is to locate the battery disconnect to keep it isolated from the rest of the vehicle, whether it is on fire or the rest of the vehicle is on fire.

Fortunately fire departments are beginning to have devices that can tell a first-responder critical information for

the make and model of the vehicle that is on fire. On-Star and other in-vehicle emergency communication services will also tell the first-responder this information so that the proper protocol can be followed.

## What is an EV fire?

Generally speaking it can be the battery itself that is burning or showing the initial stages of burning. The worst thing that can happen to one of the batteries is to have a cell become pierced with a sharp object that connects the plus and minus portions of the cell, instantly releasing a large charge of electricity. This can start a chain reaction causing a significant fire. This process can be possible to control by inundating the battery pack with water. The instructor pointed out that this critical step is overlooked by many who are dousing the car and not the battery pack itself. He showed how to direct water onto the battery pack to keep it from accelerating the burn. He also warned attendees that a fire that appears to be out can re-erupt hours or days later so it is important to isolate a vehicle from proximity to other vehicles or structures. In the other side, many electric vehicles fires have been saved from further harm by quick action to extinguish the battery.

Unfortunately, many fire departments remain unprepared to deal with EV fires as yet which is why this training is so

important and kudos are due to Duane Coute for his efforts at bringing this important and timely training to so many firefighters from Northern New England. Duane reports that the comments on the questionnaire he asked attendees to fill out at the end of the program were "off the charts." He has helped to take the mystery out of EVs and calm many firefighters fears about approaching a modern burning vehicle.

If you are the owner of an EV experi-

encing a fire, the best course of action is to pull the vehicle over to a safe area, if possible, unlock the doors and trunk and shut the vehicle off. If you do know how to disconnect the battery, DO IT NOW!

*Russ Lanoie is a long-time solar proponent in New Hampshire's White Mountains. He lives in a passive solar home which has had Daystar solar hot water for forty years and 11kW of PVs on his barn since 2015. [www.RuralHomeTech.com](http://www.RuralHomeTech.com). ♻️*

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# Two New 500kW Solar Projects Under Development in VT

The projects have passed the critical milestone of receiving Certificates of Public Good from the Vermont Utility Commission

Norwich Solar is pleased to announce receiving a Certificate of Public Good (CPG) from the Vermont Public Utility Commission for a 500kW AC solar array in Barnet, VT and another in Jamaica, VT. Both ground-mounted systems will generate enough renewable clean energy to power approximately 270 homes per year, and offset the carbon emission equivalent of almost 300 cars per year.

Martha Staskus, Chief Development Officer for Norwich Solar stated, "It's been a pleasure working with the towns' Planning Commissions and Selectboards to achieve the first milestone of CPG. We're looking forward to moving these projects forward in collaboration with landowners. Both the Milarepa Center and Kings Plot have been enthusiastic supporters from the start, and we're glad to be seen as a trusted partner."

## The Community Solar Project in Barnet

The array in Barnet will be located at Milarepa Center, off Route 5. Milarepa Center is a Tibetan Buddhist retreat center named for an 11th century yogi famed for attaining enlightenment in a single lifetime. The center, an affiliate of the international organization the FPMT, hosts both public and private retreats and was founded in 1981 by students of Lama Thubten Yeshe and of Lama Zopa Rinpoche. Barnet Selectboard, Planning Commission and the Northeast Vermont Development Association, the regional planning commission, all granted "preferred siting" for the location.

Dawn Holtz, the Director of the Milarepa Center, recognized the potential for solar to be a good use of the open field adjacent to the existing electrical transmission corridor on the property.

Holtz stated, "As a donation-based non-profit, hosting the solar array will help the Center with meeting its financial goals for the next 25 years, and we'll continue to have open meadows/land for our use." She also adds that "the Center's unanimous approval by its board members demonstrates the center's strong commitment to sustainable operations and is an example of the Buddhist practice of 'bod-

hichitta' because of the good will that will spread through renewable solar energy generation for the outside community."

## The Community Solar Project in Jamaica

The solar array in Jamaica will be located on a depleted gravel/sand extraction area. The Jamaica Selectboard, Planning Commission, and the Windham Regional Planning Commission all designated the location as a preferred site. The array will occupy roughly 3-4 acres of a larger parcel which also hosts several homes.

The Jamaica Planning Commission and Selectboard commented that they "were pleased to provide a letter to the Public Utility Commission indicating that the Town wished to designate the project location in East Jamaica as a 'preferred site' under Section 5.103 of PUC Rule 5.100."

"We recommended that our Selectboard endorse Norwich Solar's application for a Certificate of Public Good for a solar array on site P005-30 based on the project's compliance with all of our Act 174 compliant energy plan's solar array siting criteria", noted the town Planning Commission in a group statement. "Furthermore, we noted that when complete this project will provide sufficient renewable energy to meet over 50% of our plan's 2050 renewable source generation goal. We have encouraged Norwich Solar to consider additional similar future projects in Jamaica."

Domenic Mangago, owner of the property known as Kings Plot, recognized the opportunity solar provides for maximizing the benefits of his land, and gaining additional returns on his property investment. He manages several properties through his residential and commercial property management company that builds and supplies affordable homes to the local area.

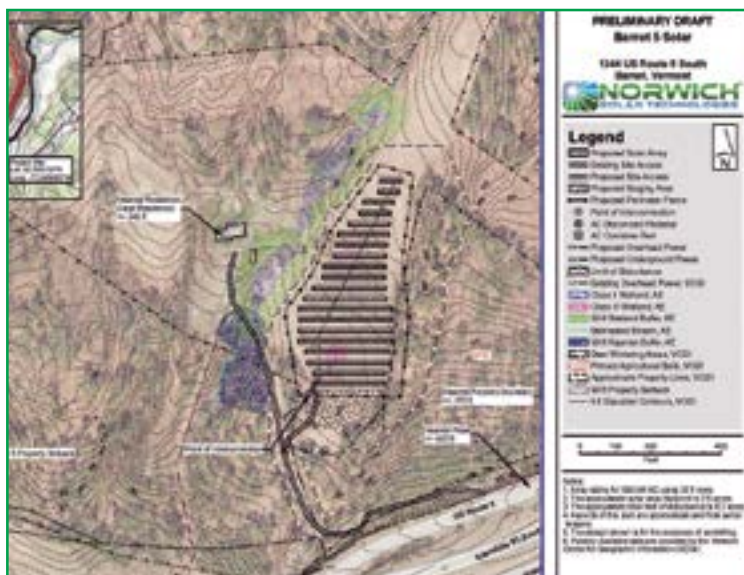
Mangano commented, "The project is a win for the town of Jamaica. Not only does the project generate clean energy for the region, it's a smart decision for me as a property owner and manager. The solar array will also not be a disruptive neighbor for the residents of the nearby homes and apartments located on the property."

Norwich Solar develops several different types of commercial solar projects including on-site solar for businesses or municipalities, as well as community solar projects like these ones. The net metering credits generated from community solar arrays are allocated to a variety of Vermont customers. Both projects have allocated a mix of small businesses, mostly agricultural producers, through Norwich Solar's Small Business Community Solar Alliance. The program is open to any Vermont business with Green Mountain Power electric bills in excess of \$10,000 a year. By participating in Community Solar projects like this, Vermont business owners can save money on

their energy costs while contributing to a more vibrant local economy.

The project has several more milestones to complete before physical work is expected to begin this spring, including permitting, final design and procurement. With over 20 similar projects in the pipeline for 2023, Norwich Solar is planning to bring more than 13 million kilowatt hours of solar energy online by the end of the year to the northern New England region.

For more information about this and other projects under development by Norwich Solar, go to [www.norwichsolar.com/solar-installation-in-development](http://www.norwichsolar.com/solar-installation-in-development).



\* Site maps can be enlarged in the posting of this article on our website.



Top left: The 500kW AC preliminary site plan for the Barnet project; top right: The 500kW AC preliminary site plan for the Jamaica project; above: an existing similar 500kW DC site at the Weathersfield town garage. (Photos: Norwich Solar)



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# MEET YOUR SOLAR INSTALLER GREEN MOUNTAIN SOLAR, SOUTH BURLINGTON, VERMONT

Green Energy Times staff

Green Mountain Solar (GMS) was founded in 2017. At that small beginning, Paul Lesure was the only employee (not counting his pickup truck), and he worked from his kitchen table.

Lesure explained the growth after that. "By the next year, we'd added batteries into our regular rotation of installs. By 2022, we have grown to about 30 people. And of course, our larger team doesn't fit around my kitchen table any more – we have outgrown two offices and are now in our permanent office and warehouse in South Burlington. GMS installed slightly less than two megawatts (MW) of solar systems in 2021. For 2022, that grew to about three MW."

Lesure explained that GMS has an overarching business objective. "I would say our goal as a company is to deliver a great customer experience," Lesure told us. "My favorite thing is just working with a homeowner to switch to renewable energy."

GMS installs Qcells solar panels, which are regarded as among the best available. Lesure pointed out that their new factory in Georgia makes it possible to have panels that are made in the United States. GMS almost always installs Enphase micro-inverters because, though they are a little more expensive than others, they are very reliable, with a failure rate of less than 1%, and they have strong performance advantages over string inverters for nearly all purposes smaller than utility-scale installations.



The Green Mountain Solar crew stands proudly in front of their hard work: a 20-panel, 8.4kW ground-mounted solar system. (Courtesy photos)

Also, Lesure noted one thing really special about the Enphase micro-inverters. "Our customers really love the production monitoring that they get through the Enphase app."

GMS often installs batteries for grid-tied systems. The batteries it uses are the Tesla Powerwall, SimpliPhi, and Fortress Power. Lesure said, however, "Battery backup doesn't offer a return on investment (for comparison, you wouldn't expect a generator to have a payback period). With a battery it is all about energy independence and peace of mind." It is something a person may pay extra for to be able to face stormy weather.

GMS does not do off-grid projects. However, they have been involved in some unique applications of batteries. A short article explaining one example of this, "Green Mountain Solar Retrofits Champlain Valley Office of Economic Opportunity's New Mobile Outreach Vehicle with Green Technology," appeared at the *Green Energy Times* web site in March 2022 (<https://bit.ly/GMS-heat-pumps>).

Installation of heat pumps is very important for switching people away from fossil fuels and to renewables, and this is the reason GMS has taken on this line of work. The same can be said for chargers for electric vehicles (EVs). Progress on taking a specific home off fossil fuel dependence need not be undertaken all at once, however. "Many customers take steps, to electrify different parts of their lives as a way to reduce their dependence on fossil fuels. That's why we also offer heat pumps and car chargers. They're such a natural pair with solar."

Lesure said he is personally excited about the emergence of bidirectional EV chargers. Such chargers allow an EV that is equipped to support them to power the house. The Ford F-150 Lightning is one vehicle that can do this. And yes, Lesure has a Ford F-150 Lightning. But no, he has not put in a bidirectional charger quite yet – every time he gets one, it goes to some customer who needs it.

Clearly, for GMS, the customer comes first. Lesure described its approach to business as including a promise of an "education-forward approach and our no-hard-sales-ever." He said, "Our customers say that our team is communicative, transparent, and professional. We offer high-quality products that will stand the test of time so that our customers get the most value out of their home improvement investment. We work with the homeowner to walk through the experience."

Like most solar installers, GMS does not do financing for customers, but it does help them get financing through VSECU, which is broadly available to almost anyone living or

operating in Vermont.

We might point out that Green Mountain Solar is not associated with the utility, Green Mountain Power, which operates in Vermont, nor is it associated with Green Mountain Energy, which is a subsidiary of NRG Energy operating in Texas.

The Green Mountain Solar website is [www.greenmtnsolar.com](http://www.greenmtnsolar.com). ☻



Top: a roof-mounted solar array in central Vermont. Bottom image shows a 17kW roof-mounted solar array in central Vermont. Both solar systems were installed by Green Mountain Solar.



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# MEET YOUR SOLAR INSTALLER HAREI, HILLSBORO COUNTY REGION OF NEW HAMPSHIRE

George Harvey

HAREI, the Hillsboro County Area Renewable Energy Initiative, is a non-profit organization based on a rather different paradigm than what most organizations use. For one thing, it is run entirely by volunteers, for people who are willing to get involved.

HAREI's operations are pretty much limited to Hillsboro County, New Hampshire. We will ask those who are not in that area to keep reading, however, because other areas have similar initiatives, and if they do not, they could. PAREI, based in Plymouth, New Hampshire, was a similar, older initiative, and HAREI's founders studied it before getting their own organization set up in 2012.

The underlying idea is that a group of people with experience helps others get involved in renewable energy. Most commonly, this is done educating homeowners on how to install a solar system at their home, culminating in a raiser where a group of volunteers participate in the panel installation. Those who are helped in this way usually start by working on someone else's system, but some will start on their own. One way or another, they gain their own experience and can help others in turn.

HAREI was founded by a group of less than half a dozen people in 2012. Since that time, the volunteers have installed more than 80 solar systems. Over fifteen of



Two ground-mounted 20 panel arrays on the edge of Lovejoy quarry in Milford, NH have produced more than 100MWh since installation by the homeowner in 2015 with the help of HAREI. (Courtesy photo)

these were "raised" last year.

The reader might ask about the term "raised." It is used a lot by the people in the group, and appropriately so. It is based on the model of the barn raising, which many people associate with Amish or Mennonite culture.

Many members of the group have made it part of their lives. HAREI has meetings every other week, with as many as twenty or thirty people attending virtually. But the members are really responsive when a raising is happening. Steve Ettelson said, "The model is unbelievable. I started the process in March. By July, I was ready for my raiser. I was worried when only six volunteers signed up. Thirty showed up to help!" Clearly, whether the reason for the response is because people want to do heavy lifting on addressing climate change and energy resilience, or it is just for the enjoyment of the process, the members

get the jobs done.

But there is more to the group than wanting to address climate change or enjoying the work. At one point, HAREI did a survey of the people who had become involved. One of the respondents said, "I found my tribe." Not only do they get into the whole aspect of solar, but they love volunteering. And that includes working with others who share the same joy.

The process includes numerous kinds of help for the members who are to get new solar systems. HAREI provides education and guidance, along with other important resources. "The members decide everything themselves," Ettelson said. "We help with education and direction, but we don't tell people what to do."

The guidance is extensive, however. It covers everything from how to evaluate and design an entire system, to finding sources of components. HAREI does not have preferred components but does have good relations with supply chain sources. Asked about what brands and models of equipment they use; it became clear that the goal was to ensure availability and good value. "We find out what is available," Ettelson told us. "At times, we try to get end of stock – 20, 30, 50 panels. We ask, 'What do you have in the back.'" Based on that approach, with the amounts they regularly buy, there can be huge savings. The deal is good for HAREI's members, but it also means suppliers do not wind up with much in the way of solar panels they will have trouble selling.

"Once someone gets well enough along that we know they are moving ahead, they get a mentor. The mentors rely on other

members. We have a lot of 'geeks' in the HAREI community. The mentor does not make decisions but does provide valuable guidance, making sure decisions are well considered.

Last year set a record for HAREI. It saw activity on fifty-four projects of all types, the greatest number ever, as the country was recovering from a very slow time in 2021. The organization does not do installations in winter, except in periods of mild weather, but when spring comes, the pent-up projects get unleashed. Right now, there are fifteen projects waiting to go as soon as the temperate conditions can be expected to last reasonably well. Given that, it seems likely that 2023 will be a second banner year in a row.

There are some things a homeowner should know about HAREI's model. HAREI does not do electrical work; members are encouraged to work with a licensed electrician. HAREI does review designs and point to relevant vendor instructions and electrical codes with an email question and answer group. Homeowners can do their own electrical work under New Hampshire laws, but most members choose to have work done by professional electricians.

HAREI's website is [www.harei.org](http://www.harei.org).

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## EIA EXPECTS 54% OF NEW ELECTRIC-GENERATING CAPACITY IN U.S. WILL BE SOLAR IN 2023

Paige Bennett (February 6, 2023)

A new report from the U.S. Energy Information Administration expects 54% of new electric-generating capacity in the U.S. to come from solar energy for 2023. Developers are planning to add 54.5 gigawatts of new utility-scale electric-generating capacity to the country's power grid this year, most of it being solar, according to EIA's Preliminary Monthly Electric Generator Inventory, in which developers and power plant operators report upcoming projects to EIA.

Developers have about 29.1 gigawatts of utility-scale solar capacity planned for 2023, following a recent decline of 23% from 2022 compared to 2021. Prior to that decline, solar electric-generating capacity had been rising since 2010, but supply chain issues and the pandemic lead to a decline last year. EIA predicts that delayed projects from 2022 may be part of the high percentage of the electric-generating capacity coming from solar projects for 2023.

EIA also noted that should all of these planned projects go into operations for 2023, this year will have the highest amount of utility-scale solar capacity added in one year. The current record is 13.4 gigawatts of utility-scale solar capacity added in 2021.

Texas will be home to the highest amount of new solar capacity at 7.7 gigawatts, followed by California at 4.2 gigawatts.

After solar, battery storage makes up the next highest percentage of new utility-scale electric-generating capacity in the U.S. for 2023, comprising 17% of projects planned for the year. Developers expect to add 9.4 gigawatts to the country's current

8.8 gigawatts of battery storage electric-generating capacity.

"Battery storage systems are increasingly installed with wind and solar power projects," EIA explained. "Wind and solar are intermittent sources of generation; they only produce electricity when the wind is blowing or the sun is shining. Batteries can store excess electricity from wind and solar generators for later use. In 2023, we expect 71% of the new battery storage capacity will be in California and Texas, states with significant solar and wind capacity."

Other utility-scale electric-generating capacity projects include 7.5 gigawatts of natural gas, with the two largest projects planned for Ohio and Illinois, 6.0 gigawatts of wind power, primarily planned for Texas, and 2.2 gigawatts of nuclear energy. For the first time in over 30 years, two new nuclear reactors have been built in the U.S. and are expected to come online this year, following a long, several-year delay.

In 2023, EIA reported that only one offshore wind project is expected to begin operations this year, the South Fork Wind plant off of New York.

Paige Bennett is based in Los Angeles, Paige is a writer who is passionate about sustainability. She earned her Bachelor's degree in Journalism from Ohio University and holds a certificate in Women's, Gender and Sexuality Studies. She also specialized in sustainable agriculture while pursuing her undergraduate degree.

Source: EcoWatch (<https://www.ecowatch.com/new-electricity-generation-capacity-us-2023.html>). ♻️

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# Seeding Solar on the Rocks

Michael J. Daley

Our focus is on the country of the pointed firs in the White Mountains of New Hampshire where more than trees are capturing solar energy these days. One hundred eighty solar panels recently joined 30,000 Christmas trees to support the operations of the Forest Society at The Rocks in the town of Bethlehem ([www.forestsociety.org/the-rocks](http://www.forestsociety.org/the-rocks)). The Forest Society is a private, non-profit land trust and forestry organization that permanently protects more than 190,000 acres of New Hampshire's landscapes for the benefit of nature and people.

John Jacob Glessner ran The Rocks as a working farm in the late 19th century. His descendants donated the 1,400-acre property to the Forest Society in 1978. They have operated it as a vibrant Christmas tree farm, educational center and working forest ever since, hosting over 14,000 visitors annually.

In 2019 tragedy struck. With an odd mimic of how a forest fire clears away old growth for new sprouts, fire destroyed two critical buildings at The Rocks, creating the opportunity for the Forest Society to re-imagine how best to carry forward their mission on the site. By this time in the organization's evolution, that included a dedication to sustainably built infrastructure. In an article by Kelly Whalen on their website, Society president Jack Savage said:

*As we designed Forest Society North at The Rocks, achieving net-zero emissions was a high priority. The Forest Society has always been a leader in energy efficient building practices. When we expanded the Conservation Center in Concord by building the French Wing in 2000, it was the first LEED gold certified building in New England. Now the conversion of the Carriage Barn will demonstrate our conservation values and help educate others on net zero building techniques.*



The 86.4kW solar array will completely power the Carriage Barn at The Rocks. (Forest Society)

The Carriage Barn dates from 1884 and is a real beauty with an historic stone and shingle exterior, but one look would make most people think it quite the pipe dream to turn such a dated structure into a model net-zero building. The success of this conversion relies on the intriguing technique of creating an interior shell, completely preserving the historic character of the exterior. The new center will contain an open gallery, gift shop, classrooms, event space, public restrooms, and offices for Forest Society staff who serve the North Country. It will be heated and cooled with a geothermal system.

Everything will be powered by the 86.4-kilowatt solar PV array spanning three ground-mounted rows in a field next to the Carriage Barn. The array will produce over 100,000 kWh of clean solar energy each year with a projected carbon offset 156,000 pounds annually. ReVision Energy was chosen to install the array. The employee-owned solar company is based in Enfield and Brentwood, New Hampshire ([www.revisionenergy.com](http://www.revisionenergy.com)).

The full recovery effort at The Rocks will require \$8.5 million. More than half of that is in hand so far. One of the funding sources the Forest Society tapped into is the New Hampshire Community Develop-

ment Finance Authority (CDFA) tax credit program (<https://nhcdfa.org/invest-nh-communities/tax-credits>). They were awarded \$300,000 in tax credits through the program earlier this year to support the renovation of the Carriage Barn at The Rocks.

The CDFA's tax credit program offers New Hampshire businesses the unique opportunity to invest in community economic development initiatives throughout the state. Businesses can choose a project and make a donation toward the grant total (think a government sponsored GoFundMe). The nonprofit receives the donation and the

company receives a 75% New Hampshire state tax credit against that contribution. The credit can be applied against the Business Profits Tax, Business Enterprise Tax, or Insurance Premium Tax and may possibly qualify as a state or federal charitable contribution as well.

Over 12 New Hampshire businesses, including ReVision Energy, made contributions toward the Forest Society grant.

Quoted on the Forest Society's webpage, ReVision co-owner David Clapp noted that everyone at his company very much wanted to be part of this exciting project because the two organizations

shared values for sustainability, learning, and stewardship. He said, "The Forest Society's renovation of the Rocks to a net zero program space and office aligns perfectly with ReVision Energy's vision of a clean environment and just society for future generations. The Rocks will be a place where our kids can continue to connect to the land, learn about our changing climate, and most importantly learn that we have the solutions to make a positive impact on the climate. They will be able to see first-hand how this solar array produces clean energy."

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

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# RENEWABLES GOING GANG BUSTERS IN NEW YORK STATE

## ALONG THE HUDSON RIVER FROM ALBANY TO NEW YORK CITY AND LONG ISLAND

George Harvey

The news about the growth of renewables in New York in the last two months has been stunning. We have a set of items to report, each worthy of its own article. In fact, the number of them is itself worth an article. Here, we will provide just a taste of what is happening in the Empire State:

Zinc8 is set to establish a \$68 million plant to manufacture its batteries in Kingston, New York. Kingston is on the Hudson River, about midway from New York City to Albany. Zinc8 batteries use an innovative storage technology that is based on zinc and air, and so it avoids several issues with materials sourcing, safety, and cost. The plant will provide about 500 jobs, and there are plans to power the plant entirely on renewable energy. It will support New York State's goal of creating six gigawatts (GW) of energy storage by 2030. A press release was made by Empire State Development. Read more about Zinc8 in the August issue of Green Energy Times at [https://bit.ly/GET\\_Aug2022\\_Zinc8](https://bit.ly/GET_Aug2022_Zinc8)

According to an article from The Maritime Executive, General Electric is proposing to increase the size of operations making wind turbine components with two factories at the Port of Coeyman's Bay, which is on the Hudson River just south of Albany. One of the facilities will make blades, and the other will make nacelles. The plant would support an ongoing effort by the state to build 4.6 GW of offshore wind capacity in its waters. The blades for offshore wind turbines are so long and the nacelles are so large that it is not practical to move



GE's Haliade-X offshore wind turbine. (ge.com)

them over roads, but because they will be made on the river, they will be loaded directly onto ships and transported to the offshore wind farms being built. NYSEDA reported that it had received over one hundred proposals for projects from six offshore wind developers for the third solicitation.

In December, the Albany Port District Commission voted to create a corporation to own Beacon Island, an artificially created island on the Hudson River. The island is to be home to a factory making masts for offshore wind turbines. Like the blades that will be manufactured nearby, the masts can be loaded onto ships for transport to the offshore wind sites where they will be used. The plant where they will be made represents an investment of \$350 million, part of which is being funded by the New York State Energy Research & Development Authority, known as NYSEDA. Beacon Island came into being decades ago as a result of

coal ash being dumped into the Hudson River, and the prospect of construction at the site has caused some opposition to the site, though it has been approved by the EPA. Loading the turbines will require construction of a 500-ft wharf, which has to be approved by the Army Corps of Engineers. The project is moving along, however, according to Spotlight News.

Two developers, Equinor and BP, submitted joint proposals for the third offshore solicitation, according to press release from BP. The Beacon Wind 2, to be built off the eastern tip of Long Island, would have a capacity of 1,360 megawatts (MW).

The huge Ravenswood natural gas facility site is being turned into a battery storage site, according to an announcement from Rise Light and Power. Ravenswood had a capacity of 2,480 MW and sat on the East River in Queens. The "peaker" plants at the facility have been shutting down, because they are reaching the ends of their operating lives and because the electricity they generate has to be sold at high prices for them to run at a profit. Now, the site can be developed to store electricity from the big offshore



Ravenswood Generating Station in Queens, NY is being turned into a battery storage site. (Taraqur Rahman, Unsplash)

wind farms that are to be built. The new plant will use its existing grid connections to supply power to New York on demand.

New York Governor Kathy Hochul announced the completion of a \$125 million Plug Power factory to make fuel cells in Bethlehem, Albany County. The factory will employ over 1,600 people and further the state's support of energy storage. Plug Power fuel cells use proven technology based on hydrogen. The company's Gen-Drive fuel cells are drop-in replacements for the engines in existing trucks.

Governor Hochul also announced that 309 MW of solar farms had been approved for three sites. The new capacity will bring the total for solar grid facilities approved since 2021 in New York to 1.8 GW, the most rapid approval processing by any state in history. The 309 MW of capacity just announced will supply enough electricity for the annual needs of over 69,000 New York households.

A total of 6 GW of battery storage is proposed by 2030 before the New York PUC, according to an article by Power Engineering International. That capacity will be able to supply 20% of the peak grid demand for the state. The proposed capacity includes 3 GW of bulk storage, 1.5 GW of retail storage, and 200 MW of residential storage, along with other capacity. The cost of the new storage facilities is estimated to be about \$2 billion.

There are proposals for specific actions attached to the basic proposal. One is that a study be undertaken to be sure that at least 35% of the storage be used to address needs of disadvantaged communities. Another is that a study be conducted to examine the potential to improve cost and quality transmission and distribution services.

Cont'd on p.13

### The Decline and Fall

Cont'd from p.1

projections. The short story is that fossil fuels declined a good deal more than expected. Gas capacity grew by 16,050 MW, 1,430 MW less than projected. Coal capacity fell by 26,710 MW, 6,014 more than projected. Overall, including the small change in oil-burning capacity, U.S. fossil fuel generating capacity fell by 12,470 MW, about 173% of what FERC had projected. Data for this is in the above report combined with FERC's Infrastructure Update for January 2023 (<https://bit.ly/Nov-2022-data>).

Now that we have looked at FERC's 2020 projections, we can look at its current projections of the coming three years. While FERC's latest projections of the use of both coal and oil continue to fall, they show that natural gas capacity has stopped its net growth and entered a period of net decline. The decline was first seen in September 2022, but it has continued since, except for very small growth in the most recent report.

This means that not only is capacity of fossil fuels in decline overall, as we noted in 2020, but that there is no single part of the fossil fuels industry that shows net growth.

It is interesting that the rate of overall decline changed abruptly, starting at just about the time that the Inflation Reduction Act was passed in August 2022. We could see natural gas additions slowing



As renewables increase, more wind farms like this one in Iowa, will be generating our electricity. (Voice of America, public domain)

before that point, which was not surprising, because the cost of electricity generated by solar and wind power had fallen below that of that generated by natural gas, even when the cost of backup batteries for renewables is taken into account. Now, the net growth of natural gas capacity is expected to be negative for the coming three years, overall.

It might be good to look at the growth of wind and solar generating capacity. It is clear that while fossil fuel capacity is no longer growing and is going into decline, the growth of solar and wind capacity has exceeded earlier projections. In 2020, FERC projected a growth of 26,154 MW of solar capacity in three years, for 56.8% growth. Solar capacity exceeded that projection,

however, as 29,580 MW were installed, a growth of 64.2%, bringing solar capacity to 76,040 MW. The current projection is that in the next three years, solar capacity would increase by 88%, with additions of 67,147 MW and no retirements.

For wind power in 2020, FERC projected a net capacity growth of 26,559 MW. At that time, wind capacity was 109,750 MW, so the growth would have taken it to 136,309 MW. Now FERC lists wind capacity at 141,100 MW, nearly 5 MW higher than they had projected. Their most recent

projection is for a net 17,449 to be added over the coming three years.

So, current projections for wind and solar capacity are that they will have net capacity additions of 84,598 MW over the next three years. And at the same time, there would be practically no growth of fossil fuel burning generating capacity.

That means approximately 100% of net generating capacity growth in the next three years is expected by FERC to be additions of renewable capacity.

By the way, for those who view such news as some sort of political propaganda, there are four members of the FERC board that issued these reports, and all of them were appointed by the previous administration. ♻️



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# Solar Rescues Pope Memorial Humane Society

George Harvey

Sundog Solar has been very busy recently. This article follows one in the *Green Energy Times* December 2022 edition. That article, "Sundog Solar Makes Sustainable Music at Snow Pond," was about a solar installation at Snow Pond, a music camp and venue in central Maine (<https://bit.ly/Snow-Pond-solar>).

Now, we are reporting on a different system, which is a bit nearer the home of Sundog Solar. The Pope Memorial Humane Society (PMHS) is in Thomaston, Maine, which is on coastal waters just south of Penobscot Bay.

While Thomaston is not a large community, with a population of about 2,700. Nevertheless, the PMHS has a large animal shelter. Danny Piper, owner of Sundog Solar, said he believed the building covered about 10,000 square feet.

Powering such a building required a large solar system, which was installed by Sundog Solar. It has 189 Vikram 455 monofacial photovoltaic modules and six SolarEdge inverters, five of 11.4 kilowatts (kW), and one of 10 kW. This gives it a total capacity of 85.995 kW (DC) from the solar panels, or 67 kW (AC) from the inverters. The solar modules are mounted on multiple rooftops, which made the project somewhat more complicated than most Sundog Solar has done.

The inverters are set up as micro-inverters, so they have the module level electronics with optimization. They meet rapid shutdown compliance, so there is no power on the grid coming from the solar system or battery in the event of grid failure, which is important so repairmen don't get shocked as they work to bring the grid back online. Piper told us that one important consideration in the choice of inverter was reliability. Not only do the SolarEdge inverters have a 25-year warranty, they have a very low

failure rate.

Maine has an unusual model for connecting solar systems to the power grid. As in other states, there is a model based on the number of kilowatt-hours stored or used from the grid. But there is also a model based on the tariffs, so the value of the electricity is a matter of account, rather than the amount of electrical energy. The value of the tariff is established by the Maine Public Utility Commission (PUC).

Piper said, "Extra care was given to the service and meter configuration on this project, allowing it to achieve bill tariff crediting through the utility, receiving monetary credit value."

For those who want to investigate the PUC's rules regarding net metering and other related subjects, information can be obtained from the PUC website, by visiting <https://bit.ly/Maine-PUC-313>. The address lists documents relating to other subjects in addition to Chapter 313 of the code.

Piper told us, "This will be one of many that we commission this year. We started the project at the end of November and worked on and off for two and a half to three weeks to complete the project.

what is happening in New York, there would be no question of whether this country could end its dependence on greenhouse gases. With that, we could see the path clear to addressing climate change.

Links to source material will be available in this story when it is published online at [www.greenenergytimes.org](http://www.greenenergytimes.org).



Above: Pope Memorial Humane Society. Right: every available rooftop was used. (Photos courtesy of Sundog Solar)

solar system over a period of years. The PMHS, however, did not go through that route. As it happened, a donor stepped up to fund the whole project. While the PPA would have saved PMHS a good deal of money, a donation could save it far more.

We should point out that PMHS did not scrimp on the installation. Piper said that one example of how careful they were to do the best installation possible for a pet shelter was the installation of alpine snowguards over the



We had to wait for the utility to shut the power down for the changeover. That was on December 21. After that, there were the holidays." The development was slower than normal because of weather. Nevertheless, it went smoothly and was completed as quickly as could be expected.

There was some question about how the system would be financed. At first, the PMHS was looking for a power purchase agreement (PPA). Normally, getting a PPA means that a commercial organization, which could be the installer, a bank, or some other entity, finances the installation and leases the

outdoor areas where dogs would play and exercise. The cost of the snowguards might be estimated at \$2,300 each, according to Piper.

While PMHS did not scrimp excessively on installation, it was also not at all extravagant. It has a standard design for a grid-tied solar project, without batteries for backup. The solar panels produce excess energy during the day, which is delivered to the grid. "The grid is the battery," Piper said.

The website for the Pope Memorial Humane Society is [popehumane.org](http://popehumane.org).

The website for Sundog Solar can be found at [www.sundog.solar](http://www.sundog.solar).

## RENEWABLES IN NEW YORK STATE

Cont'd from p.12

We try to stay abreast of the news, but with this much happening, in just two months, it is more than possible that we missed something. As the list stands, it is impressive. One thing to consider about this is that the switch to clean power is ongoing, and with the state's support, it will continue to grow quickly.

It occurs to us that if other states could set goals and achieve results similar to

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# Permitting and Promoting a Livable Future

Bob and Suzannah Ciernia

Citizens' Climate Lobby (CCL) has promoted carbon pricing, specifically a carbon fee and dividend model, for 15 years. The CCL views such a policy as the linchpin that would support and incentivize technological innovation and adaptation.

Working with legislators of both major political parties, the CCL has sought public policy that could weather changes in the political landscape and remain durable whatever happened electorally. And we're getting closer; in the last legislative session, 49 U.S. Senators voted to approve a carbon tax.

In an effort to find common ground that can become law and make progress on climate change, CCL has begun advocating for additional policies to address climate change. Among these is permitting reform.

**Why do we need clean energy permitting reform?**

America has an abundance of clean energy resources but, without an expanded electric transmission grid, we can't take full advantage of them. Thanks to the policies passed in the Inflation Reduction Act (IRA), the U.S. is expecting to see a rapid boom in solar and wind farm construction. Those facilities will mostly be built in rural areas where land is available and affordable and distant from the homes and businesses that most need the clean electricity. We need electric transmission lines to connect the two, and right now it takes over a decade on average to build a new transmission line in the U.S. Ultimately, we need to triple our current capacity to transmit clean electricity by 2050.

But our country also needs to speed up the pace with which we build new clean energy projects, and our current permitting process makes that tough as well. For example, it takes an average of 4.5 years for federal agencies to complete National Environmental Policy Act (NEPA) environmental

impact statements that are needed to permit some major energy projects. These are important assessments, but we need them to move faster.

**We don't have time to waste**

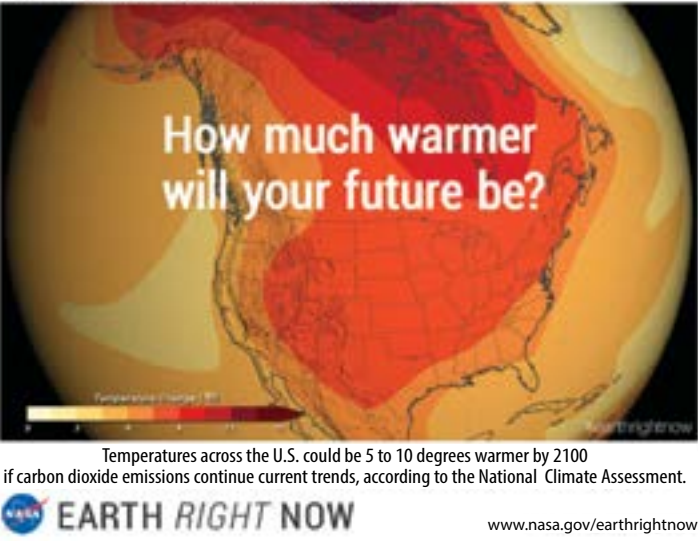
Reducing carbon emissions 50% by 2030 and being net-zero by 2050 is still the goal but this will not be easy. Missing those targets is good for neither the environment nor our descendants. To avoid being cornered by our own inaction, we need to do the difficult work of finding a reasonable compromise as quickly as possible.

'Clean Energy Permitting Reform' should not be used as a tool for gutting environmental regulations, nor should environmentalists reflexively assume the health of the planet (and the people on it) will be sacrificed if the permitting process is changed. CCL believes it must be possible to find a way to move more quickly on permitting AND still give impacted communities meaningful input in protecting their environments.

The consequences of failure in this regard are unacceptable. If we can't accelerate the building of a clean energy infrastructure, we'll only achieve about 20% of the potential carbon pollution reduction from climate policy that is already in place (Inflation Reduction Act of 2022).

It would have been better had we started this work when the Big Oil & Gas executives first learned in the 1970s that their own scientists were accurately predicting the future we are now living, but we can't rewrite the past and we must focus on our shared future.

## National Climate Assessment: Temperature Change



To these writers, the words of Fortunat Mueller, President and Co-Founder of ReVision Energy, an installer of renewables in New England, are instructive. "As a rule, we support rigorous land use and environmental standards to ensure that large scale infrastructure projects are sited appropriately and responsibly AND we have to recognize that we are in the midst of a climate emergency and that the clean energy transition of the next 25 years is the largest infrastructure project in the history of mankind. It is orders of magnitude larger than the rural electrification project of the early 20th century or the Interstate highway projects of the middle of the century. So, we have to build a LOT of stuff. And building stuff will have implications on the environment. But let's also be realistic that NOT building stuff (specifically clean energy stuff), has implications on the environment as well and though they may be more diffuse, the implications of inaction are catastrophic and mor-

ally unacceptable."

**How can reforming clean energy permitting benefit health, economic, and environmental justice?**

CCL agrees that permitting reform should be done in a way that empowers communities to weigh in on what projects happen in their area and minimizes the negative health impacts from air pollution and other pollution. This is especially important in disadvantaged communities, where lives are already being lost due to pollution from fossil fuels.

Expanding clean energy can aid environmental and climate justice in several ways. Air pollution causes about 250,000 deaths per year in the U.S. and nearly nine million per year globally. Replacing older polluting power plants and increasing vehicle electrification both result in cleaner air in densely populated urban communities.

Failing to capitalize on the pollution reductions from the IRA could thus result in thousands of needless premature deaths, concentrated predominantly in disadvantaged communities.

Wind and solar farms projects will also bring economic benefits and jobs to the rural areas in which they will tend to be built. But realizing those benefits requires widening the bottlenecks that slow the siting of clean energy projects and the electric transmission lines needed to connect them to population centers.

**An Uneven Playing Field**

Some types of fossil fuel projects already have the advantage of streamlined permitting advantages over more climate-friendly energy, so they would not gain

Cont'd on p.19

## A Rationale for Incentives

Wes Golumb

The Inflation Reduction Act (IRA) of 2022 uses incentives to encourage the adoption of clean energy technologies as a means of transforming from a fossil fuel to a clean energy economy. Despite ongoing controversy, there is logical economic rationale, over 100 years of historical precedent AND incentives are a tried-and-true means for aiding in market transformation.

**The History of Economic Incentives for Energy**

It became clear, early in the 20th century that there were tremendous social and economic benefits to the expansion of the oil and automobile industries. The practice of offering energy related incentives for fossil fuels began in 1919, when congress authorized reimbursing oil companies for costs of drilling wells, and the practice continues to this day.

In 2021 the fossil fuel industry received more than \$20 billion in incentives and tax breaks in the U.S., and the worldwide yearly incentives are more than \$440 billion.

In all we have incentivized the fossil fuel industry with trillions of dollars over the last 100 years.

Whatever your perspective, it is clear there is ample precedent for the use of

EFFICIENCY	Least				Most			
	BULB TYPE		LUMENS		RATED LIFE		SAVINGS	
	STANDARD	HALOGEN	CFL	LED				
450	40 W	29 W	9 W	8 W	1 year	1-3 years	up to 30%	up to 80%
800	60 W	43 W	14 W	13 W				
1100	75 W	53 W	19 W	17 W				
1600	100 W	72 W	23 W	20 W				

Energy efficiency lighting will help save you money by reducing your energy needs and via rebates and incentives available for home efficiency upgrades. (AdobeStock\_64144299)

incentives, and that incentives are a powerful economic tool, when applied for a better and sustainable outcome.

**Incentives as a market transformation tool**

Incentives have a proven track record of encouraging the adoption of a new technology, starting with the automobile.

The idea is not to pay full cost for a new technology, but to give enough of an incentive so that the logical economic

decision for a consumer is to purchase the more efficient alternative.

Let's use LEDs lighting as an example. LEDs can save as much as 90% or more over traditional incandescent bulbs. When LEDs first were introduced, they were much more expensive to purchase than incandescent bulbs. However, even at that initial price, consumers who were willing to make that initial investment saved significant amounts of money and energy over the lifetime of a LED bulb.

It was tough for people used to spending a dollar or less for a bulb to pay \$8 or \$10 dollars instead. The use of incentives helped to make LEDs competitive. As people bought more LEDs the cost to manufacture them dropped leading to price cuts from manufacturers. As the cost came down, incentives were lowered. After a few years, the incentives could be removed because LEDs had become competitive as a stand-alone product.

We face similar issues with the relative cost of many sustainable energy measures and technologies.

For example, imagine two houses; One has been built using best practices and has been tested and shown to be a high-performance building. The other is built with standard construction practices. From the outside these houses may look the same, but the cost to the high-performance builder runs 3-15% more and is reflected in the price. An unknowing consumer comes along, looks at what appear to be two similar houses, and makes the logical economic choice to purchase

the less expensive one.

In fact, if we life cycle cost, looking at the cost to purchase AND own a home over time, it is probably less expensive in the long run to purchase the more efficient home with the higher price tag.

One of the means of getting past this problem is to provide incentives for building or retrofitting high performance homes. That is exactly what the IRA does. Builders can get up to \$8,000 for building better homes, and homeowners now have a suite of incentives available that total's more than \$10,000. These do not pay the full cost of these upgrades but provide enough of an incentive to make it worth their while to build the better home.

Over time, as the materials and techniques become more common, the costs to build better will come down, and the need for an incentive to build this way will diminish.

The IRA passed in August, and at this writing (December 2022), there is already increased investment reported in both battery storage and solar component manufacturing. It appears these incentives are already starting to have their desired effects of encouraging the transformation of our economy from fossil fuels to clean energy.

Wes Golumb is a clean energy advocate and author of the recently published book and video series, Warm and Cool Homes, Building a Comfy, Healthy, Net-Zero Home You'll Want to Live in Forever.



# ZOMBIE BILLS ARE BACK – AT THE NEW HAMPSHIRE STATE HOUSE

Sam Evans-Brown

We are in the midst of a full-blown energy-affordability crisis. A truly startling statistic is that even before electricity bills went truly haywire and the heating season arrived with \$5 per gallon heating oil, one in five Americans was behind on their energy bills, and at risk of being without heat or light. Unfortunately, this means that politically, we all need to be watchful.

There are a number of bad ideas that have been killed repeatedly by the New Hampshire legislature's wiser minds. The bills keep coming back from the dead, and those bills are stalking the halls of the statehouse as we speak. There are at least three bills that would gut the state's modest Renewable Portfolio Standards, which sets targets for expansion of renewable energy generation. There is a bill that would zero out the balance of the state's Renewable Energy Fund (REF), which is used for grants and rebates that help buy down the cost of renewables. There are bills that would put taxes on electric vehicle charging and even a bill that would eliminate entirely the process of "Least Cost Integrated Resource Planning" a key regulatory function that ensures electric utilities are keeping their costs as low as possible.

These bills are all bad ideas, and many of them have been defeated already in one form or another, but in the spirit of "never let a serious crisis go to waste," many of these proposals are opportunistically preying on the current high-cost environment to try to accomplish long-



New Hampshire statehouse in Concord, NH (Flickr/cmh2315fl).

standing policy goals.

A perfect example is the "raid" on the state's Renewable Energy Fund. New Hampshire's legislators have actually done this before. They raided several "dedicated funds" that were supposed to be used for renewable energy or land conservation to plug budget holes during the Great Recession. It was done so many times that Gordon MacDonald (who has now been appointed by

Governor Chris Sununu as Chief Justice of the NH Supreme Court) wrote a legal memo arguing that such raids were unconstitutional.

Such raids are penny-wise but pound foolish. The money in the REF has incredible leverage and is an excellent investment in diversifying the state's energy sources. A recent report from the Department of Energy notes that these rebates and grants leverage six

times their value in private investment into technologies that reduce fossil fuel consumption, energy spending, and greenhouse gas emissions. Returning these funds back to ratepayers would likely amount to less than \$10 per NH resident, but giving out the money in grants and rebates would result in more than \$40 million dollars in private investments being made in the state.

Fortunately, it is not all storm clouds. The New Hampshire Senate continues to be a bastion of good policy making, and many of these proposals are unlikely to advance, as long as the good citizens of New Hampshire make their voices heard.

A comprehensive spreadsheet of all the bills that are moving through the NH General Court is available to any Clean Energy NH member at [cleanenergy-nh.org/member-resources](https://cleanenergy-nh.org/member-resources).

Sam Evans-Brown is the Executive Director of Clean Energy NH. He was a journalist with New Hampshire Public Radio for a decade, covering energy and environmental issues. ♻️

## VERMONT 2023-24 LEGISLATURE BUDGET ADDRESS FOR CLIMATE CHANGE MITIGATION AND ADAPTATION

On January 20, 2023, Governor Phil Scott spoke before the Vermont legislature to share some of the highlights of the Administration's proposed \$8.4 billion budget for this year. One key investment covered by Scott's budget proposal included Climate Change Mitigation and Adaptation. It included:

- \$150 million in climate mitigation funding which will be used to access federal programs that require state matches.
- \$3 million in the Budget Adjustment Act to help communities identify climate and infrastructure projects to be addressed using federal dollars.
- \$5 million for a Clean Heat Homes Initiative.

It is now up to legislators to reconcile the differences regarding the Administration's budget proposal to address climate mitigation and adaptation as a top priority. For a full transcript of the Governor's speech visit <https://bit.ly/VT-budget-2024>. ♻️

# VERMONT'S LEGISLATIVE SESSION SHAKEDOWN!

Lauren Hierl

February 10, 2023

The Vermont Legislature is actively working on a range of Vermont Conservation Voters' (VCV) priorities identified in the Environmental Common Agenda ([https://bit.ly/VCV\\_Environmental\\_Common\\_Agenda](https://bit.ly/VCV_Environmental_Common_Agenda)), including the Affordable Heat Act, smart growth housing initiatives, land conservation, Bottle Bill modernization, a bill to implement ranked choice voting for Presidential primaries, and more. Read the details below.

At the federal level, President Biden delivered his State of the Union address and was able to highlight the country's largest-ever investment in climate action. Now we need swift, effective, and equitable implementation of the Inflation Reduction Act to deliver for Vermonters. These programs will benefit every community by lowering costs, creating good jobs, and reducing toxic pollution that causes health problems.

### Climate Action

The Senate Committee on Natural Resources and Energy is working hard on the Affordable Heat Act (S.5). We believe the Affordable Heat Act will help Vermonters reduce their dependence on expensive and polluting fossil fuels by requiring importers of fossil heating fuels to reduce pollution over time. To do so, fossil fuel importers will have to provide cleaner heat options — mostly for



The Vermont State House.(stvt.org)

lower- and middle-income Vermonters — through solutions that will cut costs over time, like weatherization, heat pumps, and advanced wood heat. Learn more about this bill at [https://bit.ly/VNRC\\_AffordableHeatAct](https://bit.ly/VNRC_AffordableHeatAct). Contact your Senators and urge them to enact a climate accountable and equitable Affordable Heat Act!

Meanwhile, the House Committee on Transportation continued working on a range of public transit initiatives, bike and pedestrian accessibility, e-bike incentives, and many more important climate initiatives included in the Transportation Affordability Act.

Check out this Climate Dispatch video to learn more ([https://bit.ly/YouTube\\_ClimateDispatch\\_VNRCandVPIRG](https://bit.ly/YouTube_ClimateDispatch_VNRCandVPIRG)).

### Smart Growth Housing

The Senate Committee on Economic Development, Housing and General Affairs is working on a housing equity bill.

We are watchdogging this process to ensure the bill meets our principles of encouraging more affordable housing in thriving, walkable communities. We believe this bill has the opportunity to advance valuable policies to advance smart growth, where we can simultaneously invest in our downtowns and village centers and support the economic and ecological vitality of our working and natural lands. Stay tuned on how the bill is coming together.

### Land Conservation

Legislation is being discussed that would set a target of conserving 30% of our lands by 2030 and 50% by 2050, and establish a planning process for how to get there. We are hopeful that the House Environment and Energy Committee will move that bill forward in the coming weeks. Similar legislation was passed last year but was vetoed by the Governor. Learn more about this issue at [https://bit.ly/Democracy\\_Dispatch\\_Roaring\\_Twenties](https://bit.ly/Democracy_Dispatch_Roaring_Twenties).

### Protect Vermonters from Toxic Chemicals

The Senate Committee on Health and Welfare began walking through a bill (S.25) to restrict the use of toxic chemicals like PFAS from personal care products, textiles, menstrual products, and artificial turf. This bill would continue Vermont's

commitment to protecting Vermonters' health and our environment from these harmful chemicals. We hope the committee takes up this important bill soon. Learn more at [https://bit.ly/Democracy\\_Dispatch\\_EnvironmentalJustice](https://bit.ly/Democracy_Dispatch_EnvironmentalJustice).

The House Environment and Energy committee is also working on a bill (H.158) to modernize the Bottle Bill. This successful program would be expanded to cover a wider range of beverages to reduce waste, cut plastic pollution, and increase recycling. We hope to see action on the bill soon.

### Democracy

A bill (S.32) to establish ranked choice voting in presidential primaries is being deliberated in the Senate Committee on Government Operations. We will continue to advocate for this bill to move forward.

Lauren Hierl is the Executive Director of Vermont Conservation Voters. ♻️



## FEDERAL

### FEDERAL INVESTMENT TAX CREDIT

- To learn more about federal tax credits for home owners, home builders, and commercial buildings; go to: [https://www.energystar.gov/about/federal\\_tax\\_credits](https://www.energystar.gov/about/federal_tax_credits).
- Learn more about electrification rebates and tax credits associated with the Inflation Reduction Act at <https://www.rewiring-america.org/app/ira-calculator>.

### USDA RURAL DEVELOPMENT PROGRAM

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

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

### Biorefinery Renewable Chemical, and Biobased Product Manufacturing Assistance Program

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

## REGIONAL

### The Grassroots Fund's Grant Programs

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

- Three grant programs are offered:
- Seed grants are designed to support new (often less than 1 year old) environmental projects.

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

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

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

## VERMONT

### CLEAN ENERGY DEVELOPMENT FUND

The Small Scale RE Incentive Program, administered by Renewable Energy Resource Center (RERC), provides funds to help defray the costs of new solar thermal and advanced wood pellet heating systems. All incentives are listed at: [RERC-vt.org](http://RERC-vt.org).

**Advanced Wood Heating** Advanced wood pellet heating systems -- \$6,000 per pellet boiler/furnace (in partnership with Efficiency Vermont). Commercial spaces over 5,000 sq. ft. may also be eligible for incentives. See [www.erc-vt.org](http://www.erc-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.
- We now have a wood stove change-out program and a pellet boiler adder for income qualified homes. All information is at [www.RERC-VT.org](http://www.RERC-VT.org). Adders for the pellet boilers can be an additional \$8,000!

- 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.erc-vt.org](http://www.erc-vt.org) or call (877) 888-7372.

- More info at [fpr.vermont.gov/woodenergy/rebates](http://fpr.vermont.gov/woodenergy/rebates). Unfortunately this FPR web site is now longer up-to-date. There is good info. there still but some is outdated.

### Other Utilities Heating Offers

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

- Members of the Vermont Electric Co-op can get a \$150 credit on the purchase of an approved pellet stove: [www.vec/energy-programs](http://www.vec/energy-programs).

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

- GMP rebates available through December 31, 2021

### VT TAX CREDITS

- Vermont offers an investment tax credit for installations of renewable energy equipment on business properties and wood and pellet heaters with at least 75% efficiency. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit.
- More info on the 2021 IRS Tax form at <https://www.irs.gov/pub/irs-pdf/f3468.pdf>

### Tier III programs

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

### EFFICIENCY VERMONT

All incentives subject to availability, limits, and may change at any time. For complete details, and participating retailers/contractors, call 888-921-5990 or visit [efficiencyvermont.com/rebates](http://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: 75% off eligible project costs, up to \$2,000. Moderate income Vermonters get 75% off up to \$5,000.

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

### Appliances (must be ENERGY STAR)

- Dehumidifiers: \$25 - \$40 rebate
- Clothes Dryers: \$200-\$400 rebate

### Heating/Cooling/Water Heating

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

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

### Heat Pumps:

- Air-to-Water System: \$1,000/ton rebate
- Ducted Systems: \$1000-\$2000 discount at participating distributors
- Ductless Heating & Cooling System: \$350-\$450 discount at participating distributors
- Ground Source Heat Pumps: up to \$2,100/ton rebate
- Heat pump water heaters: \$300-\$600 discount at participating distributors;
- Moderate-income Vermonters are also eligible for bonus rebates up to \$500 for heat pumps and heat pump water heaters.

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

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

- Electric utility rebates may also be available.

### Other Opportunities to Save

- Home Energy Loan – finance up to \$20,000 in energy-related home improvements with interest rates starting at 0%. Restrictions apply.
- Additional incentives may be available through your local electric utility provider. Contact your utility for more information.

### Incentives for Pro-environment Agriculture Behaviors

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

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

## Vermont's GMP Extends Rebates Through 2023

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

In 2021, GMP customers saved with more than 7,000 rebates when they made the choice to switch away from fossil fuel at home and on the road – for heating, driving, mowing their lawns, and electric motorcycles. Rebates include a \$1,500 rebate on all electric vehicles, plus an extra \$1,000 for low- and moderate-income customers, and a \$400 base rebate on cold climate heat pumps with an extra \$800 in incentives for income-eligible customers in partnership with Efficiency Vermont.

The Vermont Natural Resources Council (VNRC) cut costs with GMP incentives while completing the renovation of a historic house in Montpelier to serve as new office and expanded meeting space.

"One of our goals was a net-zero building, and GMP's incentives were a huge help in swapping out an old, inefficient oil-burning boiler for cold climate heat pumps," said Brian Shupe, VNRC's executive director. "GMP's incentives also helped us install an electric vehicle charging station to help staff and visitors convert to electric vehicles."

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

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

## NEW HAMPSHIRE

### Renewable Energy Incentives Offered Through the NH Department of Energy

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

### Commercial Solar Rebate Program

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

Incentive levels for PV systems are as follows:

- \$.020/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:
- \$.012/rated or modeled kBtu/yr for new solar thermal facilities fifteen collectors in size or fewer; \$.007/rated or modeled kBtu/yr for new solar thermal facilities greater than fifteen collectors in size;
- Expansions to existing solar systems not eligible.

Contact: [https://bit.ly/NH-DOE\\_CommercialIndustrialSolar](https://bit.ly/NH-DOE_CommercialIndustrialSolar) or at (603) 271-3670.

**Residential Solar/Wind Rebate Program is currently closed.**

**Residential Solar Water Heating Rebate Program is currently closed.**

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

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

### Residential Wood Pellet Boiler/Furnace

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

Contact: [https://bit.ly/NH-DOE\\_ResidentialWoodPellet](https://bit.ly/NH-DOE_ResidentialWoodPellet) for more information and current program status.

### LOCAL INCENTIVES

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

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



## NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the Home Heating Index (BTUs of heating fuel / conditioned square feet / heating degree days). Must provide at least 12 months of heating fuel history. Once qualified, eligible homes get a \$450 value comprehensive 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](http://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](http://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](http://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](http://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](http://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](http://www.NHSaves.com/lighting-catalog).

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

- **NH Solar Shares:** [nhsolarshares.org](http://nhsolarshares.org)

## NHSaves: [nhsaves.com](http://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](http://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/](http://www.NHSaves.com/resource/) for individual utility contact information.

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

### Electric Vehicle & Charging Incentives:

- Up to \$1,000 incentive on the purchase or lease of a qualified EV (Residential).
- Up to \$300 incentive to install Level 2 or larger charging stations, w/ Off-Peak charging rate (Residential).
- Up to \$2,500 incentive to install Level 2 or larger charging stations (Commercial & Municipal).

### High Efficiency Heat Pump Incentives:

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

## Business Programs

Includes programs for: small and large business, new equipment and construction, seminars, lighting incentives, and catalog, and low and no interest financing programs.

Visit [www.NHSaves.com/](http://www.NHSaves.com/) for information about NH business incentives for electric-ity efficiency.

## NH Weatherization Assistance Income-Eligible Programs

Home Energy Assistance and NH community action Weatherization Assistance Program. Financial assistance paying fuel bills, and free weatherization improvements for qualified applicants. Funding from U.S. Dept. of Energy, NH utilities.

Visit [www.bit.ly/GET-NH-4](http://www.bit.ly/GET-NH-4) for application criteria, FAQs and local program contacts.

## Community Development Finance Authority (CDFA) Clean Energy Fund

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

to support energy efficiency and renewable energy projects.

### Small Business Energy Audit Grants

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

### Community Facilities Energy Assessment Grants

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

Find out more at: [nhcdfa.org/energy](http://nhcdfa.org/energy).

# NEW YORK

## RENEWABLE ENERGY INCENTIVES OFFERED IN NEW YORK

There are 169 programs and incentives available at: <http://dsireusa.org> (enter your zip code).

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

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

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

### Clean Energy Incentives and Tax Credits for Renewable Energy

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

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

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

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

## Electric Vehicle Charging Station Make-Ready Program

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

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

- **National Grid:** <https://ngrid.com/3H7hBPU>
- **Central Hudson:** [https://bit.ly/CENHUD\\_SaveEnergy](https://bit.ly/CENHUD_SaveEnergy)
- **NYSEG:** [https://bit.ly/NYSEG\\_SaveEnergy](https://bit.ly/NYSEG_SaveEnergy)
- **PSEG Long Island:** [https://bit.ly/PSEGLI\\_SaveEnergy](https://bit.ly/PSEGLI_SaveEnergy)
- **RG&E:** [https://bit.ly/RGE\\_SaveEnergy](https://bit.ly/RGE_SaveEnergy)

# MAINE

## EFFICIENCY MAINE

All incentives and rebates are subject to change without notice. For information on Efficiency Maine's programs go to [efficiencymaine.com](http://efficiencymaine.com) or call 866.376.2463

### Home Insulation:

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

See [bit.ly/EffME\\_HomeInsulation](http://bit.ly/EffME_HomeInsulation). Residents can estimate home energy efficiency with the calculator at [bit.ly/EffME\\_SavingsCalculator](http://bit.ly/EffME_SavingsCalculator).

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

### Multifamily Insulation:

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

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

### Heat and Cooling:

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

[https://bit.ly/EffME\\_VendorLocator](https://bit.ly/EffME_VendorLocator). To find a qualified partner for business solutions, go here: [https://bit.ly/EffME\\_BusinessSolutionspartner](https://bit.ly/EffME_BusinessSolutionspartner).

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

**Heat Pump Water Heaters:** \$850 mail-in rebates or instant discounts on heat pump water heaters. Learn more at [bit.ly/EffME\\_WaterHeatingSolutions](http://bit.ly/EffME_WaterHeatingSolutions). A Water Heater Cost Calculator to estimate savings is at [bit.ly/EffME\\_WaterHeatingCostComparison](http://bit.ly/EffME_WaterHeatingCostComparison).

### Electric Vehicle Charging Solutions:

Charging at a single-family home is convenient and inexpensive. Most EV drivers do over 80% of their charging at home using either a Level 1 charger cord or a faster Level 2 charger.

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

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 offers a promotion for businesses with five or more vehicles registered in Maine, 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. Maine businesses can also receive up to \$8,000 for the purchase of an all-electric commercial van for business use. See [bit.ly/EffME\\_EV\\_Rebates](http://bit.ly/EffME_EV_Rebates).

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

**Appliances:** \$50 rebates available for ENERGY STAR® certified clothes washers: [bit.ly/EffME\\_ClothesWasher\\_Rebate](http://bit.ly/EffME_ClothesWasher_Rebate)

Room Air Purifiers: \$25 rebate available for ENERGY STAR® certified room air purifiers: [bit.ly/EffME\\_AirPurifier\\_Rebate](http://bit.ly/EffME_AirPurifier_Rebate).

**\$100 "DIY" Winter Prep Rebate** toward the purchase of select weatherization and insulation products. Complete promotion details, a list of eligible products, and a claim form can be found on the Efficiency Maine website at <https://www.efficiencymaine.com/at-home/100-diy-winter-prep-rebate/>

## REGIONAL: OTHER

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

### Commercial Buildings EPA 179D

Take up to \$1.88/ sqft if qualified) Visit <https://www.energytaxsavers.com/> for more details. <https://www.energy.gov/eere/buildings/179d-commercial-buildings-energy-efficiency-tax-deduction>

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



# Green Homes, Your Time is Now!

Julia Bassett Schwerin, Green REALTOR®, Advisors Living

I have been a REALTOR® since 2006, and a designated Green Broker by the National Association of REALTORS®, since 2011. In the beginning with my new "Green" designation, tuning up the efficiency of the built environment felt like a Sisyphus act. Buildings in Maine were heated 67% with oil. New Hampshire and Vermont, even Massachusetts and other more densely populated New England states were also dependent on oil fuel, which is at best only 80% efficient. Many of the oldest buildings in America, too, are here in New England, built with a fireplace flue in every room. The powers that be back then held up the legal progression of the building energy code, so even new builds performed like old builds in terms of efficiency.

But here I am, at the start of 2023, wildly optimistic about being at the confluence of opportunity and that other green thing, money. Many New England states have placed a priority following the goals of the Paris climate accord for lowering our carbon footprint, thanks to a new administration and a plan created through consensus called Maine Won't Wait. Our local Portland chapter of the Maine Association of REALTORS® participated in the process and is now engaged in educating REALTORS® to, in turn, educate the market on the opportunity to make our built environment efficient.

Many states have rebates for consumers to invest in equipment like heat pumps, and actually these have started to change the profile of oil fuel usage in Maine's residential market. But these programs require consumers to have the capital to invest in the energy retrofits. There are loans available but not well documented as a financially prudent approach to ap-



An owner of a solar-powered, energy-efficient off-grid residence in Vermont had a successful outcome in the green real estate market in 2022. (Courtesy photos)

proach a leaky building. A lot of attention gets paid to curb appeal and cosmetics in home renovations, because they are visible. The important things in making a home more efficient like air sealing and insulation, are only visible in the lower energy bills, and that is not a huge deal yet on This Old House.

Then the first shoe dropped. The start of the war in Ukraine by Russia resulted in a massive disruption of the energy markets that was unprecedented, unexpected and unbelievably expensive for consumers throughout the world. People are suffering spikes in fuel costs, putting the question of what can be done on the front burner, so to speak. (Hint: reduce energy consumption and convert or upgrade to more efficient heat, hot water and other major energy-consuming appliances).

A short time later in 2022, the second shoe dropped. The Federal government managed to pass the Inflation Reduction Act with funding for making the built environment better including more money for rebates, and something we in Maine have

prepared for through legislation passed in 2021, funding for the Green Bank. The Green Bank being launched in Maine will make loan guarantees to banks and credit unions lending money to consumers to transform their energy-hog homes into lean, green, clean homes. This will replace a large part of the owners' crazy fuel



bills with a fixed-rate, fixed term loan to cut energy costs. If planned correctly, the loan will be at or below the cost of the fuel bill saved.

The key to that planning is to follow the playbook for home energy retrofits. Here are suggestions:

Hire an energy auditor to evaluate your building with a blower door test, infrared camera, and a priority list of recommendations to tackle, with probable paybacks. The best thing is to hire an independent auditor, even if you must get on a wait list. Do not skip this step.

Then use your state energy-efficiency agency to find contractors approved to do the work and get rebates. Reach out to them for information on loans to get the work done from them, from vendors them-

selves, and from local lenders. Weatherization is the first priority, because if you don't reduce the energy usage through air sealing and insulation first, you'll waste money down the line. Be sure to get recommendations for mechanical ventilation from the energy auditor. It may seem counter-intuitive to spend money to tighten up the building shell only to spend more money to ventilate it, but go with it.

Electrification is the second priority. When your building envelope is tight, you don't want combustion gasses polluting your indoor air. Switch to electric heat pumps and heat pump water heaters. Use 'smart' technology to reduce plug loads, LED lights, and electric vehicles, mowers, leaf blowers, and hedge and grass trimmers. True, the grid is not 100% green, but the states are increasing wind and solar energy generation and phasing out coal and gas to meet the Paris climate accord goals.

Once you have completed these measures, take a victory lap! But also document everything for potential new owners, because, as I said before, this stuff is not screaming "curb appeal." And you could go one step further: solarize! If you can add either rooftop, ground-mount, or community solar to your building, you will have achieved net zero, meaning your building will be making as much energy as you are using. Consider adding at least one back-up battery to your system, so if the power goes out, your system will go offline and become a microgrid. That is real cocktail party brag-worthy!

Julia Bassett Schwerin is a Green REALTOR® with Advisors Living in Cape Elizabeth, Maine. She is the Co-Chair of the Sustainability Advisory Group, a Board Member of the Greater Portland Board of REALTORS®, and a Board Member of the Maine Association of REALTORS®. She specializes in waterfront, vacation, investment and properties with green features for buyers and sellers in southern Maine. ♻️

## CLIMATE ECONOMY – Cont'd from p.1

sectors like cement, steel, paper, chemicals, coal, oil, and gas, with alternative sustainable solutions like carbon-sequestering concrete, recycled steel, and green hydrogen.

### Talent Transition

As a mind-blowing amount of capital is invested into climate-friendly companies, an influx of talent is flooding the sector as well: Over the past few years, there has been a mass exodus of employees from the fossil fuel industry into the ClimateTech space.

Executives, engineers, software developers, data analysts, technicians, and field workers alike are leaving their positions at fossil fuel companies in favor of cleaner, greener opportunities at companies that offer products and cultures with reduced toxicity.

Beyond this group of established professionals, younger individuals entering the workforce are looking for greener pastures as well. In the face of divisive politics, existential environmental threats,

global pandemics, and social justice challenges, these younger generations are calling out a broken status quo, demanding an urgent reckoning, bold leadership, and a radically better future.

According to Green Builder Media's COGNITION Smart Data, 82% of Gen Zs and 75% of Millennials say that a company's Environmental, Social, and Governance (ESG) policies are extremely important or very important when making purchasing decisions.

COGNITION data also shows that 87% of Millennials are worried about climate

change, 93% believe that companies should take a stand on environmental issues, and 78% prefer purchasing products from sustainable brands.

82% of Gen Zs say that the more socially and environmentally responsible a company is, the more loyal they become as an employee and customer. No doubt, these younger values-based, and mission-driven individuals are driving a transition from a corporate model that extracts value by exploiting people and natural resources to one that creates value

by enriching the lives and livelihoods of employees, customers, communities, and the environment.

### Lead or be Left Behind

Companies that successfully navigate the transition to the Climate Economy will adeptly embrace the context and contradictions inherent in

today's society, understanding the gap between brand promises and real-life experiences.

They'll respond to the aspirations, anxieties, and dynamic tensions that consumers feel with solutions that meet our moment.

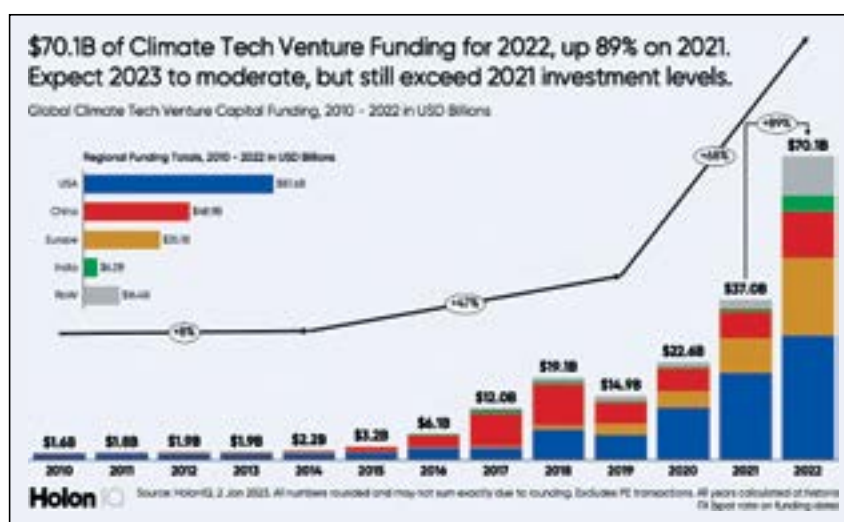
They'll be transparent and honest about the role they play in our urgent social and environmental challenges. They'll actively create value by improving the well-being of stakeholders and the environment, and they'll use their human and financial resources to uplift, support, and collaborate with causes, ecosystems, and communities.

Sara Gutterman is cofounder and CEO of Green Builder Media. She lives in Lake City, Colorado with her husband, where she is an avid long-distance runner, snowboarder,

and Crossfit trainer. She is also on the Board of Directors at Dvele, and runs the Rural Segment for Energize Colorado.

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Originally posted at [https://bit.ly/greenbuild-ermedia\\_transforming-our-future-the-climate-economy-boom](https://bit.ly/greenbuild-ermedia_transforming-our-future-the-climate-economy-boom). ♻️





# NEW COALITION CAN FUNDAMENTALLY CHANGE NEW HAMPSHIRE'S ENERGY LANDSCAPE – LAUNCHING IN THE SPRING OF 2023

Jo-Ellen Courtney

This spring, a brand-new option for where you and your neighbors can get electricity will become available. Community power allows towns and cities to come together through their democratic institutions and become the “default” supplier of electricity for all their residents. These new programs, enabled by a 2019 state law and now in final preparations for launch this spring, will allow residents to save money, choose greener power supply options, and transform how electricity is delivered in New Hampshire.

The Community Power Coalition of New Hampshire (CPCNH) is helping this launch. The Coalition is a non-profit power agency, which currently consists of 27 New Hampshire municipalities and counties that will pool their resources and customers to collectively get better prices from the electricity markets. The coalition was created “by communities, for communities” and is governed democratically. The members will decide how to



Source: [www.communitypowernh.org](http://www.communitypowernh.org)

purchase power, what types of electricity “mixes” to offer, and what to do with the funds the coalition is able to save by purchasing power under a more flexible and innovative approach as compared to the regulated investor-owned utilities. The first wave of communities will launch this spring, and dozens more will follow in the months and years to come.

CPCNH will save money for its member communities. It has signed contracts with industry leading firms that will guide the coalition through its energy procurement

process, and modeling suggests that the coalition will be able to provide at least a 5% discount off the energy bill of every participating community member, with the potential for much greater discounts during certain seasons.

Beyond saving money, the coalition also can fundamentally change New Hampshire's energy landscape. As a full-service power agency, the coalition will be able

to use the existing regional market structures to create innovative new rates and programs for its customers. These rates could provide customers ways to help pay for backup battery storage in their homes or discounts on EV charging overnight. The coalition will be able to set aside some of its cost savings to generate financial reserves, which can be either rebated to community members, or used to create innovative local programs. For example, programs could include enhanced energy efficiency offerings that overlie the existing NHSaves® program.

But perhaps most exciting is the potential for the coalition to use its collective buying power to purchase the electricity derived from locally produced community-scale renewable energy. This will allow the coalition not only to drive decarbon-

ization of the electric grid, but to do so in a way that benefits all of the customers in the community, not just those fortunate enough to own a home that is well-situated for solar panels.

CPCNH is tracking to launch service this spring. **Is your community a member?** Head to [cpcnh.org](http://cpcnh.org) to find out, and email [info@cpcnh.org](mailto:info@cpcnh.org) if you'd like to learn how to join.

Jo-Ellen Courtney currently serves as Chair of the Enfield Energy Committee. She has been a member since 2018. She also serves as Co-Leader for the Upper Valley chapter of Citizens' Climate Lobby. She is passionate about reducing reliance on fossil fuels. ♻️



The Community Power Coalition of NH is composed of 27 New Hampshire towns.

## Permitting a Livable Future

Cont'd from p.14

any further advantage from generalized reform. For example, natural gas pipelines can be sited via a Federal Energy Regulatory Commission (FERC) standard called “public convenience and necessity”, which is currently not available for electric transmission lines, CO2 pipelines, or hydrogen pipelines. It has been suggested that giving FERC authority to site new transmission lines across the country would level the playing field. Similarly, offshore oil and gas exploration routinely enjoys NEPA Categorical Exclusions that are not available to geothermal exploration; reform legislation could correct that imbalance.

Every gigawatt of clean energy installed represents a gigawatt of fossil energy generation that could be shut down or never built in the first place. Indeed, faster permitting of renewable energy projects could lead to abandonment of some competing fossil energy projects before they complete their own permitting review. Streamlining permitting rules would thus benefit clean energy far more than fossil fuel projects, as long as care is taken to protect vulnerable communities from their unintended consequences.

Fortunately, most of the new infrastructure proposed in the U.S. is now for clean energy, so making permitting easier will largely benefit clean energy projects. Reports from Lawrence Berkeley National Laboratory find that in 2021, 85% of new energy capacity was clean energy; even better, more than 92% of new energy projects – currently still tied up and awaiting permits – are solar and wind; just 7.5% are natural gas.

### What we can do

CCL supports federal policies that:

- Add to America's capacity to transmit clean electricity
- Speed up the approval of clean energy projects that are waiting to be built

- Empower communities to weigh in on proposed energy projects and minimize the negative health impacts from pollution.

Any permitting reform proposals must be evaluated in the context of the principles outlined here. As an organization that works within our democratic system, CCL encourages readers to help build the political will to shift lawmakers towards the urgently needed reforms of clean energy permitting by making your voice heard. CCL volunteers can attest to the effectiveness of personal phone calls, emails, and letters to lawmakers and how they subsequently vote on a bill. Visit this link to contact your members of Congress: <https://www.congress.gov/members/find-your-member>.

Links to footnotes are available in G.E.T.'s posting of this article online.

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

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## Unitil has Programs and Incentives to Help You Save.

Take control of your business energy costs with energy efficiency upgrades. Small business owners, contact Unitil at [efficiency@unitil.com](mailto:efficiency@unitil.com) to schedule a no-cost energy assessment. Find more ways to save at [NHSaves.com](http://NHSaves.com).







# CLIMATE, CARBON SEQUESTRATION IN THE SOIL AND FARMING

Kathy Voth, OnPasture.com

There is a lot of information out there right now about soil carbon sequestration and what farmers and ranchers can do to sequester more carbon in their soils. There are also a wide variety of new companies hoping to cash in on working with farmers and ranchers on carbon credits. As with anything humanity is involved in, there is some truth, some misinterpretation, some deception, and some P.T. Barnum thrown in.

We do not have a lot of room for error when it comes to the climate or the time and money we have to spend on these things. Let's start by arming ourselves with some basics about soil carbon.

## How Does Carbon Get into the Soil?

Let's start with John Wick's excellent explanation drawn from the research on carbon sequestration done on his ranch with UC Berkeley. I have added some additional information in the Transcript below. See <https://youtu.be/KB6cqXZZ2MY>.

### Transcript

It all starts with sunshine, soil, a seed, and a little grass plant. As the grass plant gets rain and sunshine it grows roots down into the soil. This is quite a simple thing, and it happens on more land area on earth than any other cover type. There are more acres of grassland than forest or tundra or anything else.

There are several things involved: there's air, sunshine, soil, and water. And what I wanted to talk to you guys about today is how important this combination of things is. As managers, we can start to interact with this system in a way that can stop and reverse global warming while producing fiber and food and fuel, and flora. And the way it works is really quite simple.

Grass plants, as we all learned in school, produce oxygen and a bit of moisture to the atmosphere. We live in an oxygen-rich environment. CO<sub>2</sub> is the fourth most abundant gas in the atmosphere and as a gas, it spreads itself evenly throughout the vessel it is in, and the atmosphere is a vessel. As a result, the moment these little microscopic holes in the bottom of the leaf open to release oxygen and moisture, the CO<sub>2</sub> rushes in and fills the leaf.

So now, we have a leaf full of CO<sub>2</sub> and then under the sun's energy, the plant

pulls in soil moisture and soil nutrients through the microscopic hairs on the roots and recombines all of that to create carbohydrates, which we represent as C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>. All the carbon in carbohydrates comes from the air and nowhere else.

I always thought it came out of the soil through the roots. It turns out that there is a lot of carbon in the soil and that soil is important. But the reason it's important is that the more carbon there is in the soil, the more water soil holds.

Our research project starting on our ranch looked at that whole process and what is involved in getting carbon from the air through the plant and into the soil.

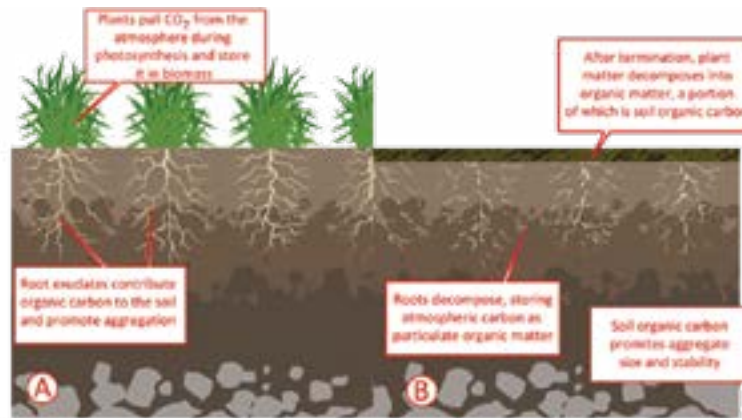
To understand how that works, it is very important to understand that carbon in the soil represents itself in three fractions.

### Labile Fraction

The Labile Fraction is fresh carbon and it is very temporary. Most of it is in the bodies of microorganisms and plants' roots. Most of it is going to go back to the atmosphere as CO<sub>2</sub>. A healthy soil system is very busy. It is full of microbes, trillions of them, and as they're going through their life processes, they oxidize carbon just as we are right now. Every single one of us is exhaling CO<sub>2</sub> into the atmosphere. We are actually recharging the resource base from which all this happens.

### Occluded Light Fraction

Some of the labile carbon in the Labile Fraction is consumed and is digested by the microorganisms and some of that carbon enters the Occluded Light Fraction. This is interesting carbon because this carbon starts to change the electrical properties of the soil structure and it starts to hold more water in a plant-available form. Consequently, the more carbon there is in the soil, the more plant there is.



How plants sequester carbon (A) as they grow and (B) after they die. (University of Nebraska-Lincoln)

This water ordinarily would have passed through the system subject to gravity and left, recharging our aquifers and things like that. But when you have carbon-rich soil, that water now is interested in hanging out.

**This is the carbon that we're hoping to sequester with our management activities. It meets renowned soil scientist Rattan Lal's definition of soil carbon sequestration:**

**"Carbon sequestration implies transferring atmospheric CO<sub>2</sub> into long-lived pools and storing it securely so it is not immediately re-emitted."**

### Heavy Fraction

After more processes, some of that carbon enters the heavy fraction. This can take millions of years. This is fossil carbon. It also stays there for millions of years because this carbon now is chemically bonded inside microsites within the soil structure and not available for microorganisms.

This is important, good carbon. All human civilization has occurred where we have carbon-rich soils like that. The challenge for us is in our agricultural practices, the conventional ones. When we plow, we actually break up the soil's structure and allow organisms to digest what has been permanent carbon. They oxidize it into the atmosphere so we're getting more and more agriculturally produced CO<sub>2</sub> to the atmosphere, and we're burning up our fossil carbon.

**How does a carbon molecule escape from being eaten by microbes to become sequestered?**

That's the puzzle that scientists have been working on, and they've recently discovered how carbon molecules escape: through very tiny pore spaces in the soil.

A team of researchers led by Alexandra Kravchenko found that the pores in the range of 30-150 µm (about the size of one to three human hairs) can trap carbon molecules, making them inaccessible to the microorganisms that might otherwise consume them and send them back into the atmosphere. Of course, the more of these tiny spaces there are, the more carbon is effectively sequestered in the soil. What Kravchenko learned is diversity is key.

"What we found in native prairie, probably because of all the interactions between the roots of diverse species, is that the entire soil matrix is covered with a network of pores," said Kravchenko. "This gives carbon molecules lots of places to hide. Without them, most of the carbon was oxidized into CO<sub>2</sub> and returned to the atmosphere."

### A soil's potential also determines carbon sequestration

Different soils have different capabilities when it comes to carbon sequestration and what a soil can hold is also influenced by climate, rainfall, the soil microbial community, management, and many other variables. Under favorable conditions, soil organic carbon will increase until the soil reaches saturation (whatever that might be for that soil) and then no more is added. Think of it as a paper towel wiping up spilled water. There's a point at which your towel becomes saturated and can hold no more.

That is a first step in understanding the complexity of trying to sequester carbon in the soil. The research done on John Wick's ranch is a story of how we can use this understanding along with a simple practice, spreading compost pastures and fields, to rapidly increase carbon sequestration. We will talk about that more in future issues.

*Kathy Voth produces On Pasture. This resource translates science and experience into practices graziers can use. Learn more at [www.onpasture.com](http://www.onpasture.com).*

## CSA: CREATING A RESILIENT LOCAL ECONOMY AND FOOD SYSTEM

Eva Barta

Community Supported Agriculture (CSA) is a partnership between community members and farmers to share in the bounty and the risks of farming. The roots of the popular CSA model, used by farms around the world, can be traced back to the beginnings of commercial agriculture. Families no longer needed to produce everything on their own land and purchased food directly from their local farmers.

As modern agriculture and technology developed, farms became less central to communities. Food could travel longer distances from the farmer to consumer, and with the rise of large-scale industrial agriculture in the early 1900s, customers were mainly connected to their farmer simply through a need for food.

Towards the end of the century, movements to reconnect with the source of our

food gained momentum, and knowing your farmer once again became important. Though it is disputed and almost impossible to determine who actually had the first idea to create a system connecting community members and farmers through a pay-up-front model, such programs emerged in Japan, Europe, Chile, and the United States in the early 1970s. The closest "grandparent" of CSA as we know it today was a club designed by Booker T. Whatley.

Whatley was a Black horticulturist, author, and professor. While much of his work focused on regenerative and sustainable agriculture practices, Whatley also thought deeply about how to support his community. Recognizing that black farmers struggled more than white farmers to receive loans from the federal

*Cont'd on p.38*



## COMMUNITY SUPPORTED AGRICULTURE

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**Friday Night Dinner CSA** — Let us make dinner for you on Fridays! Pickups monthly in the summer and weekly in the fall.

**PYO Bouquet CSA** — For 10 weeks of the summer, pick 25 flower stems per week in our certified organic cut flower garden.

[cedarcirclefarm.org/csa](http://cedarcirclefarm.org/csa)

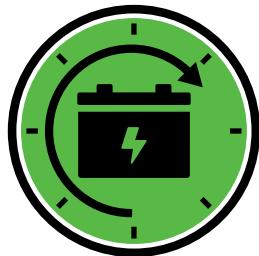




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# Can Monitoring GHG Emitters Help Maine Reach Its Climate Goals?

Toby Martin

Maine's residents recognize that oil-field burn-off emissions spew methane gas into the atmosphere, riding the jet stream across New England, then on to Europe, Africa and Asia, toxic polluters on the lam.

The methane joins other U.S. methane, carbon dioxide, sulfur dioxide and other greenhouse gases (GHGs) to collect in Earth's atmosphere and trap the heat that is already dangerously close to the 1.5-degree Celsius temperature increase cap ratified by the UN's 2015 Paris Agreement.

It's right for environmentalists to blame Big Oil for not meeting UN clean air pollution standards as it rakes in historic profits for shareholders. National and international network news is jammed full of fossil fuel offenses and finger-pointing. Frustrated climate activists at local, state and national levels are demanding results from legislators.

Have Maine's governmental and other climate efforts been strong enough? Initiatives by Governor Mills' Maine Climate Council, Efficiency Maine, the University of Maine's offshore wind research and development programs, grassroots efforts of environmental nonprofits, and energy-related businesses across the state seem to be working hard on energy efficiency. The Climate Council has set its sights on an 80% reduction of statewide GHG emissions by 2030, as Maine's ambitious slogan "Maine Can't Wait" seems to imply, but that is only eight years away and might be wishful thinking.

Maybe a closer look at Maine's major GHG emitters and reporting on who they are would help. The fact is, the tools are already

available to the public, but few people know that. If the Maine EPA and state legislature know about, demand accountability from, and have the political will to control major state emitters, might the 2080 goal have a chance?

In June of 2020, a *Time* article written by Justin Worland reported on Climate Trace, a satellite climate emissions monitoring program initiated by former vice-president Al Gore, who has been warning about climate change since 2006, when his book and companion documentary film *An Inconvenient Truth* were released.

Two years later, in November 2022, investigative reporter Annie Ropeik broke a story titled, "Scouting Maine's Top Greenhouse Gas Emitters by Satellite," which she wrote for *Climate Monitor*, the environmental newsletter published by *The Maine Monitor* of The Maine Center for Public Interest Reporting.

Ropeik's article reported on who Maine's heaviest emitters are, where they are located, their GHG emissions levels, and how they compare with others on Maine's major



carbon dioxide, methane, and nitrous oxide emitters' list.

She drew her Maine information from data collected by two emissions monitoring agencies: Climate TRACE, a national U.S. coalition of 10-member digital data analytics organizations, and the Energy Information Agency, the statistical agency of the Department of Energy.

Climate Trace conducts a

satellite-generated "...global inventory of greenhouse gas (GHG) emissions... data for 72,612 individual sources worldwide... including specific power plants, steel mills, urban road networks, and oil and gas fields... the power sector, oil and gas production and refining, shipping, aviation, mining, waste, agriculture, road transportation, and the production of steel, cement, and aluminum."

The Energy Information Agency (EIA) lists policy-independent data, forecasts, and analyses to promote sound policy making, including fossil fuels, nuclear, electricity, and renewable energy.

Ropeik's list of Maine's 51 major GHG polluters run from 430,021 metric tons of

emissions generated by burning gas for electricity, to the bottom emitter on the list, which burns oil, also to generate electricity, at 4.49 metric tons.

Since 2010, facilities that emit at least 25,000 metric tons of GHGs per year must submit annual reports to the U.S. (EPA). Maine has 22 locations that exceed the EPA's standard and must report: eight gas-fueled electricity generators, five trash-fueled electricity generators, four landfills, two coal-fueled electricity generators, two airports, and one cement plant. Also, there are six others -- four landfills and two oil-fueled electricity generators, -- that fall just below the EPA's reporting requirement.

Ropeik's reporting illustrates what many already know: fossil fuels should stay in the ground. Electricity is generated in Maine using gas, oil and coal (10 of these are on Ropeik's list emitting over 25,000 metric tons of GHGs), fossil fuels shipped by rail, water, or trucked long distances from out of state (more petroleum emissions), or from burning trash wastes (much of which is unrecyclable plastic, also a petroleum product).

When Maine's towns burn carbon fuels and produce carbon dioxide, or they dump refuse in landfills to decompose and emit methane, they cause climate change to increase, not decrease.

*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 Committee member, the Islesboro Energy Conference and is a contributing writer to Green Energy Times, and Maine's distribution team. ☘*

## Natural Gas Leaks Erode Climate Gains

### AND BURNING ANY GAS IN THE HOME ERODES INDOOR AIR QUALITY

George Harvey

We were reminded once again of the problems with using natural gas in the home when CNN ran an article saying the Consumer Product Safety Commission is considering putting a ban on new gas stoves (<https://bit.ly/CNN-gas-stove-ban>). The issue is whether gas stoves degrade indoor air quality dangerously. It was brought up because a study found that 13% of childhood asthma could be attributed to the use of gas for cooking.

There have been so many issues coming up about use of natural gas in the home that an increase of 13% in asthma cases really seems like the straw that broke the camel's back. We do not want to trivialize childhood asthma. We have seen it, and it really can be horrible. But other issues caused by natural gas can be so much worse. Natural gas is a major contributor to climate change. It also sometimes makes houses explode (<https://bit.ly/MV-gas-explosions>).

Let's take a look at the second of those. It has been only a bit more than four years since 40 houses in the Merrimack Valley of Massachusetts and New Hampshire had explosions or fires as a result of increases in pressure in a natural gas system. One person died when an explosion in a house caused a chimney to fall on his car, and 30,000 people had to evacuate their homes (<https://bit.ly/MV-gas-explosions>).

Sadly, that was not a unique event. It is a replay of what happened when a pressure increase hit East Boston in 1983, making pilot lights suddenly grow to a foot high. At least one house exploded, but there were so many fires that the Callahan Tunnel was



A house is destroyed by a gas explosion in the Merrimack Valley region of Massachusetts in 2018. (Wikipedia)

closed to all traffic except emergency vehicles for a time (<https://bit.ly/EB-gas-surge>).

Of course, those are just two problems that happened in the Northeast. It happens that both are listed in a Wikipedia category, Gas explosions in the United States, with a total of 31 entries (<https://bit.ly/Wiki-gas-explosions>). And please note: These are just the big problems, and just the ones that involved explosions. But there is more.

According to the 2021 IPCC report, 30% to 50% of the global warming we currently experience is caused by methane emissions (<https://bit.ly/bbc-methane-21>). If the higher figure is correct, it means that methane is a bigger climate problem than carbon dioxide. Understanding this is vitally important for stopping climate change.

We should take a look at where all that methane is getting into the environment. The short answer, unfortunately, is "Everywhere." Anywhere there is a natural gas pipeline under pressure, there is a possibility of methane leaking. In 2015, Reuters

reported on a study by Harvard researchers who found that about \$90 million worth of natural gas leaked from pipelines and other sources within the city of Boston each year (<https://bit.ly/Reuters-gas-study>). At prices of that time, that was judged to be enough gas to heat 200,000 homes, leaking each year in Boston.

Of course, leaks happen elsewhere. The gas wells themselves are a source of the problem. A study from Stanford University used sensing equipment in airplanes to look into gas leaks at the Permian basin. It found that about 9% of the gas that came up through the wells was leaked into the atmosphere (<https://bit.ly/SU-gas-study>). This is several times more than the EPA estimated.

But the biggest problem with natural gas might be neither the source nor the destination, but what lies in between. In November, numerous news organizations reported a massive gas leak from a storage facility in Pennsylvania, one of them being a report at Pennlive.com (<https://bit.ly/Penn-gas-leak>). The natural gas was being stored in an old gas well, and a safety valve designed to prevent blow-out from excess pressure opened. It was not a big valve. It was on a 1-inch pipe. But it took eleven days to close the leak, during which 1.1 billion cubic feet of gas leaked. The sound of the rushing gas could be heard four miles away. The article says this has the climate equivalent of burning 1,080 rail cars filled with coal. Similar problems developed in 2018 in Ohio, and the leak at the Aliso Canyon storage facility in California was far worse.

One point that is made clear by scientists is that we could do a lot to reduce the speed of climate change if

we could reduce the amount of methane released from natural gas sites. This may be very much in the interest of the gas companies, because leaking gas means lost revenue. That may sound hopeful, but the question of how to do it is not really answered.

We anticipate some questions about how the use of propane relates to this. The first thing we should note is that propane is not listed as a greenhouse gas. We have been unable to find a lot of information about this, but there are two properties of propane that would tend to limit the climate damage it might cause. One is that the propane molecule is very heavy, so it tends not to get into the atmosphere much above ground level. The other is that it degrades in sunlight rather quickly, with a half-life of under a year. Unfortunately, we could not find much information about what it degrades into. It is possible that a propane molecule could produce two methane molecules, when it breaks up, so if that is the case, we are back to methane again.

It is clear, however, that it is increasingly important that we reduce methane emissions as quickly as possible, for indoor air quality, for safety, and to address survival. ☘



This leak allowed climate damage equivalent to burning 1,080 rail cars filled with coal over an eleven-day period. (PA Department of Environmental Protection)



# The Challenges We Face as a "Climate Haven"

Barbara Whitchurch

"The alternative to orderly migration is conflict." – Dan Hemenway, writer and teacher, International Permaculture Institute

Federal climate disasters hit 90% of U.S. counties between 2011 and 2021, according to the Atlas of Disaster, a project of the U.S. Department of Housing and Urban Development ([www.bit.ly/rbd-atlas](http://www.bit.ly/rbd-atlas)). In 2021 alone, the U.S. experienced 20 separate billion-dollar climate disasters with over 688 associated fatalities.

Even if all carbon emissions stopped today, the effects of climate change are already here. They will worsen, and humans will need to adapt or flee. Some places will fare better than others, hence the terms "climate haven" and "climate oasis."

Although this piece focuses on Vermont, the same is true of most of the Northeast. You may have heard that Vermont has been designated as the best state to migrate to. Of five climate change hazards (extreme heat, drought, wildfires, inland flooding, and coastal flooding), only extreme heat threatens Vermont. Experts believe the state will only have about nine "dangerously hot" days per year by 2050. To put this in perspective, Florida is projected to experience 151 dangerously hot days per year by 2050.

In her recent book, *Nomad Century* (2022, Flatiron Books), Gaia Vince contends that nations of the temperate north should prepare now for wholesale migration of people from regions where climate change is threatening



Forest smoke and fires are forcing many to re-locate to safe haven states. (Marcus Kauffman, Unsplash)

survival. She explores scenarios, including ambient temperatures too hot for humans, desertification, and increasingly violent storms.

Vince predicts that migrations to more livable climates, such as ours in Vermont, will increase. And she recommends welcoming climate refugees. (I am personally involved with an aid organization for refugees and asylum seekers, the Central Vermont Refugee Assistance Network ([www.cvrn.org/](http://www.cvrn.org/)), and I see some of this in effect already. Note: Regarding climate-related immigration issues from outside the U.S., google: "Immigrant assistance organizations near me.")

In his most recent article on climate migration in the Montpelier Bridge, Dan Hemenway gives a few current local examples: [www.bit.ly/tmb-migr](http://www.bit.ly/tmb-migr).

"In the U.S., people are starting to move from the West Coast because of forest fires that reduce some communities to ash...In

the Southwest, the two largest U.S. reservoirs on the Colorado River are drained to 10% capacity, and their levels still fall. Agriculture that feeds much of the country...[is] in unwilling competition for the diminishing water. Appalachian states such as Kentucky experience record-setting flooding and tornadoes. Sea level rises threaten to displace (coastal) people from Miami to New England."

What can we do? We need to initiate more public discourse.

Orderly migration to a well-prepared destination is one of the ways to avoid "climate chaos." According to Hemenway, we should create public dialogue now about how Vermont can best meet the added stress of refugees in our communities. "We have an opportunity now to begin a public discourse to examine options and agree on the safest way to locate and support newcomers with homes, infrastructure, and services while causing the least possible damage... by emergency personnel. The alternative to orderly migration is conflict. We can stand by... or use the near future to both secure our own environment...and prepare to accept reasonable numbers of displaced people."

We need to educate ourselves –and our legislators and government officials – about the requirements of our natural environment.



Rising seas and flooding in coastal regions displace many to move inland to VT. (Kelly Sikkema, Unsplash)

For example, Vermont's forests provide flood moderation and protection from excessive heat. They also help anchor the soil by absorbing rainfall. Says Hemenway, "Refugees ... cannot be prudently located on the floodplain that Vermont's present population occupies. To avoid deforestation, we will be pressed to somehow move many existing homes, businesses, and government facilities to higher ground."

We need to prepare to receive more residents in a sustainable and equitable way.

What types of economic and social disruptions can we anticipate? An increase in population means an increased need for public transportation, housing, employment, retraining, medical care, social services, schools, food and water. We already know that Vermont will also continue to experience a phenomenon known as "climate gentrification," in which richer people can afford to move to safer ground, while poorer people will have to stay where they are or be forcibly evacuated by emergency personnel.

So far, the first wave of climate refugees consists of affluent folks from the East Coast or the South, or people who already have a second home here. Cities such as Montpelier, Burlington and Rutland can pass housing policies to guard against gentrification, plan for the climate impacts that will still occur, and reduce emissions through promoting renewable energy, public transit and denser, more efficient housing. But the smaller villages and towns -- not so much.

What distinguishes climate migration from climate displacement? In common usage, it is the difference between the opportunity to have a choice (migration) and the condition of being forced out (displacement). Climate change and climate migration are issues squarely in front of us. Failures to address these issues successfully will lead to conflict, as we have seen across the globe.

Barbara Whitchurch is a Vermont-based freelance writer who owns a net zero+ Passive House and an electric car. ☞

## COP15 UN Conference – Cont'd from p1

The broad context here is that there has been a 69% plunge in wildlife populations over the past 48 years. The global rate of species extinction is already at least tens to hundreds of times higher than it has averaged over the past 10 million years.

Much of this accelerated loss has been caused by the destruction of natural habitats by humanity for commercial or agricultural uses; coupled to the increase in climate extremes linked to the relentless burning of the fossil fuels by "business as usual."

A key agreement reached is to conserve 30% of the Earth, both terrestrial and marine ecosystems, by 2030 the end of this decade. The expansion of new protected areas will respect indigenous and traditional territories. The language emphasizes the importance of effective conservation management to ensure wetlands, rainforests, grasslands and coral reefs are properly protected, not just on paper. One critical step is the recognition that Indigenous peoples' rights are at the heart of conservation. Several scientific studies have shown that Indigenous peoples are the best stewards of nature, representing 5% of humanity but protecting 80% of Earth's biodiversity. From Brazil to the Philippines, Indigenous peoples are still subjected to human rights abuses, violence and land grabs (after centuries of similar abuse). The language in the text is clear: Indigenous-led conservation models must become the norm this decade if we are to take real action on biodiversity.

The meeting addressed the need to reduce environmentally harmful subsidies. The world spends some \$1.8 trillion every



Woodland Clearance in Ribaue foothills of Mozambique (@RBG Kew/L.Derbyshire)

year on government subsidies driving the annihilation of wildlife and a rise in global heating, according to a study earlier this year. Agreement was reached to phase out or reform subsidies that harm biodiversity by at least \$500 billion per year, while scaling up positive incentives for biodiversity conservation and sustainable use.

The final text included watered-down language requiring governments to ensure that large and transnational companies disclose "their risks, dependencies and impacts on biodiversity." If implemented, this could be the start of a significant change in business practices. This issue is rapidly moving up the agenda of "corporate" risks, as about half of global GDP is dependent on the healthy functioning of the natural world. Several countries are already developing rules for sustainable sourcing. However a

widespread change of business strategies this decade will be a challenge.

Key financial discussions at COP15 centered on how much money developed countries will send to developing countries to address biodiversity loss. It was requested that a Special Trust Fund – the GBF Fund – be set up to ensure an adequate, predictable and timely flow of funds. It was recognized that at least \$200 billion per year were needed from public and private sources for biodiversity-related funding and international financial flows from developed to developing countries would have to be raised



COP15 recognized clearly that this coming decade is critical for conserving and protecting natural habitats for all wildlife.

to at least \$ 30 billion (US) per year.

Critical issues of access and benefit-sharing from digital sequence information (DSI) from genetic sources were addressed. Digitized genetic information that we get from nature, which is used frequently to

produce new drugs, vaccines and food products come from rainforests, peatlands, coral reefs and other rich ecosystems. Corporations develop, patent products and profit. Products are hard to trace back to their origin country, but many in the developing world are now expecting payment for the use of their resources. COP15 reached the first international agreement to create a multilateral mechanism for benefit-sharing from the use of digital sequence information on genetic resources, including a global fund. This agreement to develop a funding mechanism on sharing DSI benefits in the coming years was hailed as a victory for African states who called for its creation.

COP15 recognized clearly that this coming decade is critical for conserving and protecting natural habitats and biodiversity, and set some clear targets for governments, businesses and society to follow. The tasks will not be easy as we have no global legal structures to enforce the preservation of life on Earth in the face of a capitalist system that presumes it has the right to exploit and if needed destroy life to increase its profits. COP15 did not focus on the parallel issue of accelerating climate change addressed at COP27, and it did not consider Mother Nature's apparent takeover of the climate system to protect life on Earth, which were both discussed in the December issue of GET. It is worth noting however that Mother Nature is likely to back all COP15's plans to address biodiversity loss and restore ecosystems.

Dr. Alan Betts of Atmospheric Research in Pittsford, VT is a climate scientist. See more at [www.alanbetts.com](http://www.alanbetts.com). ☞



# THE HUMAN RIGHT TO CLEAN AIR AND WATER

## The Green Amendment: The People's Fight for a Clean, Safe, and Healthy Environment

Maya K. van Rossum. Second edition. Disruption Books, New York, NY (November 2022).

Book review by Janis Petzel, M.D.

In 2008, drilling companies from the shale gas industry came into the Delaware River Watershed in Pennsylvania to frack natural gas through the Marcellus Shale. In less than a year, many communities where people had signed drilling leases were suffering from sick livestock, toxic fracking water spills, serious medical problems and industrial-grade stink and noise.

The Delaware Riverkeepers and a coalition of community groups persuaded The Delaware River Basin Commission to place a moratorium on fracking in 2010. But it was obvious that the deck was still stacked in favor of the drilling industry. The fracking industry greenwashed the risks to public health and the environment and lobbied the Pennsylvania legislature heavily. The legislature passed Act 13, a law essentially written by the industry, which gave them almost unlimited access to property, including the ability to seize land by eminent domain to store natural gas underground.

It was in this context that lawyer Maya K. van Rossum, in her role as the Delaware Riverkeeper and leader of the Delaware Riverkeeper Network, began her journey to creating the Green Amendment for The Generations Movement.

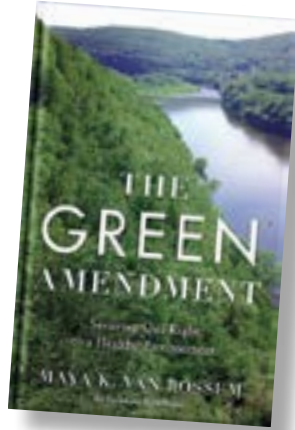
Act 13 was defeated thanks to the revival of a law passed in 1971. Back then, a far-sighted state legislator in Pennsylvania, Franklin Kury, got environmental protections added to the state constitution's Declaration of Rights. Article 1, Section 27 protected the right of the

people to a healthy environment and established the government's obligation to protect the state's natural resources, "the common property of all the people, including generations to come."

*The Green Amendment* is about the journey to enshrine the human right to clean air and water into state constitutions. With its focus on people and their stories, the book is written for the average person who wants to do the right thing for the environment but isn't sure how to go about it. The writing is accessible and engaging. You do not have to be a lawyer to read it.

One of the most startling observations in van Rossum's book is this. "Existing laws don't ban pollution or environmentally devastating activities. Industries are perfectly able to pollute the air and water not in spite of, but because of the Clean Air Act and the Clean Water Act...they simply need the right permits to do so. These [laws] create a presumption—even an expectation—that it is a right of business and government to pollute and degrade our environment.... Sadly, government-issued licenses to pollute and degrade are rarely denied."

Highlighting the risks to human health of pollutants from radioactive fracking waste to rotting chicken parts, van Rossum takes us through the heartbreaking personal experiences of people living in "sacrifice zones," communities where



industrial waste products are dumped "knowingly, intentionally and with the full blessing of the law... despite the system of federal, state and local environmental laws we have in place."

The book then moves into chapters to teach us why a Green Amendment has to be constructed carefully and tested in court challenges that stay "... focused on protecting

water, air, soil, plants, animals, wilderness, climate and equitable environmental justice for all."

In a chapter titled "You're Not Expendable," van Rossum talks about a young woman's life upended by military exposure to chemicals, and about a family of pollutants—PFOS/PFAS—in New York state. PFAS is also causing heartbreak in many regions including Maine after contaminated sludge was dumped on farm fields and entered the water supply in rural communities.

Maine and New York are featured prominently in this book. New York for its successes in passing a Green Amendment, and for its dedication to using environmentally healthy ways to protect the clean water supply for New York City -- a fascinating story -- and Maine for its potential.

In Maine, The Green Amendment did not pass in its first go-round in our state legislature. Van Rossum said that is not unusual for it to take two or three attempts. A state constitutional amendment is a high bar to get over, but once it happens, it's likely to remain in place.

If you are considering a Green Amendment for your state constitution, the last chapters in the book will be of great help to you. Chapter ten, "Can We Afford a Green Amendment?," should actually be called—We Can't Afford to Go Without One. The economy of a community improves with a clean environment, as van Rossum clearly shows.

The final chapter "Fighting for A Green Amendment" is both a nuts-and-bolts tour of how to design a Green Amendment for your state, and an inspiring, supportive call to action.

Despite the heavy topics of climate and pollution, this book inspires hope and reasons to act. If you're as angry as I am about the damage certain industries have done to our environment and to people's lives, you'll want to read this book for a dose of realistic optimism.

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

## Is Individual Carbon Footprint a Conceptual Sham?

Roger Lohr

In a podcast with Ski Area Management, Molly Kawahata, who is the former advisor for energy and climate change at the Obama White House expressed a concern about one's "individual carbon footprint." As the founder of Systemic Impact Strategies, Kawahata advises leading brands, corporations, nonprofits, foundations, and thought leaders on strategy development and communications. She stated that the footprint concept was a public relations campaign by British Petroleum passing the fossil fuel companies' responsibility for climate change on to us by making everyone (the end user of fossil fuels) individually feel responsible that "WE'VE done this."

While it certainly makes sense that we all can be more energy efficient individually, the actions by each of us will be UNABLE to make much of a difference. Blaming individuals is tantamount to pointing a finger to develop our "climate guilt" and frankly even environmentalists have been climate shaming individuals.

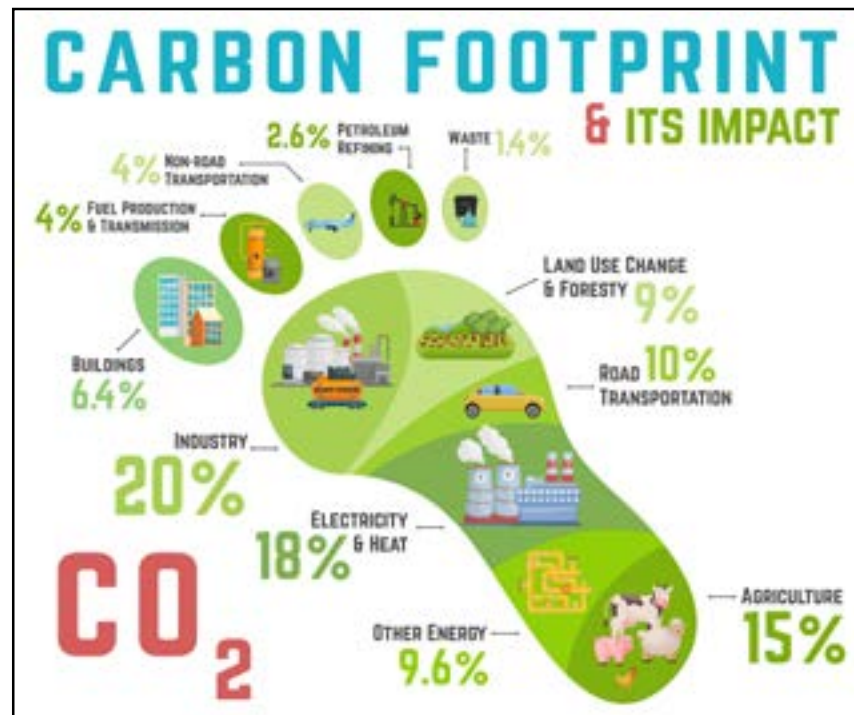
Kawahata is the speaker in a film for Patagonia titled "The Scale of Hope" where she explains that we need to help people to understand how they can conceptualize the climate change crisis. She states that "We have found that public health is one of the most effective ways to frame climate change. Pollution disproportionately impacts communities of color who are likelier to live near power plants, highways, and toxic waste sites. The public health impacts are profound — increased rates of cancer, lung disease, heart disease, and miscarriage. We need to reframe the narrative around public health. Because nothing is more personal and relevant than the health and well-being of the people you

care about."

Systematic change can help us to impact the path that we are on — that is, government action on climate policy; trade associations advocating for their members change; and ambitious climate action that mitigates broad scale carbon emissions. Kawahata pits current hopelessness and frustration against a solution to develop a zero-carbon economy. She suggests that reframing the climate change scenario is necessary to go from saving the planet, economic catastrophe, fear of weather disasters, the need to "green your life" to public health associated with air and water pollution. It is not primarily about sustainable living. People are getting sick but frankly the Earth will remain.

How do you reduce 34 billion tons of carbon emissions? Kawahata thinks it is more about campaign finance reform, gerrymandering, and multiplying the number of power purchase agreements with clean energy companies.

On a broad scale, New Delhi suffers hazardous air quality levels on multiple days that are toxic to humans. These air quality levels are caused by vehicles, industry, energy production, and agricul-



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tural burnings done to clear ground for plantings. These levels are high enough that schools and factories have to close and construction sites have to be shut down because of health concerns. Internationally, 1.6 million people die annually due to complications associated with air pollution! Would this seem to be fear mongering within the health perspective?

In the U.S. there are 285 million cars and trucks and in 2016 there were 1.3 billion such vehicles on the planet! A

recent report about the Carbon Billionaires stated that 125 billionaires in the world have a higher carbon footprint than the country of France. Can an American buying an electric car make a dent? Is this a gloomy view?

Kawahata's premise is that we need to make the climate change message optimistic rather than an apocalyptic desperate warning. She suggests that talking about you and your relatives' health would be more effective than the doom and gloom of climate change outcomes.

There is a Winston Churchill quote about the rise of the Third Reich: "The era of procrastination, of half measures, of soothing and baffling expedients, of delays,

is coming to a close. In its place we are entering a period of consequences." From one holocaust to another — do you know any prospective government official who is ready to overhaul things on a broad scale to have an impact on climate change?

Roger Lohr of Lebanon, NH, who owns and edits [www.XCSkiResorts.com](http://www.XCSkiResorts.com), has published articles and promotional topics on snow sports, sustainability, and trails in regional and national media. ♻️



# Heating with Fossil Fuels is Out – Heat Pumps are In

## The Secret to Replacing a Hot Water Boiler with Geothermal Energy

G.E.T. Staff

In case you have not seen the news, it is now common knowledge: heating buildings with fossil fuels is out and heat pumps are in. Thanks to new government incentives and rising fuel oil prices, it no longer makes sense to cling to dirty fossil fuel heating systems.

But if you have baseboard radiators or old cast iron radiators in your home, as so many of us in the Northeast have, you may be thinking, “Am I going to have to add one of those boxes on my wall that blows air at me all day?” or, “What do I do with my old radiators that work so well?” Have no fear, buildings with hot water heating systems have *the most to gain* from the national shift towards heat pumps and can reuse all of the existing equipment.

The June 2022 issue of *Green Energy Times* (<https://bit.ly/GET-June2022-DoubleHybridHeatPump>) covered a demonstration project for a promising technology called a Double Hybrid heat pump that is designed for converting homes with hot water systems to geothermal heating. A year later, the results are in. “Our customers saved significantly more money than expected, thanks to very high seasonal efficiencies,” said Energy Catalyst founder Matt Desmarais. “What we are most proud of is the robustness of the heat distribution, that is to say, even through some very cold, bitter weather, the buildings remained warm and comfortable. That is the part that I’m most proud of.”

There are some unique challenges when reusing existing hot water infrastructure in a home. In particular, hot water boilers typically operate between 160°F-180°F, a temperature range that is well out of reach for most heat pumps. A heat pump, such as the Double Hybrid, that maxes out at 120°F will be able to cover about 80% of the building load on average, according to Desmarais. “Baseboard [radiators] and [older type] radiators are often oversized and circulate hot water through them less than 30% of the time. A geothermal system with lower temperature hot water will circulate water into the building double or triple the duration to get the same number of BTUs (units of heat) even with lower temperature hot water. We are trading high temperatures for a longer duration. With recent advances in high efficiency circulators, the annual pumping wattage (electricity use) is nearly the same as before.”

So, low temperature hot water can be reused to provide 80% of the heat needed for the home, but what about the rest? There are several trains of thought. The old way would have involved adding hydronic air handlers throughout the home for supplemental forced air heating. These work, but add a lot of extra material and labor cost to a project. The other disadvantage is they require high temperature hot water, which reduces the heat pump’s efficiency.

Energy Catalyst’s Third Generation Double Hybrid has a different approach; it uses a refrigerant-to-air heat exchanger to reclaim heat from the hot water production and provides a passive flow of heated air to the first floor of the building. Desmarais noted, “By wringing out extra heat, we increase the efficiency of the system by 27% while providing a source of supplemental heat at the same time.” Ductwork is added from the



Recently installed Double Hybrid with external data logging sensors. (Photos courtesy of Energy Catalyst)



Double Hybrid with control panel open. Installation 90% complete in a low basement.

basement to the first floor and can be used for super high efficiency central air conditioning in the summer. This is hot air and hot water from a single unit.

“What is the real secret to hot water heating? During off peak days, we can provide very low hot water temperatures and get incredibly high efficiencies. Most people cannot believe they are heating their home with 85°F hot water, but on a mild day, it works perfectly.”

The third generation Double Hybrid heat pumps are being rolled out this winter and continue to exceed expectations. The new models have more robust controls, larger heat exchangers and use electronic expansion valves, so that no home has to choose between comfort and efficiency.

And what about the price? Government incentives are at their highest levels ever. Homeowners can expect to receive a tax credit worth 30% of the project cost while commercial, government, and non-profit buildings could receive up to a 50% reimbursement on the project cost. Buildings that were once excluded, like places of worship which do not pay taxes, will now be able to receive a direct repayment worth up to 40% of the project costs.

Most customers want to know



Three new Double Hybrid heat pumps in Energy Catalyst’s warehouse in Albany, NY. Three-, four-, and six-ton units from front to back.

exactly how much a system will cost them out-of-pocket. This will depend greatly on the size of the home or building, the ease of installation and many other factors. Desmarais said his customers are paying between \$30,000 to \$42,000 after incentives for a geothermal system, fully installed. Though this may be more than twice the price of a new boiler, the payback is usually around six to eight years when compared to fuel oil or propane. “We can produce the equivalent heat output of a gallon of fuel oil for about \$1.20 in most areas,” Desmarais said. “Incentives are great but it’s the high fuel costs that really make the phone ring.”

Incentives are at their highest levels ever and there has never been a better time to ditch the old boiler and convert to geothermal and heat pumps for heating and cooling! ☺



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# A Unique Heat Pump – The New Award Winning System M

Michael J. Daley

A heat pump is a heat pump is a heat pump, right? Once you've seen one of those buzzing boxes with all the insulated pipes and electrical shut offs barnacled to the outside of a building, you've seen them all, right?

Apparently not.

Enter System M, developed by Taco Comfort Solutions of Cranston, Rhode Island and just introduced for sale in the United States and Canada in August 2022. It is a new, unique type of heat pump system. The sales literature says so. The awards committee of the International Air-conditioning, Heating and Refrigeration Expo 2023, the largest HVAC trade show in North America, says so. And Mark Chaffee, Taco vice president in charge of System M's development, says so – with enthusiasm and conviction.

## What makes it unique?

Green Energy Times spoke with Chaffee shortly after System M was awarded the sustainability innovation award. That category considers, compares and judges ALL entries in the entire trade show, not just heat pump systems. Chaffee was particularly proud that Taco Comfort Systems gained this recognition. He said, "Our small, family-owned company was up against multinational giants like Mitsubishi and Trane."

And what, exactly, is this unique thing everyone mentions? Water. Plain ordinary water!

"Our company history is all about the thermal management and movement of water," Chaffee explained. "So, it was only natural for us to design System M to use water instead of refrigerant as the thermal transfer medium between the outdoor heat pump and our indoor HydroBox."

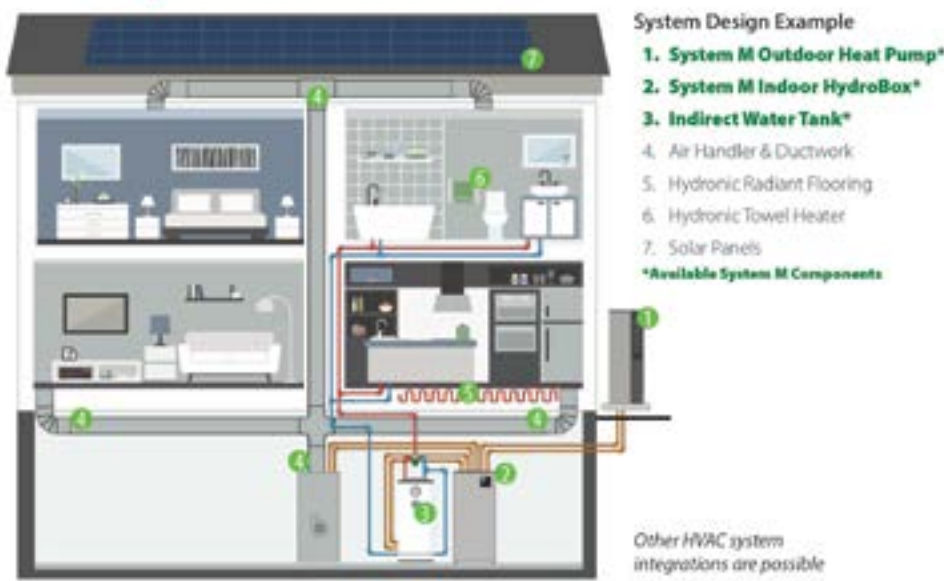
A little noted downside to the common mini-split heat pumps is the huge increase in the volume of refrigerants used to move energy from outdoors into all the indoor spaces. These refrigerants, despite efforts to improve their environmental profiles, cannot compare to the Earth-friendliness of natural, non-toxic water --- nor can they transfer heat as efficiently.

Just a few minutes' conversation with Chaffee revealed how passionate he is about efficiency and water. "The more efficiently we can use every Btu without a global warming impact, the more we move toward sustainability. Water is the most natural and efficient energy transfer medium on the planet."



Top: A typical System M heat pump installation; Bottom: System M indoor unit installation at a Vermont farmhouse. (Images: Taco Comfort Solutions)

## Complete Home Comfort



Chaffee pointed out two other aspects of System M that he feels assure its uniqueness: the system produces heating, cooling, along with domestic hot water AND it is a turnkey system.

"We tried to make System M as appliance-like as possible," he said. "A contractor just has to hook up power and make six pipe connections, and you are ready to go."

Chaffee strongly feels that his industry needs to step up to the challenge to provide the innovations that will move us away from fossil fuel-based heating. He and Taco believed that creating a "turnkey" electric powered HVAC system supplying the three major home energy needs would be a big step in the right direction. The judges at AHR Expo agreed, citing this aspect of System M as one of the many reasons they awarded it the sustainability prize.

The "plug and play" feature may well be the aspect of System M that puts Taco Comfort Systems on the leading edge of what is sure to be an explosion of demand for ready-made solutions to non-fossil home heating needs. The accelerating movement at local, state, and national levels to issue outright bans on the use of fossil-based heating systems in new construction, coupled with the major incentives for fuel switching in the Inflation Reduction Act, are expected to lead to a shortage of expertise in the field. Contractors without the skills in each individual aspect of building ground up systems will find the integrated components of System M very attractive. Homeowners will appreciate that it fully qualifies for the maximum credit of \$8,000.

## System M facts

The ultra-efficient System M consists of a sleek, whisper quiet, inverter-driven outdoor heat pump that can be up to four times more efficient than a gas furnace. The outdoor heat pump was developed with German partner Glen Dimplex, a leading manufacturer of intelligent electric heat pumps and renewable energy solutions. It seamlessly integrates with Taco's exclusive indoor HydroBox to provide a complete system. Heating and cooling are transferred between the outdoor and indoor unit with water. System M also produces plenty of hot water, which integrates with an optional indirect hot water tank.

- 44,000 BTU/h heating capacity
- 3-1/2 tons cooling capacity
- Max COP >4 (Coefficient of Performance)
- Outdoor unit produces 29 dB(A) @10m –

equivalent to a whisper

- Domestic hot water first hour rating 115 gallons with a 85 gallon tank
- Smart Grid and PV ready
- Built in Cranston, RI USA
- Qualifies for full \$8,000 IRA heating credit

System M is designed to integrate with almost any high-efficiency heating and cooling system and is perfect for both new construction and existing HVAC systems. Whether replacing an existing furnace-based ductwork system or taking advantage of the benefits of a low temperature radiant floor hydronic system, System M is up to the challenge.

## SIMPLE SOLUTIONS TO A COMPLEX CLIMATE PROBLEM

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## The Little Book of Sustainable Heating

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## More about the company

Taco (pronounced tay-co) Comfort Solutions, is a 103-year-old, third-generation family-owned global company based in Cranston, RI that engineers and manufactures high-efficiency indoor heating, cooling, and plumbing comfort systems. Founded by Elwood White in 1920 as the Thermal Appliance Company, Taco launched its business with a firepot generator that heated water along with a coal fired boiler. Expanding under the leadership of White's son, John Hazen White, the name was shortened to T-A-C-O, or Taco.

Under the guidance of John Hazen White, Jr., the family's third generation owner, the company and its product offerings grew dramatically. White Jr. carried his father's vision forward, building the finest LEED Gold certified warehouse and training facility in the industry, developing new high-efficiency products and technologies, and expanding into international markets, as well as committing the company to sustainability practices.

Their philosophy of "nothing in the ground" means none of their waste ends up in a landfill. In addition to recycling all metal waste (copper, bronze, brass, and cast iron), wood, and cardboard, they also recycle all the water used in the test labs. Non-recyclable waste goes to a waste to energy facility.

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

**Links:** Taco Comfort Solutions | Leader in Hydronics and Pump Solutions: [www.tacomfort.com](https://www.tacomfort.com); The AHR Expo Innovation Awards – AHR Expo: <https://bit.ly/AHR-innovation>

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## Radically Innovative

System M is an air-to-water heat pump system that provides comfortable, efficient heating, cooling, and plenty of domestic hot water to your home without the use of fossil fuels - so it doesn't create CO<sub>2</sub>. And since System M is smart grid and solar PV ready, you can tap into green, renewable energy sources to reduce your HVAC carbon footprint even further.

When it comes to comfort, System M uses gentle, lower temperature water to heat your home, so you avoid the extremely high heat of a gas furnace as well as the dry, uncomfortable air that it produces. System M also enables the addition of even more comfortable heating and cooling options, like radiant floor heating, towel warmers, or integration into a central cooling system.

Learn more at [www.tacomfort.com](http://www.tacomfort.com)





# Everything You Need to Know About Radiant Floor Heating

Adriana Lopez

Radiant floor or radiant heating systems distribute heat through the floor, wall panels, or ceiling of your home. This system works by delivering heat from a hot surface to the room using infrared radiation. It works in the same way you feel the heat coming from a stovetop, even if you are not near it. The method uses convection which circulates heat throughout the room as the warm air from the floor (or other surface) rises into the air around you. This form of heating was first used in Korea and China around 5,000 B.C. when heat from fireplaces was sent through flues built into the earth below, allowing the heat to conduct onto the surface as it radiated into the rooms around it. It wasn't until around 1907 that radiant floor heating became popular in the United States. However, famous architect Frank Lloyd Wright really brought it into the spotlight when he began using it in many of his projects, including public administration buildings and homes. Today, this heating method is found in many homes and uses electricity to generate heat.

The key to understanding radiant distribution systems is understanding the three main ways to use energy to get radiant floor heating. They are air, water (hydronic), or electricity. Newer homes often employ wires built into the flooring to generate warmth throughout a space.

## The Benefits and Pros of Radiant Floor Heating

There are many benefits to choosing this type of heating for your home, including safety, energy efficiency, and more. Let's take a closer look at some of the many pros of choosing this form of home heating. First let us detail three major types.

- **Electrical radiant heat:** This type of radiant floor heating uses wires or cables built into the floor or subfloor. Flooring materials like polished concrete with a high thermal mass will keep the heat stored in the house for up to eight to 10 hours, making it an energy-efficient choice for some homes. This option is also a popular choice for bathrooms since it allows you to step on warm floors when getting out of the bath or shower. It may be more expensive than other options up front, but electrical radiant heat can save homeowners a significant amount in energy costs over time.
- **Air radiant heat:** Air radiant heating systems are the least popular and least-used systems of the three. They use forced air to warm up a room but dissipates rather quickly. You likely won't find this option in newer homes since electrical and hydronic are much more effective at keeping rooms warmer for longer periods of time. However, if you have a solar-air heating system, it may work in conjunction with that to keep your home at a reasonable temperature.
- **Hydronic radiant heat:** Water-based or hydronic systems are cost-effective and pump heated water from a boiler through tubing underneath the floor. Newer systems allow you to control the flow of hot water through the tubing by using zoning valves and thermostats to regulate the room's temperature, so you don't always need to have it running in rooms that are not being used. Overall, this system is the most eco-friendly and cost-effective option for most homeowners.

Now let us consider some advantages to most radiant heating systems as a group.



Radiant heat tubing (Flickr/Todd Lappin)

- **Energy-efficient:** Radiant heating systems are energy-efficient and can save you money over the long run. Unlike forced air that can dissipate quickly and is prone to draftiness, radiant heat dissipates slowly and uses convection to keep the warm air moving. It also prevents duct loss that is common with forced air systems, ensuring that your home remains warm once the heat is operational. Because heat rises, it's also a much more effective method of heating overall. The average homeowner can save around 15 percent as compared with other distribution types in their monthly energy costs with radiant heating systems.
- **Easy and safe to use:** Because you don't need to worry about dust, pet dander, and other debris floating through the ductwork and the air in your home, radiant floor heating is a good option for people with allergies or those who suffer from dry noses during the wintertime. It's safe for pets, children, and elderly family members. This form of heating is easy to use and can be turned on or off with a simple switch. Thermostats make it easy to measure the temperature in your home so you can adjust as needed.
- **Space-saving:** With radiant floor heating, you won't need to worry about bulky heaters, radiators, or mess from fireplaces. Since this form of heating is embedded into the floor or comes from small panels or registers, it doesn't take up much space in the home. You also won't need to deal with issues like annual chimney cleanings, messy soot, or a possible house fire like you might from a fireplace.
- **Easy installation and maintenance:** Radiant heating systems are easy to install and will work with most floor coverings like tile, concrete, and many other materials. Hydronic heating pipes are leak-free, and electrical systems use cables or wires embedded into the floor, so there are no worries about keeping them in good condition. And, maintaining this home heating system is easy and not very costly, making it a very smart option for homeowners. Be sure to acquire all the equipment you will need; some is shown here.
- **Long lifespan:** Typical HVAC systems require regular maintenance and have a lot of moving parts to remain operational. However, radiant heat distribution is less complex, which means it has quite an impressive lifespan. If the system is installed correctly, it can last for decades with very few issues, if any.

## Maintenance for Radiant Floor Heating

Of course, proper maintenance will help to protect your investment. Here is some more information about maintaining your radiant floor heating system.

**What's required:** There are some key things to consider when maintaining your radiant heating system, including:

- **Pressure check:** An annual pressure check is recommended if you have hydronic heating to ensure that the pipes are in good condition. If a leak or breach is present, it can make your heat less efficient and may waste energy and money.
- **Cleaning:** The pump, pressure tank, and boiler should be cleaned as often as possible to ensure that everything is working properly. A clogged or dirty pump can make the system work harder, increasing energy costs. This simple cleaning can be done by most HVAC professionals.
- **Condition of pumps and valves:** All parts, including pumps and valves, should be inspected regularly to ensure that each piece is in good working order. If a part is broken or worn out, they're typically inexpensive and easy to replace. The sooner you notice a problem with the valves or pump, the better.
- **Type of floor:** Depending on the type of flooring and system you have, most radiant heating is self-operational, and your floors won't need much additional attention. In fact, once electrical radiant heating is installed, all you need to worry about is making sure that the thermostat is working correctly to keep your home and your floors nice and warm, you will need the help of a handyman for a secure installation.

**Don't neglect it:** Although radiant heating systems are low maintenance, you should always contact a trusted professional if you notice an issue. If your home is struggling to keep warm or the floors feel cold to the touch when the heat is on, you may need a service call to troubleshoot the problem. It could be related to the electrical wiring connection, an issue with the boiler or pump, or a problem with the pipes or tubing if you have an in-floor hydronic system.

**Basic maintenance:** Ensure that your home's thermostat is working properly and that your boiler and pump are in good condition. Listen for any unusual noises which could indicate a problem with a leaky pipe or an issue with the

pressure valve. Test your system before winter arrives so you can pinpoint any issues and catch them early so your home will stay warm during the colder months of the year. Keep the boiler clean and clear of dirt and debris to keep your system running optimally.

**Inspection:** Just like any other home heating or cooling system, an annual inspection is highly recommended. This will ensure that everything is working as it should be, and it will help to keep your radiant floor heating in great shape for many years to come.

## Newest Technology: Radiant Floor Cooling

Radiant floors are often only used for heating. We are just now starting to see some used for cooling, but this tends to only occur in office buildings where workers wear shoes. Radiant cooling floors are less popular among homeowners because home occupants don't want to walk on cold floors when radiant ceiling panels can be used to cool the environment instead.

The reason that radiant cooling is a relatively new technology is that we had to get to a point where we could control the temperature of the water within panels or floors to keep it from dropping below the environment's dew point temperature, which is the point when condensation forms. For the longest time, no one could monitor the dew point, so radiant cooling was never possible.

Saul De Los Santos from Messana Hydronic Technologies mentions that through the use of our Messana mSense room comfort sensors, Messana can measure the room's relative humidity and figure out the dew point temperature. From there, Messana mControls can regulate the system to ensure that the temperature of the water within the panels never falls below the dew-point. Additionally, if one of our Air Treatment Units is used, we can dehumidify the environment to lower the dew-point temperature, increasing the cooling capacity of our panels!

There are circumstances that you should put a priority on when picking the most suitable floors for your home. The value of each one differs depending on the place/area you wish to create. For wet sections (e.g. bathrooms and laundry), you need floors that are non-slip, low-maintenance, and secure to walk on. For the living room, convenience is the priority. For hallways, smoothness of travel and ergonomics are important.

As you can see, choosing a radiant floor heating system is a smart investment. Thanks to its ease of use, safety, and energy efficiency, more homeowners choose this option over other methods including forced air. With minimal maintenance, you can enjoy a toasty warm home all winter long with minimal worry. This type of heating is also an excellent option for bathrooms so that you can enjoy a comfortable temperature and warm floors. No matter where you choose to install it, choosing a radiant floor heating system is a smart way to maintain a comfortable temperature inside your house throughout the cold winter months.

*Lopez is a member of the Porch Content marketing department and loves sharing tips and advice to make every DIY project as easy and as much fun as possible.*

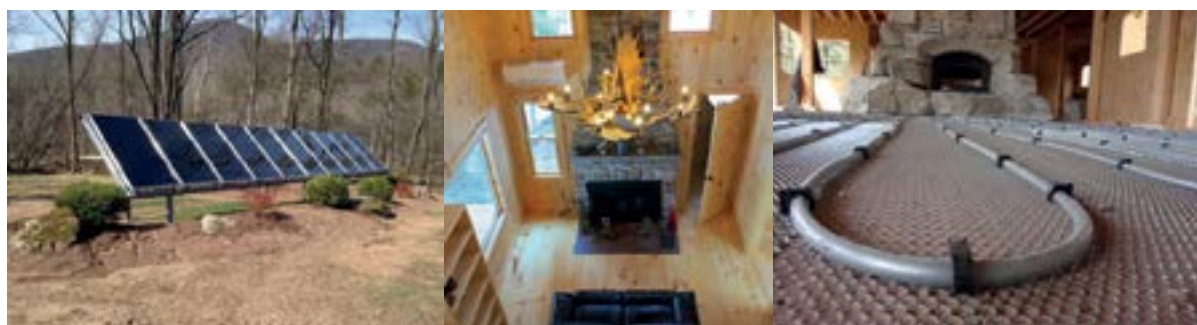
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## Glens Falls Vertical Farm Project Heated by a 2-t Heat Pump

Jessie Haas

After considerable supply chain delays, Glens Falls, NY, is close to going live with its vertical farm pilot project at 22 Ridge Street. The project is funded in part through a \$96,700 grant from Empire State Development's Smart Cities Innovation Partnership, with partnership support from the New York city-based Re-Nuble company. The grant supplied 50% of the cost, with the city and other partners putting in the remainder. Building owner Brian Bronzino offered the space at no charge for the duration of the pilot project.

Essentially a box within a box, the farm unit consists of a 20-by-24-by-10 foot plastic-walled cube, built inside a large third story room in an old downtown building. Inside the cube are racks on rolling tracks containing grow trays and energy-efficient LED lights. The configuration helps keep the box as compact as possible, thereby saving energy. The cube will be heated and cooled by a Daikin two-ton heat pump installed on the roof of the building. A Vert-Air air handling system that provides circulation is designed into the grow racks, which also deliver and recirculate organic hydroponic nutrients. The growing medium is fully compostable. Once the reverse-osmosis unit is installed to purify the water, the project is ready to go. Director of Economic Development Jeff Flagg expressed hope that it would start up in February.

Currently the plan is for the farm to be as automated as possible. National Grid has been helpful in providing the capacity for remote monitoring and sensing, which should help keep manual labor to a mini-



Top: Construction of the outside box. Middle: Inside the box are racks on rolling tracks containing growing trays. Bottom: The farm is a plastic-walled cube, built inside a large third story room in an old downtown building. (Photos: Sustainable PR)

mum. Originally, project planners hoped to create jobs in what was expected to be a depressed post-pandemic labor market. But the realities of tight labor supply may end up fitting well with the realities of indoor vertical farming. Sheltered from pests and adverse weather, the plants should grow contentedly without much need for care. The racks will be planted and harvested on a six week cycle. In any one week, one rack should be planted and one should be ready for harvest with two-thirds of the plants requiring little or no care.

Flagg emphasizes that this is a pilot project, as does Re-Nuble in the articles on its website. The goal is to create a template, Flagg said, "a reasonably replicable model that identifies pain points and opportunities that can be replicated in any community."

A "pain point" for the Glens Falls project is the third story location, which necessitates venting the heat pump through the roof. Opportunities? The space was vacant, centrally located, and free. There are many empty industrial spaces in the northeast that might profitably host box-within-a-box vertical farms.

Part of the pilot project is to figure out what makes sense in terms of delivering the produce. The avoided carbon footprint of not trucking in lettuce from California should not be

squandered by delivering in too wide a radius. Flagg hopes to figure out what distance makes sense. Is Lake George (11 miles) too far away? Is Saratoga (32 miles)? Should those municipalities have their own vertical farms? As for hyperlocal delivery, bikes or electric robots similar to the small delivery units that have been operating on campuses like Flagg's alma mater, Bowling Green University, might be employed.

Flagg emphasizes that these decisions are not his to make. Glens Falls is not going into the farming business. Once the pilot project is tested for and the template developed, it's time for commercial entities to dive in and make their own decisions.

Cont'd on p.34



The farm units are heated and cooled by a Daikin two-ton heat pump installed on the roof of the building. (Courtesy photo)



# THE PATH TO NET-ZERO IN KEENE, NEW HAMPSHIRE

Hilary Harris

310 Marlboro Street - A project that is being given priority and run differently in a NH city that has paved the way to make net-zero possible

Known for its forward-thinking leadership in climate change policy, Keene, NH recently adopted a Sustainable Energy Plan with the goal of transitioning the city to a 100% renewable energy future by 2050. Integral to this goal is creating a walkable and bikeable community along with using the existing building infrastructure. City planners knew this when they created the Business Growth and ReUse District, and Randall Walter, a local architect and developer, took notice.

When 310 Marlboro Street came onto the market, Walter did his research and made the decision to form 310 Marlboro St., LLC. The company purchased the property in July 2021. Hilary Harris, a former colleague of Walter's and architect and developer herself, joined him shortly thereafter to help shape the vision and strategy to move the building towards a net-zero community. The goal was to find the most sustainable solution not just for the community but for the climate, and it had to make fiscal sense.

Up until recently investing in net-zero buildings was often cost-prohibitive. The materials and systems were too expensive and the payback period was too long. All too often it was commonplace to eliminate these strategies when "sharpening the pencil" during the budgeting process. Today, however, there is additional funding available beyond traditional bank financing and private equity, be it through rebates, grants, tax incentives or low interest financing. 310 Marlboro St LLC (@310) was able to tap into all these resources making it possible to reduce the carbon emissions of the building, and ultimately move forward on constructing a residential addition on top of it, resulting in a live-work community.

@310 broke the project into two distinct phases. Completed in 2022, the first phase was to remove the existing 85,000 square foot commercial building from its dependence on oil. Future efforts will continue to remove the existing building's dependence on fossil fuel 100%, but there are a couple of propane rooftop units that need to be phased out. Phase

Two is underway and is adding 57 mass timber net-zero housing units on top of the existing building. Expected completion is in May 2024. Among other things this phase of the project was made possible with a variance and special exception from the Keene Zoning Board of Adjustment and a \$3MM grant from InvestNH in the fall of 2022.

## Strategy

With the help of a grant from the New Hampshire CDFA, @310 engaged Margaret Dillon of Sustainable Energy Education & Demonstration Services (S.E.E.D.S.) to conduct an energy audit. Recommendations from the audit included five options, with close to one-million-dollar range in capital investments depending on the option. It was evident immediately that the team's original intentions of going 100% electric were implausible both financially and practically so a hybrid solution was chosen.

## Thermal Solutions

The team had a good idea of the energy required to heat more than two thirds of the building based on the oil consumption in previous years. This area of the building did not need to be heated as much as an office space due to its industrial use. In fact, there are a couple of tenants that produce heat in their baking process to help supplement the space with heat. It made sense to opt for a biomass-based boiler to replace the 1961 oil boiler to meet the thermal needs of that area of the building. The boiler was also strategically sized to meet the estimated domestic hot water demand of Phase 2. Froling Energy installed a 450kW 1.5 million BTU/hour Schmid Wood Chip Boiler along with a new hydronic distribution system to replace the steam one. This system is saving 19,415 gallons of oil



310 Marlboro Street in Keene, NH moves toward being a net-zero community. (Courtesy photo)

annually which offsets 434,508 pounds of CO<sub>2</sub>.

Historically this would have been challenging to finance, but fortunately the system was made possible by a \$300,000 grant awarded from the U.S. Department of Energy (DOE) as well as a \$200,000 grant awarded by the Rural Energy for America Program (REAP).

## Electrical Solutions

A 143kW solar array was installed by Revision Energy with an estimated carbon offset of 255,233 pounds of CO<sub>2</sub> annually, the equivalent of 13,027 gallons of gasoline not burned. Estimated electrical savings at the time of the install was \$20,248. With electrical rates increasing in the past

six months this saving is even better.

@310 was also fortunate enough to receive financing through the NH CDFA for this part of the project and is applying a percentage of the \$200,000 grant from REAP to pay for the array. Tax credits and a \$10,000 rebate also helped make the system possible.

Once the building is fully occupied and the team is able to obtain data, adjustments will be made and supplementary panels added if needed. Additional solar panels will be installed for Phase Two.

## Additional Solutions

Heat pumps have been installed in selected areas by K.E. Bergeron Mechanical to provide both heating and cooling to use-groups that need both. Electrical upgrades including occupancy sensors and LED lighting have been done by JE & BC Electric. Because there were a number of original single pane windows that needed replacing, the team opted to replace them with Marvin triple-glazed instead of double-glazed as the difference in price was minimal. Most important, the community working, and in the near future living, in the building plays a vital part in getting closer to net-zero. @310 continues to work on various ways to keep the community incentivized to do just that.

Net-zero buildings are a critical piece of solving the climate change puzzle and existing buildings are one of the best and most immediate solutions to reducing carbon emissions. Moving an existing

Cont'd on p.31

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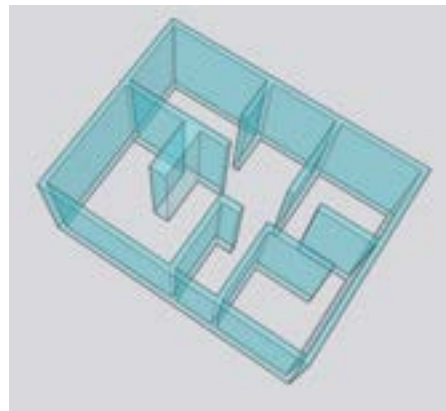
## A BUNCH OF B.S.\* (\*BUILDING SCIENCE, OF COURSE!)

# INTERSTITIAL SPACE: THE 'HOUSE WITHIN THE HOUSE'

Nate Gusakov

When we walk through a finished house, our world is bounded by walls. The wall surfaces divide one room from another, and on the other side of any given wall is...the next room. Simple. Same goes for the exterior walls – we look at painted sheetrock or wallpaper, and on the other side of that is some framing and some insulation, and then...the outside. Right? From an air leakage standpoint, it is not at all so simple, and it was not until I started conducting whole-house airtightness tests with a blower door setup that I began to understand just how connected interstitial space really is.

The word interstitial means, in a nutshell, "Between things." Visualize an interior wall in your house. Behind the wallpaper and sheetrock there are some vertical wood studs, probably 3 1/2 inches thick, maybe 5 1/2 inches. On the other side of those studs is more sheetrock or whatever forms the wall surface. In between, there are rectangles of mostly empty space that reach from floor to ceiling between the studs. Now think of looking up at the ceiling from a first-floor room. Above you is a surface (likely sheetrock), and above that are floor joists. These are likely almost 12 inches thick, and so before you get to the underside of the floor above you, there is again a rectangular cavity of mostly empty space, this time much deeper than the wall. These cavities make up the interstitial spaces of a building, and they are all much more connected than you



A 3D visualization of the connected interstitial space on one floor of a house. (Nate Gusakov)

might ever think! Often there are wires and pipes running through this space, and each time those wires or pipes must go through wood or sheetrock, we cut a hole for them. In addition, even though a piece of sheetrock screwed tight to framing lumber might seem to be an airtight connection, it really is not. The result is usually that almost all the interstitial space in a building is fairly connected to all of the other interstitial space, as far as air movement is concerned.


What does this mean? Well, for exam-

ple, it means that when I am conducting an airtightness test, I might well feel cold outside air being drawn into the house through a wall outlet that is on an interior wall in the middle of the house. Because the interstitial spaces are connected, there is a direct air leakage pathway from the center of the house to the outside air. I cannot emphasize how hard this is to understand until you've felt it in action during a blower-door test!

Of course, this works in both directions – during normal winter conditions, warm indoor air (driven by stack effect) follows the same pathway into interstitial space through outlets, fixtures, and closets and then makes its way right outside. Heat loss in action. The picture may help to visualize; it's a 3D rendering of the interstitial space in one floor of a house. The transparent blue area is what would usually be completely hidden to our eyes behind wall surfaces. As you can see in the picture, it can make up a significant amount of the interior space! The 'house within the house' – maybe 'the hidden room inside the house' would be more accurate. Whatever you call it, it's all connected, and the trick is to keep it from being connected to outside air.

Quite often, the access to interstitial space is through the attic plane and down

into the wall cavities; other times it is through porous wall assemblies into floor systems; still another favorite is into the basement through leaky basement walls and rim joists, and then up into the wall and floor systems from there. Understanding where the cold air is coming from reinforces the importance of a consistent, durable air barrier that is aligned with the thermal envelope of the building. In other words, make sure the air never leaks past the insulation in the first place and keep your interstitial space inside the house where it belongs!

Nate Gusakov is a building enclosure consultant at Zone 6 Energy and Silver Maple Construction. 

## PATH TO NET ZERO

Cont'd from p. 30

building towards net zero is a simple concept, but it is not easy. It requires innovative thinking and searching under every rock for solutions. We often think of net-zero as the end goal, but it is the process of getting there that needs constant diligence. Fortunately, the improvement of tax credits and additional grant funding makes net-zero more achievable than ever.

More detailed information on the wood chip boiler will be featured in an article in the next addition of G.E.T..

Hilary Harris is an architect and co-owner of Lignin Group LLC with Randall Walter, a design development company with a focus on adaptive reuse projects. Her current focus is overseeing the sustainability efforts at 310 Marlboro Street with the goal of making the project fiscally possible. 

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# Grid-Interactive Efficient Buildings

Greg Whitchurch

Remember way back when buildings were just consumers of energy? Electricity, gas, oil, wood and coal were delivered. Lots of mining, refining, storage and transportation infrastructure - a continuous stream of pollution!

Now buildings can have envelopes that protect them far better from the variations of our weather. They have LED lighting and heat pumps. They take advantage of the sun in the winter and shading in the summer. Manufacturing machinery is being converted to electrical. Full electrification is a common goal today.

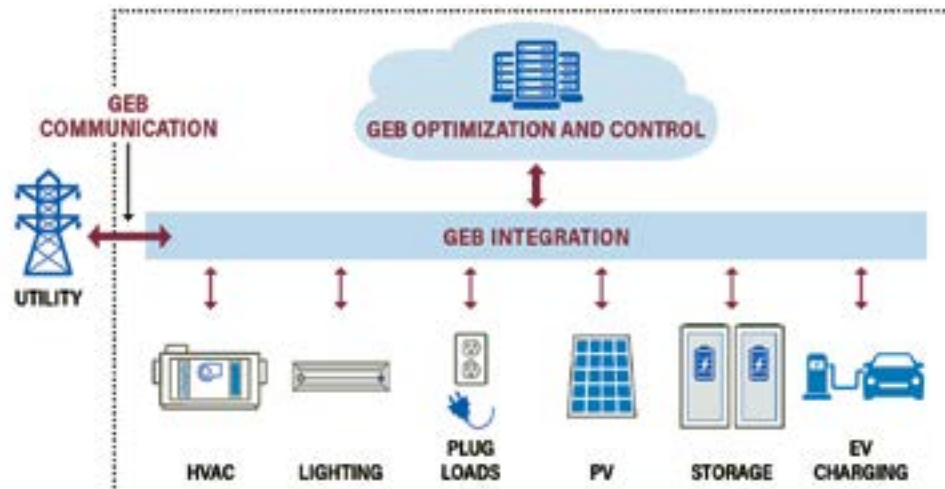
New buildings and their grounds often host solar PV and small-scale wind (ground and roof mounted: [www.bit.ly/wcax-btv-wind](http://www.bit.ly/wcax-btv-wind)). Company cars and delivery trucks are being electrified, and these vehicles carry enormous batteries that can be used for supplemental or backup power ([www.bit.ly/ct-v2g](http://www.bit.ly/ct-v2g)). Have a major short, but huge, electrical spike-draw need in your process? How about tapping into your electric vehicle (EV) fleet to level out those costly spikes a bit? Flow batteries are another commercialized provider of very cheap, onsite energy storage (<https://bit.ly/wired-v2g>).

These developments represent a major change in how we can look at our buildings. They have become less dependent upon our traditional energy paradigms and are increasingly a partner. A complex of buildings or housing development can be designed to "island" itself from our increasingly unreliable electric grid, washed-out roads, and other weather disasters ([www.cnn.it/3PEpqSd](http://www.cnn.it/3PEpqSd)).

The environmental sins of our past (the U.S. is still increasing its CO2 emissions every year) have resulted in less dependable energy infrastructure. But as we build or remodel our buildings, we can take advantage of new technology to save money, improve comfort and health, reduce the maintenance requirements and increase resiliency.

The video here, [www.bit.ly/phius-grid-bldg](http://www.bit.ly/phius-grid-bldg), discusses the why and how of these opportunities. The U.S. Passive House Institute has been at the forefront of the transition from our old-timey, one-step-at-a-time tradition of building-design improvement. Using science and engineering practices that have been available for about 30 years, these people have laid out a path that is being followed by increasing numbers of architects, engineers and builders since the turn of this century.

A client or owner can take a very small part of the traditional or typical operating and maintenance costs they



Source: Joe Zhou, [www.bit.ly/slip-geb](http://www.bit.ly/slip-geb)

are accustomed to including in their budgets, and "upfront" that little slice into their designs to drastically reduce those hard-to-predict long-term operating line items. There's little to no incentive for a walk-away developer or a landlord to consider the owner's or renter's occupancy and operating costs. But if you yourself are the owner/builder/operator, your financial path is in your hands.

Allow me to talk through my hat for a bit: Imagine that I am the CFO of a business or I own and operate a housing development ([www.bit.ly/get-hillside](http://www.bit.ly/get-hillside)). We have some buildings we need to refurbish and some to build. I want to

cut long-term variable costs (energy, maintenance, repair, etc.) with some upfront, one-time fixed investments. So, I will plan to build to the Passive House standard ([www.bit.ly/phius-prin](http://www.bit.ly/phius-prin)). I will try to electrify everything I can. I will want to generate whatever solar and wind energy I can to reduce my operating costs, perhaps permit islanding during outages, and maybe even provide some income through net-metering.

Air source heat pumps for heating, cooling and domestic hot water are *de rigueur* now. But I want to move a lot of BTUs quickly and efficiently; so, I will be checking out my geothermal options because the ease of moving BTUs into and out of 50-degree water is so much more efficient than wringing heat from 0-degree air and stuffing more heat into 90-degree air.

Further, I will want my EVs to charge at reduced-cost times. I will also look into compensation for offering my EV battery power to the grid at discharge rates that are easy on my batteries while leaving them above the minimum charge levels I specify ([www.bit.ly/lbl-geb](http://www.bit.ly/lbl-geb)). I also have

a business process that generates a lot of waste heat, so I contact [www.epa.gov/chp](http://www.epa.gov/chp) for their free help in turning this costly problem into a cost-reducing resource.

It might not be feasible to accomplish all of these things right off the bat, but I sure want to be prepared when these opportunities do appear. Now back to stuff I think I know about. Every piece of the foregoing is currently in practice; Google "grid interactive efficient buildings" for lots more information.

The video earlier in this piece is the

deeper dive into the possibilities that pop into existence if we take advantage of our new building technologies and our new electrical generating and distribution advances. Much like mobile phones versus fixed telephones, and radio versus print media, these mind-expanding opportunities have arrived within a single generation and in the midst of entrenched competing businesses. This explains why there's A LOT of pushback and denial going on. (I am sure you've witnessed this in the EV discussion.)

The fields of architecture, engineering and construction are well-populated with professionals who have the requisite portfolios. My wife and I attend many conferences on these topics where we see attendees from all over the U.S. and nearby Canada, along with government officials and business leaders, expressing their interest and support, and detailing their experiences with these sustainable advancements. (e.g. [www.bit.ly/evt-bbd](http://www.bit.ly/evt-bbd) and [www.bit.ly/revermont](http://www.bit.ly/revermont))

Oh, did I mention that, in addition to the direct cost advantages, these improvements will also tend to dampen and shorten the climate crisis we have entered. This bears repeating anyway.

The Whitchurches' EVs provide backup power for their owner-designed net-zero+ Passive House ([www.bit.ly/phc-vtbiz2](http://www.bit.ly/phc-vtbiz2)); are board members of [www.VTPH.org](http://www.VTPH.org); and have electrified all but their wood splitter. See also: [www.bit.ly/mdx-mec-bldg](http://www.bit.ly/mdx-mec-bldg) and [www.bit.ly/get-w-build](http://www.bit.ly/get-w-build). 

*Buildings can have envelopes that protect them far better from the variations of our weather... Full electrification is a common goal.*

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# Efficiency Vermont's Efficiency Excellence Network (EEN) Contractor Spotlight: Green Mountain Electric Supply

INTERVIEW WITH NIC VARTULI, LIGHTING SPECIALIST AND LIGHTING TEAM MANAGER FOR NEW ENGLAND



G.E.T. Staff

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

**Nic Vartuli:** Green Mountain Electric Supply (GMES) was founded in 1953 by the Laber family in Newport, VT. I joined Green Mountain Electric Supply on February 11th, 2008. Over my 25 years' experience in the electrical wholesale industry, I have worn several different hats for several different wholesalers; but would you believe I fell into this industry by accident?

I attended Lyndon State College in Lyndonville VT and majored in telecommunications. After college I worked as a light fixture and ceiling fan repair man in a lighting showroom in Williston, VT with Home Lighting Company. Here I learned all the ins and outs of light fixtures and ceiling fans. The Home Lighting Company closed its doors the following year and I worked for Yankee Electric Supply as an assistant manager and lighting designer. Yankee Electric Supply was purchased by another wholesaler at the conclusion of my tenure prompting me to join the team at Green Mountain Electric Supply. I began work as the lighting showroom manager and support person for all the GMES showrooms. I am now the commercial and residential Lighting Specialist for the entire company as well as the Lighting Team Manager for the New England territory. I design commercial and residential lighting projects every day. My customer base is 100 accounts, and the entire company services over 4,000 accounts.

**What is your service territory?**

**NV:** VT, NH, NY, MA, NJ, PA, ME is our



Green Mountain Electric Supply's New England lighting team (left to right): Nic Vartuli, Hannah Herriott, Jessica Migrant, and Ben Leclair. (Courtesy photo)

day-to-day service territory. We also service clients all over the world.

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

**NV:** Electrical work! Always hire a professional! There are lots of reasons why electricians go to trade school for four years and must log the required field time to achieve a Master Electrician's license. They know the codes; they know what is safe, and they have the real-world experience needed so that we can all sleep at night. Fire is an electrical contractor's biggest fear!

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

**NV:** Perform an energy audit of your home or business. You need to establish a baseline of your energy consumption and where your losses are. This is the only way for the true savings and efficiency to be realized. Change all incandescent lamps, compact fluorescent, metal halide

and halogen lamps to new LED versions. Identify inefficient lighting control strategies and replace with new efficient control strategies, i.e., daylight sensors, occupancy and vacancy sensors, dimmers, timers, and a lighting control panel.

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

**NV:** Facilities lighting audit and controls strategy implementation for one of the largest manufacturers and installers of heating and ventilating equipment in Chittenden County. After establishing a baseline consumption of 5,000kWh per month to run the existing lighting technology, GMES was able to prescribe a complete factory and office area lamp retrofit from fluorescent lamps to LED lamps. The saving was realized immediately by reducing monthly energy consumption for the lighting system to 2,260kW. Almost a 50% reduction in energy consumption with a payback of 1 year! The business will save over \$60,000.00 in energy costs of the next 10 years just by making this one change.

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

**NV:** Real world experience. I have been in the lighting industry for 25 years. I watched the innovative technology hit the market from its inception starting with compact fluorescent lamps all the way to present day LED technology. I have witnessed in real time how old technologies and new advancements have impacted our past as well as our future. It has certainly been a wild ride!

**Why should people use an EEN member over someone else?**

**NV:** We are qualified energy efficiency professionals that are extensively trained in best common practices as well as advanced control protocols.

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

**NV:** The lighting rebate programs are an invaluable sales and marketing tool! Rebate program incentives are a major driver for efficiency upgrade projects. They help to reduce the initial financial impact to the end user as well as the payback time.

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

**NV:** What project success stories can you tell me? What percentage of savings have your other clients seen? What rate of ROI can I expect based on the work to be performed? How long have you been in business? ♻️

## Want to save energy and reduce your carbon footprint at home?

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# CHAMPLAIN COLLEGE McDONALD HALL DEEP ENERGY RETROFIT

Barb and Greg Whitchurch

"We track every BTU in every building." – Nic Anderson, Sr. Director of Operations and Campus Planning, Champlain College

When is a better time to inculcate young adults with socially responsible values than while they're in school? Regardless of age or education level, why not provide them with examples of good moral principles in action, a living environment where those principles are embedded all around them all day long, and surroundings that showcase the practices and technology that enable sustainable living?

This article was triggered by Champlain College's (CC) recent ribbon-cutting for McDonald Hall ([www.bit.ly/vbm-mcdonald](http://www.bit.ly/vbm-mcdonald)), a deep energy retrofit of a 19th Century mansion-turned-dormitory for first-year students. Unless one has done it before, such an ambitious project as this might seem daunting. But CC has done it before at Perry Hall ([www.bit.ly/in-perry-hall](http://www.bit.ly/in-perry-hall)) and with these same partners as below.

We share with you here the various companies and professionals who made this happen – even in the face of COVID, supply chain delays, and inflation pressures – and who have done it before for other clients. As CC well knows, once accomplished, this climate-friendly, low-pollution, healthful and cost-saving approach is easily replicated.

Setting the goals – specific metrics for energy loads, indoor air quality (IAQ) and comfort, while figuring out how to accomplish those goals within the restrictions of historic preservation requires some fancy footwork in the design stage. Having an experienced architectural firm such as Colin Lindberg is very helpful. In turn, Lindberg has established relationships with several firms to form the team for this project.

In order to reduce the sizes, costs and energy needs of the heating and cooling equipment, they first addressed air tightness and insulation of the envelope: the outside walls, basement and roof. Where necessary, they dug down as far as 12 feet around the foundation to install foam board and to air-seal those "ancient" walls. They removed the top floor's ceilings, and foamed and sealed the underside of the roof. They drilled holes in all of the window and door jambs and foamed those, while upgrading the windows themselves. All other penetrations (chimneys, etc.) were carefully addressed separately. This work made controlling the interior



"After" photos of McDonald Hall, now a fossil-fuel-free, super-efficient dormitory. Note the carriage entrance at right. (Photos: Whitchurch)

temperatures and IAQ a far less costly endeavor, and moisture control was easily piggybacked in the same mechanicals.

This is now a fossil fuel-free building, and the "natural gas" lines have all been recycled!

Twelve years ago, CC drilled a number of 800-foot geothermal wells near the aforementioned Perry Hall. McDonald is the eighth building to tap into that resource for extremely efficient heating and cooling. The year-round 50-degree water flows through a large heat exchanger where coolant from the three Daikin heat pump condensers either sheds or picks up heat, as needed ([www.bit.ly/daikin-w2a](http://www.bit.ly/daikin-w2a)). The coolant is then pumped to the 19 heat pump heads located throughout the building.

The improved envelope and state-of-the-art HVAC permit vertical zoning of the living spaces so that the microclimate around the building – instantaneous solar heating, shading from trees and other buildings – can be counterbalanced. For example, in the "shoulder" seasons the south side can be cooled as the sun strikes it, while the shaded side is still being warmed. This flexibility provides finely tuned temperatures. Each room has a thermostat which can be adjusted within set limits.

IAQ is handled separately by an energy recovery ventilator (ERV: e.g., [www.bit.ly/tempeff-ex](http://www.bit.ly/tempeff-ex)).

This unit removes stale inside air (including bathroom fans) and replaces it with highly-filtered "fresh" outside air. At the same time, it tempers the incoming air with the heating or cooling which has already been invested in the stale air. Thus, it provides savings over simple exhaust fan ventilation or traditional leaky building "breathing."

Speaking of not throwing away hard-earned heat, the sink and shower drains all exit the building through drain water heat recovery piping, in which the final drainpipe is wrapped with a coil of incoming service water so that it pre-heats it a bit before it enters the hot water tanks. There are three 80-gallon Rheem Proterra air-source heat pump (ASHP) hot water tanks within the utility room, where some waste heat of the other systems can be put to good use.


Of course, maintaining the historical visual integrity of a landmark building like this requires compromises, and this is all the more reason to take advantage

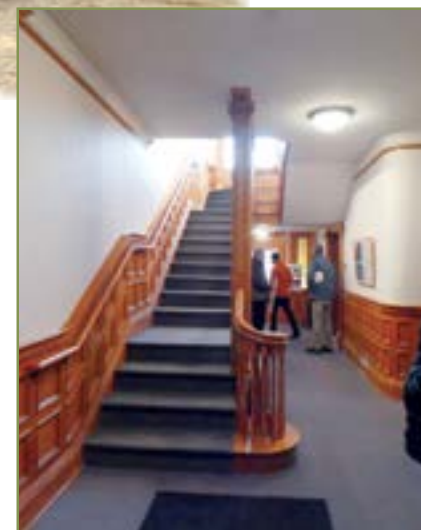
of every possible pollution-fighting new technology one can. Geothermal energy and a high-performance envelope surely help when one is trying to hide the new stuff behind the beautiful old stuff – no big condensing heat exchangers outside or on the roof; inside, only small heat pump heads where necessary.

The lower level and first floors are fully ADA-compliant. All showers are completely enclosed, with an included changing stall. Special attention was given to making all rooms convenient and easy to navigate; space-saving furniture was chosen to preserve the feeling of spaciousness.

Champlain College has done all this even as it adds "carbon neutrality" to its goals! As one contemplates joining in such a pursuit of more responsible operations and examines the opportunities taken by CC ([www.bit.ly/ccollege-sustain](http://www.bit.ly/ccollege-sustain)), one might well feel overwhelmed at the magnitude of their accomplishments. But that's not how they began! Taking that first step, then leveraging that success into further steps, gets one going down the path to someday recapturing the climate and environment we took for granted for too long.

The Whitchurches drive only EVs which also serve to back up their ownerdesigned net-zero+ Passive House ([www.bit.ly/phc-vtbiz2](http://www.bit.ly/phc-vtbiz2)), and are Board members of [www.VTPH.org](http://www.VTPH.org).


See also: [www.bit.ly/mdx-mec-bldg](http://www.bit.ly/mdx-mec-bldg) and [www.bit.ly/get-w-build](http://www.bit.ly/get-w-build). 



## Glens Falls Vertical Farm – Cont'd from p. 29

Could this spread in the region? Should it? Hydroponics are controversial within some parts of the organic and regenerative farming community, but there is no doubt that with care, growing indoors can save shipping costs, both to the consumer and the environment. Especially on the east coast, a continent away from the source of most winter salad greens grown in this country, projects like this may have strong economic and environmental benefits. The model of constructing grow boxes within disused space has some strong carbon footprint benefits as well. All in all, a project to keep an eye on, as hopefully the grow lights switch on in a few weeks.

Jessie Haas lives in an off-grid cabin in southern Vermont with husband and fellow G.E.T. contributor Michael J. Daley. She's the author of over 40 books, including the *Bramble* and *Maggie* series.

Links: Glens Falls, NY - Official Website | Official Website: [cityofglensfalls.com](http://cityofglensfalls.com); Projects – Re-Nuble: <https://bit.ly/Re-Nuble-projects>. 



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Elm Place, Milton Vt (Carolyn Bates)

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# Agrivoltaics for New England (REV Conference 2022)

Barbara Whitchurch

Agrivoltaics is the practice of co-locating crops and solar installations to raise food, pollinator flow-ers or livestock while generating renewable energy. This practice can reduce costs, increase yields, and generate extra income for farmers.

As we customarily do, my husband Greg and I tried to go our separate ways during last fall's annual Renewable Energy Vermont conference, so that we could attend as many workshops as possible. (More about the conference below.) But we both were intrigued by the agrivoltaic workshop titled, "The Role of Solar Power in Enhancing Biodiversity and Farm Viability in Vermont."

Moderator Ethan Winter, of the American Farmland Trust ([www.FarmLand.org/](http://www.FarmLand.org/)), introduced the panelists:

Shannon Scarborough of Greenbacker Capital ([www.GreenBackerCapital.com/](http://www.GreenBackerCapital.com/)), the leading U.S. developer of a nationwide pollinator/agri-solar funding and operations clearinghouse. Their \$2 billion investment has funded 52 projects in Vermont. During their site assessments, they consult with local experts and professional botanists to prepare the vegetative cover for each site. It should be noted that the Inflation Reduction Act (IRA) includes incentives for such dual use: about \$400 billion in grants and tax deductions.

Amber Lessard of Encore Renewable Energy ([www.EncoreRenewableEnergy.com/](http://www.EncoreRenewableEnergy.com/)). Amber explained how Encore focuses on reclaiming undervalued land through pollinator projects and grazing. A farmer who needs a reliable source of income from part of his or her land could contract with a solar installer to put up a large solar array there. The farmer would then plant low-growing plants beneath the solar array and could then periodically bring her sheep or goats to the site of the solar array to graze around the solar panels ([www.bit.ly/get-bee-1](http://www.bit.ly/get-bee-1)).

According to Lexie Hain, co-founder of



Bee-friendly pollen bearers. (Bee the Change)

the American Solar Grazing Association (ASGA) ([www.SolarGrazing.org/](http://www.SolarGrazing.org/)), grazing is cheaper than mowing, often costing 30% less than traditional landscape maintenance. Or a contract could be made with the ASGA, who will keep vegetation below the solar panels by bringing animals to the site. (Interestingly, sheep love to eat poison parsnips, an annoying weed that can cause rashes more painful than poison ivy.) Three examples of such projects in Vermont are Nava Solar in Royalton, South Street Solar in Middlebury, and St. Michael's College in Colchester ([www.bit.ly/get-agri-sheep](http://www.bit.ly/get-agri-sheep) with help from [www.AgrivoltaicSolutions.com/](http://www.AgrivoltaicSolutions.com/)).

These projects generate improved soil quality (manure) and increased yields. However, not all plants thrive while sharing space with solar panels. Potatoes, wheat, cucumbers, and lettuce do not do well, but tomatoes often thrive. A research paper published by the National Renewable Energy Laboratory last August surveyed agrivoltaic research across America. It noted that, on average, tomato yields doubled compared to non-agrivoltaic sites ([www.bit.ly/pv-tomatoes](http://www.bit.ly/pv-tomatoes)).

Next, we heard from Patrick Kitchen, a representative of the nonprofit Bee the Change ([www.BeeTheChange.earth](http://www.BeeTheChange.earth)),

which began sponsoring pollinator projects in Vermont seven years ago. (Pollinators enable the growth and diversity of 90% of our flowering plants, which supply us with B vitamins and micronutrients from fruits, berries, and vegetables.) They have worked with American Meadows, a Vermont-based seed company, to adapt 30 solar fields in VT, CT and Maine by creating pollinator fields around solar installations. Bee the Change has measured a ten-fold increase in pollinating

insects since the start of their project in Ferrisburgh, VT ([www.bit.ly/get-bee-2](http://www.bit.ly/get-bee-2)). They also collaborate with Green Lantern Capital, Green Mountain Power, Pollinator Pathways, and Aegis Renewable Energy to create solar fields from leased land. Mike Kiernan of Bee the Change said, "Our dream is to create the equivalent of every household in Vermont...having a 10 foot by 10-foot pollinator garden."

According to the IPCC paper on climate change of June 2021, climate change and biodiversity loss are occurring at a much faster rate than scientists had previously predicted. Agrivoltaics that utilize pollinator gardens have been successful in Vermont and other states in increasing the diversity of pollinators ([www.bit.ly/get-bee-3](http://www.bit.ly/get-bee-3)).

If any of this information piques your interest, consider contacting Bee the Change, the ASGA, or Encore Renewable Energy about enhancing your town's or your own solar installation with agrivoltaics using animals or pollinators. Other news about agrivoltaics can be found at [www.bit.ly/ct-agri-ira-1](http://www.bit.ly/ct-agri-ira-1), [www.bit.ly/ct-agri-1](http://www.bit.ly/ct-agri-1), [www.bit.ly/tr-agri-pv](http://www.bit.ly/tr-agri-pv) (from MIT), and [www.bit.ly/ct-agri-nrel](http://www.bit.ly/ct-agri-nrel) (from NREL), and [www.bit.ly/pvm-fr-agri](http://www.bit.ly/pvm-fr-agri) (France and vertical panels).

The annual Renewable Energy VT Conference (REV) is THE place to go for homeowners and professionals to see the latest techniques, engineering, machinery, systems, and political information/news. Visit [www.REVermont.org/our-work/annual-conference/](http://www.REVermont.org/our-work/annual-conference/) for a recap of this year's event. Speakers from far away offer global perspectives, while our regional political leaders, utility and power executives, machinery and service vendors from the U.S. and Canada speak to our more local needs and opportunities. A glance at the agenda reveals that every aspect of renewable energy is covered.

Barbara Whitchurch is a freelance writer and climate activist who owns an EV and an owner-designed Passive House in Middlesex, Vermont. ☞



Foliage mowers at a solar PV facility. (American Solar Grazing Association)

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## Can Large and Wild-raised Herbivores Help Slow Climate Change?

George Harvey

In December, *Mongabay* ran a very interesting article on large herbivores and their effects on land and climate change, "Counterintuitive: Large wild herbivores may help slow climate change" (<https://bit.ly/mb-herbivores>). The article is based on peer-reviewed science that shows how such big animals as elephants, wildebeests, and reindeer can have a number of positive effects on climate change, despite reputations to the contrary. In fact, the article points out, there are species that depend on large herbivores for seed dispersal. If we lose elephants, we lose some species of trees with them.

A possible lesson is that before we intuitively decide how nature should work, it behooves us to understand how nature does work. In the absence of such knowledge, we are sure to get it badly wrong.

We might ask why this only applies to large wild herbivores, and large domesticated animals. Why would wildebeests be good and cattle be bad? In fact, why would domestic cattle be bad, but not wild cattle? The question is not new. The book, *Cows Save the Planet*, was published in 2013.

Polyface Farm, in Virginia's Shenandoah Valley, provides a practical example of a different paradigm. It is run by a somewhat controversial farmer named



The eggmobile has nests in it. (Jessica Reede, CC-BY-SA 2.0. <https://bit.ly/eggmobile>). Inset: Beef cattle at Polyface Farm. (Brian Johnson & Dane Kantner, CC-BY-SA 2.0, [bit.ly/share-alike-2](http://bit.ly/share-alike-2))

Joel Salatin. We note that he has been accused of all sorts of things, from racism, which he denies, to being a lunatic, which he admits freely – he even wrote a book about it, *The Sheer Ecstasy*

of *Being a Lunatic Farmer*. He has said a few things about science that we can't agree with, but none of that is really important. The issue here is what we can learn from his farming model.

The model was built over time. When Salatin's parents bought the property at Polyface Farm, it

was in bad shape. Salatin remembers that the soil was in such bad condition when he was a child that he could walk all over

the farm without once setting foot on vegetation. In some places there wasn't any soil, and the surface of the land was just rock. Salatin's parents were very interested in land restoration, guided by *Organic Gardening and Farming Magazine*. His father began developing a system of moving the cattle on a regular basis. At first, they were moved every few weeks. Later, it came to be every fourth day.

In time, new types of electric fencing made it possible to move cattle daily. The herd is kept in a small area, where it eats the grass down to a few inches tall. The herd is moved to fresh, tall grass each day by putting up a new, temporary fence and opening a gate they can go through. In videos of cattle moving to fresh pasture, it is clearly an event they anticipate. All Salatin must do is open the gate; the cows don't need to be guided.

Salatin has developed different kinds of enclosures for chickens, built on skids, so they can be moved easily. An eggmobile has the laying hens' nests in it. The chickens are moved into the area where the cows were about four days after the cows left. The four days gives larvae a chance to grow in the manure, and as the chickens scratch them out, they break up the manure and spread it.

Other animals have

Cont'd on p.39





# RESOURCES

**350-Vermont:** General group that coordinates a variety of statewide actions. [www.350vermont.org](http://www.350vermont.org)

**American Council for an Energy-Efficient Economy:** [aceee.org](http://aceee.org)

**American Solar Energy Society (ASES):** [www.ases.org](http://www.ases.org)

**Backwoods Solar:** Specialty: solar, off-grid - [www.backwoodssolar.com](http://www.backwoodssolar.com)

**Carbon Tax:** [carbontax.org](http://carbontax.org)

**Clean Energy NH:** [www.cleanenergynh.org/](http://www.cleanenergynh.org/)

**CO2.Earth:** See emissions harms, scientific advice, and pathways to follow. [www.co2.earth](http://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](http://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](http://www.dsireusa.com)

**Efficiency VT:** A must-go-to site for immeasurable amounts of info. [www.efficiencyvermont.com](http://www.efficiencyvermont.com)

**Energy Efficiency & Renewable Energy Clearinghouse (EREC):** [eetd.lbl.gov](http://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](http://www.energyguide.com)

**Energy Star Federal Tax Credits:** [www.energystar.gov/about/federal\\_tax\\_credits](http://www.energystar.gov/about/federal_tax_credits).

**Federal Energy Regulatory Commission (FERC):** [www.ferc.gov](http://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](http://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](http://hes.lbl.gov)

**IREC/ Interstate Renewable Energy Council:** RE educational info. [www.irecusa.org](http://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](http://www.nabcep.org)

**NESEA/ Northeast Sustainable Energy Assoc.:** [www.nesea.org](http://www.nesea.org)

**National Association of Energy Service Co. (NAESCO):** [www.naesco.org](http://www.naesco.org)

**National Renewable Energy Laboratory (NREL):** [www.nrel.gov](http://www.nrel.gov)

**NeighborWorks® Alliance of Vermont:** Low-cost energy loans - [www.vthomeownership.org](http://www.vthomeownership.org)

**New York Solar Energy Industries Association/NYSEIA** [www.nyseia.org](http://www.nyseia.org)

**New York Solar Energy Society (NYSES):** [www.nyses.org](http://www.nyses.org)

**NFRC** independent rating & labeling system for the windows, doors, skylights [www.nfrc.org/](http://www.nfrc.org/)

**NH Energy Divison:** [www.nh.gov/osi/energy/index.htm](http://www.nh.gov/osi/energy/index.htm)

**Renewable Energy World:** [www.renewableenergyworld.com](http://www.renewableenergyworld.com)

**Renewable Energy Vermont:** [www.revermont.org](http://www.revermont.org)

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

**SmartPower:** [www.smartpower.org](http://www.smartpower.org)

**Solar Components:** [www.solar-components.com](http://www.solar-components.com)

**Solar Jobs:** Listed by city, state, and district, [SolarStates.org](http://SolarStates.org)

**Solar Power Rocks:** Impressive data and info ,including per state. [www.solarpowerrocks.com/](http://www.solarpowerrocks.com/)

**Solar Store of Greenfield, MA** Stock & install a wide variety of solar & environmentally friendly technologies. [SolarStoreofGreenfield.com](http://SolarStoreofGreenfield.com)

**Tax Incentives Assistance Project (TIAP):** [www.energytaxincentives.org](http://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](http://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](http://www.vecan.net).

**VPIRG:** understand the clean energy resources available to VT - [www.vpirg.org/cleanenergyguide](http://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](http://www.veic.org)

**Vermont Passive House:** [www.vermontpassivehouse.org/Resources/](http://www.vermontpassivehouse.org/Resources/)

**Weatherization, Energy Star & Refrigerator Guide:** [www.waptac.org](http://www.waptac.org)

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## BOOKS

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## GEORGE HARVEY’S FICTION

Do you like George Harvey's writing? You might want to read his newest novella, called, *Annie and August*. If you would like to read it or try some of his fiction, you can find links to his books for sale at Barnes & Noble at <https://bit.ly/GH-fiction>.

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Larry Plesent

## Ingredient of the Month

### Is Sesame Oil a New Miracle Drug for Your Arteries?

I did not go into this article as a cheerleader for sesame oil and sesame products. That came later. As I read the abstracts of studies conducted on the stuff, a clear picture of its potential for the health and healing our stressed and crying arteries emerged. Here's the backstory.

A few months ago -- an acquaintance -- let's call him Sam, contacted me.

"Larry," he said. "Earlier this winter I took a bad fall. I'm 76. I keep and can a large garden and consider myself fairly active. I cook my own food and eat fresh duck eggs every day, and I rarely eat anything that's over-processed. I hadn't had anything like a real medical checkup since age 65, so everyone got all excited and wanted to do a bunch of tests. They guessed that I had fallen due to a lack of blood flow and not enough oxygen. Clogged arteries are very common in people my age. They even ran a camera up inside of me! Cardiovascular disease runs in my family, and I was sure this was the beginning of the end."

It was not. Besides having a stellar diet, Sam only used sesame oil for his fat source after a minor stroke showed him

his likely future just eleven years prior. He used no butter, no other oils, just sesame oil. He would sop it up with his toast and duck eggs for breakfast.

Sam was 76 and he had the arteries of a 45-year-old. Better in fact than most 45-year-olds.

Here is some science to back it up.

In 2017 (Cureus) Edmund Hsu and Sam Parthasarathy conducted a review of the literature on sesame oil and atherosclerosis. They found as follows. "Sesame oil... has been shown to have anti-inflammatory and antioxidant properties... effective for reducing atherosclerosis and the risk of cardiovascular disease. Current research has shown that sesame oil can reduce LDL levels while maintaining HDL levels."

Sesame oil contains about 4% vitamin E compounds. These have long been known to be heart- and artery- beneficial.



Image: AdobeStock/441478258

The oil also contains about 1% phytosterols, known for their cholesterol-reducing properties.

I find it interesting that there are water-based compounds in sesame oil that exhibit anti-inflammatory and anti-atherosclerotic properties, too.

From Alganti et al (Journal of Medicinal Food, 2016) comes a study titled, "Water Soluble Components of Sesame Oil Reduce Inflammation and Atherosclerosis." They concluded as follows.

The high-fat diet supplemented with sesame oil aqueous extract significantly reduced atherosclerotic lesions, plasma cholesterol, and LDL cholesterol levels in mice.

So, get yourself down to your favorite co-op or health food store and pick up a bottle of cold pressed sesame oil. It's good for you on the inside and for the outside of your skin, too. Use it to replace most of the solid and liquid fats (and mass market lotions) you now consume. Tell them Sam sent you.

Larry Plesent is a writer, philosopher and grandfather living in the Green Mountains of Vermont. He is the former CEO of Vermont Soap in Middlebury, VT (now retired) and the author of The Reactive Body Handbook, [www.reactivbody.org](http://www.reactivbody.org). ♻️

#### Disclaimer:

We at Green Energy Times want to remind readers that the experience of one individual does not provide a scientific conclusion, just anecdotal verification. We do not know, for example, what other things in his environment had effects on his body that may have contributed to the story.

Other oils also claim to keep arteries free of plaque, such as grapeseed and olive oils.

Avoiding saturated fats is recommended for a healthier heart. Choose foods with "good" unsaturated fats, limit foods high in saturated fat, and avoid "bad" trans fat. "Good" unsaturated fats — Monounsaturated and polyunsaturated fats — lower disease risk. Foods high in good fats include vegetable oils (such as olive, canola, sunflower, soy, and corn), nuts, seeds, and fish.

Many other factors lead to a healthier heart including exercise and staying active.

We recommend that you make sure to consult with your doctor before making dietary changes in your life. - the G.E.T. staff. ♻️

## ELMORE ROOTS' PERMACULTURE KNOW-HOW

### How Plants and People Grow

David Fried

Deep in the muck are the roots of the lily pond water lily. Many years of the land's leaves and bugs composting down have made this rich fertile ground to grow in. One day, with all its energy from the muck and mire, a stem reaches forth through the water up to air. Touching this air and light and sun, a bud soon opens into a flower.

The flower sits on top of the water. There is no effort. It is connected to what's below. It uses the broken-down life energy at the bottom of the pond to lift up into new life. It would not be this soft and precious flower without its rootedness into the dark and mushy layers down under.

A bur oak has another story. With its natural zest to make more of its kind, it stands tall and shares its pollen with other oak trees nearby and farther away, with the wind. It sets an example for all the other trees for how to stand tall and produce food for smaller beings below. An acorn falls and rolls from a bur oak nearby or is buried by a squirrel from a nearby hill. It starts to break down in the dark and dim clay of the earth. Just before it gives up and becomes part of the forest floor, it is said to begin growing a new sprout which becomes a root and then another which becomes a stem with green leaves. Eventually this stem grows tall and strong and has many branches and many more acorns which drop and roll and get buried, to start again.

We, the people, sometimes have to go through some rough times to get to where we are comfortable in the world and healthy. We often do everything we can to avoid the hard turns of life.



Painting by Joyce Dutka

One of my favorite bumper stickers I spotted on a car on Elm Street in Montpelier, Vermont a few years ago, read, "enough learning experiences already!"

But every day, we have the chance to learn something important to our wellbeing. Just as the tree and the water lily puts down new roots into unfamiliar territory, sometimes we grow and walk into the sunlight of a new day.

Of course, when we stay rooted deeply in what we have learned and where we are coming from, there is less of a chance of being blown over by the wind or anything else. This is how trees make it. This is how water lilies can support the weight of a frog. This is how we can do acts of kindness even when a lot of the world around us seems not to care..

We are stronger when we have life experiences we learn from and grow from.

We are more like a lily and an oak tree than we usually like to admit.

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

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# MONADNOCK FOOD COOP'S TEN YEAR ANNIVERSARY AND EARTH DAY CELEBRATIONS

Say "Cheers to 10 Years" with Monadnock Food Co-op this April. The Co-op will celebrate its 10th Anniversary for ten days starting on Thursday, April 13 and culminating with the 2023 Monadnock Region Earth Festival, which will take place throughout downtown Keene, NH and the Co-op at 34 Cypress Street on Saturday, April 22, from 12 pm to 4 pm.

For these ten days, Monadnock Food Co-op will highlight and feature what sets their community-owned business apart; this includes: being a welcoming and accessible community-owned downtown market, having a dynamic and passionate staff, offering a diverse variety of products (including the option to buy in bulk!), its local products, farmers, and producers, community partnerships forged, and a vast number of sustainability strides made over the last decade.

Enjoy promotions and giveaways, tastings from local producers and farmers, raffle drawings daily, member-owner incentives, community offerings, family-friendly activities, and more. Everyone is welcome to take part in the region's Earth Festival on Saturday, April 22, from 12 pm to 4 pm.

## Earth Day Festivities 2019



The Co-op's annual Monadnock Region Earth Festival celebrates some of the many things that make the region special.

- A commitment to ever-greater sustainability.
- Healthy communities for all.
- Preserving and sustaining our planet, which is increasingly threatened by the impacts of climate change.

Join the Co-op in learning about what others are doing and making, buy delicious whole foods, meet local farmers and producers, learn something new, enjoy performers and activities throughout the Co-op, Railroad Square, and amphitheater (behind Monadnock Food Co-op), and celebrate all the things we are doing well and renew our commitment to keep striving ever onward.

Learn more at <https://monadnockfood.coop/event/earthfest/>. ♻️

## CSA: RESILIENT ECONOMY AND FOOD – Cont'd from p.20

government, Whatley devised methods to support them through the winter, advocating in the 1960s for what he called "Clientele Membership Clubs." Members would pay during the off-season for produce that they would receive during the coming growing season, effectively supporting farmers through the unproductive months. These clubs were the central part of Whatley's plan for a successful small farm as they make the winter months easier logistically and financially.

Many components of a CSA as we know it today --commonly a share is a box of in-season produce picked up weekly -- are borrowed from programs first run in 1986 at Temple-Wilton Farm in Wilton, NH and Indian Line Farm in South Egremont, MA. The CSA movement effectively supports farmers through off-seasons when input costs for seeds, labor, and planning are high but income is low, exactly as Whatley intended more than half a century ago. With fewer financial worries, farmers can focus their energy on improving agricultural methods to best support their environment, employees, and communities. You can help create a



Art courtesy of Cedar Circle Farm and Education Center, East Thetford, Vermont. (Cecily Anderson)

more resilient local economy and food system by joining a CSA through your local farm.

Much of the information for this article comes from "You Can Thank Black Horticulturist Booker T. Whatley for Your CSA," written by Shelby Vittek for *Smithsonian Magazine* in 2021, and from a 1982 interview with Whatley by *Mother Earth News* titled "The Small Farm Plan."

Eva Barta is the Marketing Assistant at Cedar Circle Farm and Education Center in Thetford, Vermont. Cedar Circle is a nonprofit, certified organic farm committed to developing regenerative agriculture systems that build connections between our food, ecosystems, and community.

More at [www.cedarcirclefarm.org](http://www.cedarcirclefarm.org). ♻️



## SHOP CO-OPS

Co-operatives are businesses that are member-owned collectively managed by paid staff and a member-elected board of directors. Values include democracy, self-help and a concern for families and the community.

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# Earth Day-April 22, 2023

N.R. Mallory

April 22, 2023 marks the 53rd annual Earth Day celebration of our planet, with the theme "Restore Our Earth." This year's event is a call to action to protect the environment and promote sustainability. One of the most important ways to reduce our impact on the environment is through the adoption of clean, renewable energy sources such as solar power.

Solar energy is an important necessity to reduce our dependence on fossil fuels and cut down on greenhouse gas emissions. In addition to its environmental benefits, solar power brings cost savings, job creation, and economic growth. The widespread use of solar energy is an essential step in fighting climate change and securing a sustainable future.

Another way to reduce our carbon footprint is through the transition to electric vehicles (EVs). EVs produce no emissions and are powered by clean, renewable energy sources. They also offer cost savings over traditional gasoline vehicles through lower energy costs and less maintenance. The widespread adoption of EVs is critical to reducing air pollution, combating climate change, and ensuring a sustainable future.

On Earth Day, individuals

and communities around the world come together to raise environmental awareness and take action to protect our planet. Despite the ongoing pandemic, there are still many ways to get involved, such as reducing your carbon footprint through small daily changes, participating in local community events, and supporting environmental organizations.

This Earth Day, consider making a commitment to reduce your carbon footprint by conserving energy, reducing food waste, and using environmentally friendly products. Participate in local community events and projects, such as clean-ups and tree-planting initiatives, to give back and protect the planet. And support organizations working to address environmental issues by volunteering or making a donation.

By embracing clean energy like solar and EVs, and taking action together, we can "Restore Our Earth" and secure a healthy and sustainable future. Investing in renewable energy and electric transportation are essential steps towards a greener and more sustainable future, and Earth Day serves as a reminder of our shared responsibility to protect our planet for future generations.

Visit [www.earthday.org](http://www.earthday.org). ♻️



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## Herbivores Help Slow Climate Change? Cont'd from p. 35

their places in the daily and annual cycles of the system. Pigs, rabbits, and domestic turkeys are in the mix. Each has its own place. Each does its own share of the farm work.

Moving the animals means that the soil does not have a chance to become a haven for pathogens. Also, about 80% of the farm is woodland, and the wood edge is important for keeping everything in balance. Wild turkeys live in the woods, but they feed in the pasture, eating ticks, among other things.

Over the years, bare rock has been covered by thick soil. In 1961, ten acres would support one cow. Now, less than one acre is needed. But the land supports lots of other animals as well as cows. The soil has built up, drawing down carbon dioxide. No pesticides are used, and no chemical fertilizers. The farm doesn't spread seeds for the plants the animals eat, because it is not necessary.

Salatin says with a high carbon content, the soil draws down more carbon dioxide. But also, some bacteria consume methane. We found that hard to believe. But it turns out to be true, according to a paper published in 2019 in *Proceedings of the National Academy of Sciences* (<https://bit.ly/methane-eater>). Of course, to get the bacteria to work for you, it is necessary to stop killing them with chemicals.

Polyface Farm sells what it grows, but only locally. Their suggestion is that anyone who wants to get good quality food, buy it from local farmers. They provide a web site to help people find local farmers: [www.eatwild.com](http://www.eatwild.com).

Polyface Farm's website is [www.polyfacefarms.com](http://www.polyfacefarms.com). (Note the 's' in the name.)

There are many sources, and listing a few would make the focus too narrow. We suggest that those interested in learning more search the web and youtube.com for either of two terms: "Joel Salatin" and "Polyface Farm." Also, Salatin has written about a dozen books that are in print. ♻️

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