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The Changing Climate Impacts To Retirement Planning

Jessie Haas

blogspot.com

It used to be a given; the best states to retire to, for winter-weary Northerners, were Florida and Arizona, both of which have seen huge population surges. But the summer of 2023 was simply unbearable in both states, with weeks of record, triple-digit heat, turning many people's retirement dream into a nightmare.

Retirees often choose southern states hoping to spend many more days outdoors. But when it is over 100ºF degrees, outdoor recreation is not only no fun, it is dangerous, especially for seniors. Of two dozen heat-related deaths in Maricopa County, Arizona, this summer, half the deceased were over 65. Heat worsens common age-related health problems like heart, lung, and kidney disease. Older people are often less effective at sweating, a natural cooling mechanism. Prescription medications like anticholinergics, prescribed for digestive and lung problems, make the problem even worse. Beta-blockers and diuretics, combined with extreme heat, can cause dizziness, dehydration, and delirium. Blood pressure medications often come with a warning to avoid becoming overheated. Good luck with that!

Health concerns aside, heat has other ways of impacting your retirement. You may be able to turn on the AC to keep cool, but that can lead to high energy bills, and the disquieting knowledge that keeping yourself comfortable is only worsening the global problem. Staying indoors in hot weather makes sense, but can lead to isolation, depression, and a loss

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Staggering Growth of Renewable Energy – Good-paying Jobs are Growing, too

George Harvey

Renewable energy jobs are growing for everyone. Here, a woman works as a battery technician. (Courtesy of Enel North America)

Many young students who will graduate in the spring are already actively looking for jobs. Others, who will graduate after that, are starting to give the matter some serious thought. For all of them, there is some really good news. Some types of jobs will be ready and waiting for them. And they are not just good jobs, some are really good jobs. And they are not just available now, they will continue to be available for the foreseeable future.

Another nice aspect of this is that the jobs we are talking about provide a way for young people to earn good pay while they join the fight against climate change. These jobs are in renewable energy and related fields. We need solar designers and installers, wind turbine installers and technicians, electricians, heat pump specialists, and other workers in clean energy. Young people can earn good pay while they save the planet for the future -- their own and their children's.

Several years ago, I came across two pieces of news that fit together to create a fascinating picture. One was that more than half of the wind turbine technicians in Massachusetts had been working on wind turbines for less than one year. The other was that the median pay for wind turbine technicians in that state was upwards of $50,000 per year. Those two facts together provide the

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Celebrating Holidays 2023

Tweak your Holiday Traditions to Make them Green(er)

Janis Petzel

Looking for an eco-friendly alternative to gift wrapping paper this holiday? Try the ancient Japanese art of cloth wrapping, furoshiki to gift goodies without adding to landfills this holiday season. (pleinvanity.com). Giving thanks on Thanksgiving day and throughout the holiday season is a sustainable way to show appreciation for friends, family, health and food that is locally-sourced or home-grown. (AdobeStock_357644483)

No matter which holidays your household celebrates, the joy comes from spending time with family and friends, sharing traditions and special food, and exchanging gifts. But all of the travel and overindulgence results in waste and elevated carbon pollution, up to 1.5 tons of carbon dioxide per person each year.

One of the more distressing factoids I uncovered while researching this article is that close to half of the toys and gifts given at this time of year are broken or rejected before the spring equinox arrives. And the wrapping for all those wasted gifts? Americans send well over two million pounds of un-recyclable wrapping paper to landfills each holiday season.

There must be a better way. What could be a better gift than a cleaner environment for the people we love? Is it possible to clean up our acts for the holidays? Waste is one big culprit, so let's start there.

Maybe kids would appreciate the gifts they receive a little more if they didn't get so many of them? Don't I sound old and grinchy when I say that? When my children were little, we bought them too much stuff. They would start to play with a toy and we would interrupt them to open the next thing in the pile. After everything was open, what did they play with? The boxes. Maybe that should give us grownups a clue. Children like things that stimulate their imaginations. If they like a gift, they want to spend time with it. They do not need mountains of stuff to be happy. I encourage you to shop as local as possible and avoid plastic junk as much as possible. Gifts of experiences outlast the holiday let down, especially if the child gets to spend time with you to enjoy the gift--museum passes, memberships to the YMCA pool, tickets to a concert.

To avoid paper waste, get creative with wrapping—pillowcases or kitchen towels can be used after the holidays and are a decent gift on their own.

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Concentration of CO2 in the Atmosphere

418.53
parts per million (ppm)
October 8, 2023

Learn more at www.CO2.earth.

IN THIS ISSUE

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

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LETTER FROM THE PUBLISHER

Happy Fall to All of Our Readers!

It was quite the summer for pretty much everyone around the world. How there can still be climate-change deniers boggles my brain. What will this season bring us?

As Dr. James Hansen stated on August 14, 2023, we have entered "A new climate frontier. The leap of global temperature in the past two months is no ordinary fluctuation. It is fueled by the present extraordinarily large Earth's energy imbalance (EEI). EEI is the proximate cause of global warming. The large imbalance suggests that each month for the rest of the year may be a new record for that month. We are entering a new climate frontier."

In this edition of *Green Energy Times, we* did not cover the recent flooding in New York City and New Jersey because it amounts to every day news -- not to lessen the gravity of the situation. I feel quite certain that most of our readers know why this is happening.

The big question here is if we each are doing enough in our own lives to become more resilient to the changes we are now experiencing -- and know will only worsen. We cannot stand back and wait to see what the government will do. Yes, we need to advocate strongly a need for our governments to do more. Waiting for them can put each of us in harm's way if we do not do more somehow, some way. Where there is a will, there is a way!

We have the colder winter months approaching. No matter how cold it does or does not get, we need to be ready for it. This is where it is so important to quickly try to reduce our dependence on fossil fuels. Using fossil fuels for heating only makes the future harder and harder to deal with. Then there is the ever-rising costs to continue to use them. We are very confident that making the change will mean more money in your pocket in the end.

How do we keep warm without using fossil fuels?

- Tightly seal and thoroughly insulate your home or business.
- Consider replacing your heating system with one of the many options that we present to you in our "Heating without Fossil Fuels" feature (see pages 20-24).
- Get some solar pv to offset the costs of electricity to any degree you can.
- There are incentives, rebates and IRA money for weatherization, solar, heating options and private programs to help you do all of this. In the end, you will honestly be saving yourself plenty of money that will not be spent on fossil fuels any more.
- When that is done, replace your cooking range with an efficient induction cookstove and compatible cookware. (New cookware -- with some ferrous content -- just might go on your holiday gift list!).

With the continuing rains in the northeast at the start of October 2023, this is how it looks nearly every where. The ground can simply not absorb any more rain.
(Photo by Aaron Burden on Unsplash)

The **three biggest aspects of our lives that add to our higher cost of living as well as emissions into our atmosphere are:** buildings leaking emissions, heating emissions and waste from leaky buildings, and our transportation. If you could focus on each of these sectors in your life and figure out a way to make improvements, then lower emissions and lower costs will result. And THEN you can focus on the "small stuff' like **making your holidays more sustainable and by that we mean, to create less or no waste.** With many holidays ahead, we have many steps to take: Halloween, Thanksgiving, Hannukah or Christmas and New Years -- all before Valentines Day in 2024. Be sure to read our Holiday article starting on the front page..

Clearly we all have a lot to do. I hope this edition of *G.E.T.* will help you as we watch the changing leaves turn to snowflakes piling up.

Act Local. Think Global. Think Climate.
– Nancy Rae Mallery ♻

"You cannot get through a single day without having an impact on the world around you. What you do makes a difference. You have to decide what kind of difference you want to make."
— Jane Goodall

Late-breaking News

Don't get depressed by the bad news – just read on and you will see the hope.

- Summer of 2023 was the hottest on record by a wide margin. Because of renewable energy that has been added to the grid, however, the serious power outages that can accompany hot weather did not happen. (https://bit.ly/GET_LBN_1)
- In late September, a study confirmed that the Gulf Stream has slowed by 4% in the last 40 years. The study was published in Geophysical Research Letters. (https://bit.ly/GET_LBN_2)
- Prices of gasoline have been going up quickly in some parts of the United States due to an increase in the price of crude oil. At some stations in the Los Angeles area, the price of a gallon of gas has hit nearly $7 per gallon. (https://bit.ly/GET_LBN_3)
- This summer has been the driest on record for Phoenix, Arizona, and the records go back to 1895. During the rainy monsoon season of over three months, the city had a total of 0.15 inches of rain. (https://abcn.ws/46KlBm0)
- Despite bad news on climate change, Fatih Birol, executive director of the International Energy Agency said the "staggering" growth of green energy resources gives him hope that we can limit global warming to 1.5°C. (https://bit.ly/GET_LBN_4)
- MidAmerican, a large utility in the Midwest, announced that its customers in Iowa got all of their electricity from windpower in 2022. (https://bit.ly/GET_LBN_5)

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First-Ever White House Climate Resilience Summit

In conjunction with White House Summit on Building Climate Resilient Communities, Administration announces more than $500 million in additional investment for resilience

Across the country, Americans are experiencing the devastating impacts of climate change. In just the first eight months of the year, there have been 23 separate billion-dollar weather and climate disasters – more than any other year on record. And the longer-term effects of climate change – including sea-level rise, hotter average temperatures, changing precipitation patterns, and more – are affecting every corner of society and every community in America.

That is why President Biden is leading the most ambitious climate, conservation, and environmental justice agenda in history. President Biden is fulfilling a commitment he made in June to host the first-ever White House Summit on Building Climate Resilient Communities. This Summit, which will include representatives from more than 25 states, territories, and Tribal Nations, underscores the Administration's commitment to solutions that will both dramatically reduce greenhouse gas emissions and better manage climate threats, and recognizes the importance of locally tailored, community-driven strategies.

The summit will amplify the leadership of climate resilience practitioners nationwide – the construction workers, educators, resource managers, city and state resilience officers, emergency managers, local and Tribal leaders, and many others who are striving to help their communities adapt to today's climate impacts and prepare for future climate risks. It also provides an opportunity for practitioners and senior Administration officials from more than 15 federal departments and agencies to jointly discuss needs and opportunities for future climate resilience efforts, including maximizing the impact of the more than $50 billion for climate resilience in President Biden's Investing in America agenda, as well as President Biden's Emergency Plan for Adaptation and Resilience (PREPARE), which builds climate resilience in developing countries.

Utility workers repair climate-related damages more often than ever. Image from Pexels. (https://bit.ly/Utility_worker)

In conjunction with the Summit, the Administration is releasing the National Climate Resilience Framework, a vision for a climate resilient nation designed to guide and align climate resilience investments and activities by the federal government and its partners. The framework identifies common principles and specific actions to expand and accelerate progress towards six objectives.

Additionally, the Administration is announcing today more than a dozen new actions – including the awarding or availability of more than $500 million in dedicated funding – to help build a climate resilient nation, and commitments from major philanthropies to expand financial support for climate resilience and align investments with national climate resilience priorities.

The September 28th announcements come on the heels of a historic stretch of actions and investments through President Biden's Investing in America agenda to bolster climate resilience nationwide. Just last week, President Biden took executive action to launch the American Climate Corps – a workforce training and service initiative that will mobilize more than 20,000 young Americans to help build a more sustainable, resilient nation. And in the past months, the Administration has also invested billions to combat extreme heat and storm-induced flooding by expanding urban forests, build community resilience to extreme weather, and strengthen the security and sustainability of the electrical grid in rural communities, Puerto Rico, and Hawaii.

The actions described here are listed at the *Green Energy Times* website found here: https://bit.ly/Biden_fact_sheet. ♻

The Markets Are Proving They're Ready for Clean Energy

Carl Pope

Rarely has the chasm between global reality and global diplomacy loomed larger. Over the past several months the urgency of the climate threat has exploded as tipping points we thought were decades away pound at our doorways; we suffer on a daily basis the hottest weather in hundreds of thousands of years; an entire American city vanishes in flames, while one in *Libya* vanishes beneath a crumbling dam *after a stronger-than-normal storm*. At the same time, the economic benefits of rapid decarbonization have been spectacularly on display across the world, as China uses its investments in electric vehicles to challenge Europe's engineering finest automotive engineering at the *recent* Munich auto show.

Energy traders watching the market rise and fall. (public domain)

The week of September 21, 2023 signals the opening round *of* climate diplomacy season, as the UN General Assembly and the Secretary General's Climate Summit convene in New York. Climate scientists just issued their stocktake of the horrifying state of the national commitments made since the Paris Agreement; it revealed that existing pledges barely nudge us towards the essential 2030 benchmark of cutting emissions almost in half.

India's leadership of the just concluded G20 had to stretch hard to extract verbal global support for a vital annual tripling of global investments in renewable energy to replace coal, gas and oil – and the implementation commitments remained on the table. It's not that we can't afford it.

Renewable electrons are cheaper than those from polluting hydrocarbons – but the monopoly utilities that would lose out in an efficient market for clean electricity are not budging. Nor have the unbelievable profits of the oil industry prompted them to stop venting and flaring so much of the fossil methane they extract that so called *natural* gas—which they tout as a cleaner alternative to coal – is in practice, often just as dirty.

If we want better climate survival odds, we better tell our leaders that it is time to act on everything we can agree on. If it's good for the climate and the economy, it needs to happen – now.

Climate diplomacy needs to stop defending the fossil past, and instead accelerate the clean energy future that the market is ready for. It should start this week in New York.

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

Mr. Pope is also the author of the books: Sahib, An American Misadventure in India and Hazardous Waste In America. *Carl Pope is the co-author with Michael Bloomberg of* Climate of Hope: How Cities, Businesses, and Citizens Can Save the Planet. *How to attack climate change as a series of manageable challenges, each with a solution that can make our society healthier and our economy stronger.*

*"To learn more about Carl's views on the environment, energy and climate, read "*Climate of Hope*" which he has co-authored with former NYC Mayor Mike Bloomberg and which can be purchased online or from your local book store.*

From Carl Pope's Blog, TAKING THE INITIATIVE, *September 21, 2023.*

This article was published earlier in Bloomberg. ♻

Late Breaking News – Cont'd from p.2

- Goats are helping prevent wildfires in Southern California. They can eat woody shrubbery, reducing the amount of fuel available for fires. (https://bit.ly/GET_LBN_6)
- New York State is moving ahead rapidly on renewable energy and electric vehicles. There are stories about some of the accomplishments in this issue of *Green Energy Times*. How many accomplishments? See pages 4, 7, 9, 21, and 35 of this issue.
- Deployments of battery energy storage systems in the United States is expected to be more than 10,000 megawatts this year. (https://bit.ly/GET_LBN_7)
- Wind power capacity is expected to grow 10.1% annually and hit 2.38 terawatts globally by 2032. That amount, 2.38 terawatts, is equal to 2,380,000 megawatts. (https://bit.ly/GET_LBN_8)
- Wright Electric says it is developing batteries with an energy density of 1,000W per kilogram. At that density, it should be possible to use aircraft carrying 100 passengers on flights of up to one hour. The first aircraft might be running commercially in 2026. (https://bit.ly/GET_LBN_9)

Wind turbines in Iowa (Drew Hays, Unsplash, bit.ly/3rKySfq)

- Adding a heat pump water heater to a home could easily save enough electricity in a year to charge an electric vehicle for the same year. (https://bit.ly/GET_LBN_10)
- Uruguay was in economic doldrums in 2007 because its industries were growing faster than the electric supply. A decision was made to provide extra electricity from wind farms, and now the country is out of the doldrums in 98% powered by renewable electricity. (https://bit.ly/GET_LBN_11)
- To reach its sales goals for this year, Tesla is reducing its prices on some models of electric cars. (https://bit.ly/GET_LBN_12) ♻

Vermont's Electric School Bus Success Story

South Burlington Schools celebrates one year of successful clean electric bus transportation for students across the district.

Burlington, Vermont school district's four electric buses completed more than 30,000 miles of clean driving last year, offsetting more than 100,000 pounds of CO2 equivalent emissions, and were ready to get rolling when students headed back to school on August 30. Bi-directional chargers allow electricity to flow from the grid to charge the electric vehicle's (EV) battery and also to flow from the battery to the grid. South Burlington's installation included four bi-directional chargers allowing the district to share energy stored in the buses' batteries during periods of peak energy use. Synop, a software company for EV fleets, manages the Vehicle to Grid (V2G) transactions through its charging and energy management platform. When stored energy in the buses is transferred to the grid, it is the equivalent of taking about 80 homes off the grid during those peak energy times.

Four electric buses from Highland Electric Fleets joined South Burlington, VT's school district. (power-grid.com)

The South Burlington District received a $965,000 Vermont state grant from the VW Environmental Mitigation Trust Funds to help purchase the buses. Green Mountain Power (GMP) provided additional incentives towards the buses and V2G chargers. Based on the reduction in carbon emissions the project was estimated to achieve the equivalent of taking 905 gasoline powered cars off the road. Fossil-fueled transportation is a major source of carbon pollution in Vermont, and switching to driving with clean electricity is the biggest step we can take to help reach emission reductions goals. GMP's energy supply is 100% carbon free on an annual basis.

OK, How About in Winter?

As a result of another Vermont initiative, the State's Department of Environmental Conservation issued a report in June of this year on its Vermont Electric School and Transit Bus Pilot Program project conducted by the Vermont Energy Investment Corporation (VEIC). The two-year vehicle testing period ranged from spring of 2021 through spring of 2023.

One of the project objectives was to determine how the buses would perform in cold weather. The project found mixed results:

> "It is feasible to operate electric school and transit buses in Vermont even in cold weather and varied terrain. The success of that implementation, particularly in winter, may vary between bus manufacturers. Some brands performed well in winter, and some failed to perform at all. Among the buses that were in-service in the winter, some buses performed better than others. Charging equipment performance remained a persistent issue for all sites year-round … however, most electric buses performed well on daily routes with more than enough battery range, even in cold weather. All project partners realized fuel cost savings and greater efficiency over their diesel counterparts. In-service days showed the greatest variability. One bus had a perfect service record (a Lion bus) while others were out for significant periods for service."

While South Burlington's Thomas Built school bus model was not included in the VEIC study, a similar bus performed well in Alaska over the winter months. The big issue there was keeping the interior of the bus warm – it required more energy to do that than drive the vehicle!

Keeping passengers warm in winter is a concern in colder climates: some electric bus manufacturers resolve this by providing diesel-fueled heaters, reminding us that part of the efficiency of electric vehicles is that they do NOT generate much waste heat, which provides the heat we take for granted from fossil-fueled vehicle "heaters." A solution previously used in some earlier air-cooled gasoline powered vehicles with heat management issues, most notably Porsches, gasoline-fired heaters kept passengers warm on chilly days.

No information was provided about the consumption of diesel fuel for the heaters compared to consumption of fuel, and related emissions, of diesel-fueled buses.

What Else?

In addition to the greenhouse gas (GHG) emission reduction, electric buses provide cost benefits as well.

Traditional diesel school buses get an average of 8 miles per gallon (mpg), dismal, but better than city transit buses that clock in at an astonishingly low 4 mpg. As the Vermont Department of Conservation's report shows, the GHG savings resulting from replacing transit buses with electrics is more compelling than for school buses. However, the additional benefit of eliminating diesel exhaust particulate emissions around kids is significant, and integrating school bus batteries in a "smart grid" promises future cost and GHG reduction benefits.

Electric school buses are three times as efficient as diesel buses when comparing diesel fuel miles-per-gallon to electric versions' miles-per-gallon equivalent as measured in miles per kilowatt hour of electricity used. Maine discovered that the cost of charging them was 40% to 75% cheaper than fueling diesel versions, depending on variations in diesel fuel and electricity costs. They also anticipate reduced maintenance costs due to fewer parts and the reduced brake wear of regenerative braking. The VEIC report however notes that because of the higher upfront costs of the electric buses and the charging equipment, "[without the funding sources available to help offset the cost of the project for each partner, buying electric buses outright would have been cost prohibitive." Nevertheless, electric school bus providers maintain that their buses are cost-competitive with diesel versions considering the lower fuel and maintenance costs over their lifetimes.

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

ZERO-EMISSION BUSES WILL SOON BECOME A HALLMARK IN NYS

GET *staff*

In late September, New York Governor Kathy Hochul announced that $100 million will be made available for zero-emission school buses. The funding comes through the $4.2 billion Clean Water, Clean Air, and Green Jobs Environmental Bond Act of 2022. New York has goals of having all new school buses sold in the state be zero-emission types by 2027, having all school buses on the road be emissions free by 2035, and reducing the state's overall emissions by 85% by 2050.

The funds will be available to help school districts and bus operators statewide to phase out fossil fuel buses, curb emissions, and make zero-emission buses more affordable. The Bond Act supporting this goal includes an allotment of $500 million for zero-emission school buses and the infrastructure they require.

"The commitment of public funds and guidance released today puts New York State schools and bus operators on a trajectory to embrace clean transportation and the benefits that it will bring," Governor Hochul said. "Zero-emission buses will become a hallmark, not only transporting students through our communities, but also demonstrating the promise and possibility of a healthier, environmentally friendly, low-carbon future for our youngest citizens."

"The Power to Change the World" painted on the side of a Smith electric school bus. No exhaust pipe needed! (Laura Gichrist/Flickr)

To qualify for the New York School Bus Incentive Program (NYSBIP), which is releasing the funds, a dealer or manufacturer of buses has to apply and show that the buses it plans to sell are in compliance with the program rules. The rules were released by the New York State Energy Research and Development Authority (NYSERDA).

The NYSBIP offers a point-of-sale incentives enable discounts for eligible school bus fleet operators. The buses themselves must be zero-emission battery-electric or hydrogen fuel cell electric types. Funding for the infrastructure to charge or fuel them is also available.

The amount of funding available is intended to offset part or all of the difference in the purchase prices of the zero-emissions bus and a comparable bus with an internal combustion engine. Funding for the buses is available to manufacturers and dealers. Funding for the charging or fueling infrastructure is available to the owners of the fleets that will operate them.

The Environmental Bond Act requires that special attention be provided for disadvantaged communities. They will receive at least 35% of the total funding distributed, though the goal is to have them get 40%, and that is the goal NYSERDA is striving for. Greater assistance is available for such communities. ♻

2023 Clean School Bus Rebate Program

The EPA has announced the 2023 Clean School Bus (CSB) rebate program. This is the 2nd rebate funding opportunity through the multi-year funding program. Under the 2023 rebate program, the EPA anticipates awarding at least $500 million in rebate funding with the potential to modify this figure based on the application pool and other factors. Find more info at EPA.gov.

Eligible applicants can apply to receive funding for the purchase of up to 25 zero-emission (ZE) and clean school buses, along with ZE charging infrastructure and eligible workforce development costs. Selectees may be eligible for Inflation Reduction Act (IRA) tax credits applicable to their bus and infrastructure purchases. For example, le: the Clean Vehicle tax credits for qualifying school buses are worth up to $40,000.

The EPA is prioritizing applications that will replace buses serving high-need local education agencies, rural areas, tribal school districts funded by the Bureau of Indian Affairs and public school districts receiving basic support payments for students living on tribal land. In addition, the EPA is committed to ensuring the CSB program delivers on the Justice40 Initiative that at least 40% of the benefits of certain federal investments flow to disadvantaged communities.

Applicants must submit all application materials by January 31, 2024. ♻

Used EVs – Range Loss Versus Range Improvement

Jesse Lore

One of the biggest concerns people have about making the switch to an electric vehicle from an internal combustion engine is the life of the battery. The battery can often represent 30% of the cost of the vehicle, so battery failure would certainly be a devastating blow. The manufacturers of these vehicles, across the board, have taken this into account and offer warranties of eight years and 100,000 miles on the battery, guaranteeing it works up to 70% of its original capacity. And the good news is that battery failure is exceedingly rare. A study this year by *Recurrent Automotive* showed that only 1.5% of all EV batteries have ever been replaced, going back as much as ten years with the Nissan LEAF.

But for a used EV purchaser, where the battery warranty remaining is less than the original warranty and the remaining battery life may not be the same as when the vehicle was new, the questions remain: how healthy is the battery of this vehicle I am purchasing? How much range am I going to get if I buy an electric vehicle used versus buying a new one? The reality is that EVs are showing both range loss and range improvement, years after their original in-service date. At Green Wave Electric Vehicles, we have observed and studied these phenomena and can share our experiences and research.

First, let's talk about range loss. Lithium-ion batteries exist in so many of the products we use every day, from our tools to our computers and cell phones. We are all familiar with the battery depletion that we experience with these products. But while EV batteries are generally made from the same materials, they have sophisticated battery management systems (BMS) to prevent diminishing capacity. These systems include capacity buffers which make the usable capacity less than the total capacity. This prevents over-charging and over-depleting, which are detrimental to batteries. They also have conditioning systems that optimize battery temperature during charging and use. They also have computer systems that analyze the battery, the energy draw, and the driving style and climate control usage (heating the vehicle cabin takes a lot of electricity); these computers give a real-time battery health report to the driver in the form of its range meter.

The team at Green Wave Electric Vehicles where many used EVs can be found. (Courtesy photo).

Working together, these elements of the BMS have told a fairly consistent story: batteries do not lose that much capacity in normal operation. *Auto Week* reported in 2022 that up to about 300,000 miles, EVs are going to lose about one to three percent of their range per year, with a more pronounced degradation in the first two years, and then "a slow decay of approximately seven percent in 175,000 miles." So, if you purchase an EV with 250 miles of original range, you can expect about 230 miles of range after 11 years. Not too bad!

But range improvement is possible as well! There are a couple reasons that you might find a used EV to be showing greater range than the original EPA-rated range: (1) Recall-related battery replacement (like on the Chevy Bolt or Hyundai Kona EV), and (2) Improvements to the BMS through over-the-air (OTA) software updates.

First, the battery replacements. Chevrolet responded to a NHTSA safety recall on its Bolt EV batteries in late 2021, announcing that they would replace all batteries on 2017 and up model years related to fire risk. The original battery was a 60 kilowatt-hour battery, rated to deliver up to 238 miles of range. But the battery they replaced it with has a capacity up to 66 kWh, and the range displayed on these vehicles can show 250 miles or more on a full charge.

Next, let's look at the magic of OTA BMS improvements. In late 2021, Ford sent owners a letter indicating that they would deliver software updates that would give Mustang Mach E owners "improved range in cold weather." At first, this update was only available via a trip to the dealership. But by the following year, owners were able to get these updates to their vehicle while they slept. I am a Mustang Mach E owner myself, and I woke up one morning to find my EV showing 286 miles on the range meter at full charge; the EPA range for my car is 270 miles when it was new. This phenomenon also occurred with the Volvo C40 and XC40 Recharge Pure Electric, which went from 208 to 223 miles in range, as reported by *Car and Driver*.

If you are shopping for a used EV, the best thing to do is to check out the range on the gauge cluster when you turn it on. To figure out the total maximum range, you can divide the shown range by the state of charge percentage. So, if the range meter is showing 100 miles of range at 45%, you know the max range is about 222 miles (100/0.45=222). Better yet, ask your dealer for an independent battery health report, like the ones provided by Recurrent Automotive. The bottom line is that you can buy a used EV with confidence and get great range – if you know what to look for and what questions to ask. Learn more at GreenWaveEV.com.

Jesse Lore is the owner of Green Wave Electric Vehicles, a great place to find a used, affordable EV. ♻

The display on the Chevy Bolt shows great battery health of 271 miles at 100% charge. Each green bar represents 5% of battery charge. (G.E.T. *staff)*

Watts Up with Workplace Charging?

Peggy O'Neill-Vivanco

According to McKinsey and Company, electric vehicle (EV) sales in the United States have grown 40% since 2016. For a number of years EVs were out of reach for many, but now it is more affordable than ever to buy an EV.[1] With federal tax credits, state and utility incentives, many EVs are on par with the price and performance of comparable gas-powered vehicles. However, charging infrastructure has lagged behind and many Americans cite charging and battery concerns as a reason for not switching to an electric car. According to a 2023 Workplace Charging Barrier Study by Cadeo Group, "workplace charging can alleviate range anxiety thereby encouraging EV adoption across diverse segments of population... and... can further ameliorate unequitable distribution of charging infrastructure when sited in underrepresented and overburdened communities."[2]

Thanks to funding support from the U.S. Department of Energy, a new project takes insufficient charging infrastructure head on. **Equitable Mobility Powering Opportunities for Workplace Electrification Readiness** (or EMPOWER) is the first and only equity-focused, nationwide workplace charging program in the United States, and is led by Columbia-Willamette Clean Cities with East Tennessee Clean Fuels Coalition, over 30 Department of Energy Clean Cities Coalitions, and industry partners. Vermont Clean Cities at UVM's Transportation Research Center, Granite State Clean Cities and Maine Clean Communities Coalitions are leading the implementation of this national workplace charging alliance in our states by working to simplify the transition to EVs for all, by expanding charging infrastructure and by making charging convenient, accessible, and equitable.

Why focus on Workplace Charging?

Vermont and Granite State Clean Cities aim to address the electric charging speed bump through EMPOWER by providing technical assistance to help install EV chargers in workplaces across the Northern Tier of New England. One of EMPOWER's specific goals is to ensure that 40% of the EV chargers installed will be at workplaces with historically underserved work forces. This includes workplaces owned by women or minorities, workplaces with majority-minority workforces, or with employees who live in areas which are rural, formerly redlined, low-income, or have low air quality. For states like Vermont and New Hampshire, our underserved communities include rural areas with higher energy burdens, increased commuting times, limited home charging opportunities, and limited broadband access. Further, there are areas in our communities with a high number of rental properties and multi-unit dwellings, where home charging is not always a viable option. Workplace charging can provide a convenient location and fueling flexibility for those without dedicated home charging, as well as mid-day charging to benefit workers with longer commutes.

Our goals with this project are to provide education and outreach activities to employers and employees on the benefits of workplace charging; provide survey tools, energy calculators and EV information to help identify employee charging needs and help employers find answers to their charging questions, and the right fit to their workplace charging needs. With a focus on energy and environmental justice and underserved communities, we aim to get pledges from 12 to 15 employers in each state to install workplace charging.

NREL Image Gallery #61268 and iStockphoto #1209837227

What's in it for employers?

Vermont and Granite State Clean Cities staff can provide workplaces with free, direct technical assistance and consulting to help determine the best workplace charging plans for them – from hard-wired to off-grid, solar options. We can assist with assessing work sites for suitability and collecting information from employees to help determine interest and demand. We can provide resources and planning assistance for installation, signage creation, employee education, and company policy development. We can help connect organizations with utility partners, leading charging equipment manufacturers, certified installers, and other important vendors. We can provide information and updates on funding opportunities, and state and utility incentives that may offset the cost of purchase and installation Finally, we can provide statewide and national promotion of workplaces that help speed America's transition to electric transportation.

As fleets begin the transition to electrification, workplace charging infrastructure can serve employees and fleet vehicles in the right situations. Employees can pay appropriate fees for access to charging at work during the day, and fleet vehicles can utilize charging in off-hours.

By pledging to install workplace charging, employers across our states can demonstrate their social and corporate leadership by supporting sustainable transportation options, expanding equitable access to EVs by providing charging to employees with no dedicated home charging and accelerating the U.S. federal target of net-zero emissions by 2050.

*Peggy O'Neill-Vivanco is the Director of Vermont Clean Cities. To learn more about the EMPOWER project, contact O'Neill-Vivanco in VT (*poneillv@uvm.edu*), Jessica in NH (*jessica.wilcox@des.nh.gov*) or visit:* https://www.workplacecharging.com.

Major project partners working with Vermont Clean Cities include Burlington Electric Department, Green Mountain Power, and Two Rivers-Ottauquechee Regional Commission.

Major project partners in the Granite State include Eversource Energy, Liberty and Unitil.

Links available online at GET's website:

[1] McKinsey and Company. "Building the Electric Vehicle Charging Infrastructure America Needs."

[2] Workplace Charging Barrier Study. ♻

Lebanon, NH City Officials Thank EV-friendly Employers

Sherry Boschert

The City of Lebanon, N.H. publicly thanked 17 Upper Valley employers in New Hampshire and Vermont that offer employees some electric vehicle (EV) charging or have other policies promoting EV adoption. The city displayed the resolution at the Upper Valley EV Expo on September 30 at Lebanon City Hall.

Norwich EV charger installation at Orvis in Manchester, Vermont through the Green Mountain Power Workplace Charger Program. (Courtesy photo).

The resolution encourages other employers to get free help from a new federal program called EMPOWER that helps employers explore workplace charging, so that they do not have to figure it all out on their own. The northern New England contacts for EMPOWER are: Peggy O'Neill-Vivanco of the Vermont Clean Cities Coalition (poneillv@uvm.edu); Jessica Wilcox of the New Hampshire Department of Environmental Services (jessica.wilcox@des.nh.gov), and Jon Gagne of Maine Clean Communities (jgagne@gpcog.org).

Lebanon City Council Resolution Honoring EV-friendly Employers

WHEREAS, the Lebanon City Council is committed to promoting sustainable transportation options and reducing or eliminating greenhouse gas emissions; and

WHEREAS, electric vehicles (EVs) reduce emissions by two-thirds compared with gasoline vehicles, even after accounting for emissions created by electricity production (according to the U.S. Department of Energy), and EVs get cleaner as our electrical grid gets cleaner; and

WHEREAS, EVs save drivers money compared with comparable gas vehicles thanks to greater efficiency, lower fuel costs, and minimal maintenance; and

WHEREAS, the least expensive, safest, and most logical places to charge an EV are at home or at work, where vehicles typically sit for eight or more hours per day; and

WHEREAS, not everyone can charge at home – especially renters and residents of multi-unit housing – which makes the availability of charging at work even more important; and

WHEREAS, being an EV-friendly employer can help with recruiting and retaining workers who want to drive EVs; and

WHEREAS,

- Dartmouth Health provides more than 20 EV charge ports for employees at three sites (Dartmouth Hitchcock Medical Center, the Heater Road Clinic, and Alice Peck Day Hospital); and
- Hypertherm Associates provides at least seven charge ports at four of its buildings; and

Cont'd on p.17

Western Maine's EV Charger Network is Growing

With New Charging Stations, Western Maine's Foothills Become an EV-Friendly Community Center for an Ecology-Based Economy (CEBE)

The Center for an Ecology-Based Economy (CEBE) recently added four new electric vehicle charging stations, adding eight new plugs to their Western Maine EV charging network. This latest addition makes a total of 26 public plugs that the climate justice nonprofit has installed over the last eight years. The new ChargePoint Level 2, dual-plug chargers are located at Buck's Ledge Community Forest in Woodstock, the Paris River Park in South Paris, the Water Street trailhead for the Farm-to-Town trail to Roberts Farm in Norway, and at the Whitman Street parking lot behind the Fare Share Co-op in Norway. Also, the plugs at the Paris Police Station in South Paris and the Deering Street lot in Norway have been upgraded to dual-plug ChargePoint chargers. Exact locations of the charging stations can be found on PlugShare.com.

Funding from Efficiency Maine Trust, The Nature Conservancy, and an anonymous foundation helped make these upgrades possible. "Electric vehicles are in the future for many residents. Any way we can help with that here in Paris without putting the burden on the taxpayer is a good thing," said Dawn Noyes, Paris Town Manager. "Thank you to CEBE for helping Paris with grants to install two charging stations here in town."

With these recent additions to our Western Maine EV Charging Network, CEBE declares that the western foothills region of Maine is an EV-friendly community. Norway, Maine has a current total of 13 plugs with a population of 4,962 residents (2020). Neighboring Paris has a total of 10 plugs with a population of 5,187 residents (2020). That means there are roughly 382 residents per plug in Norway and 518 residents per plug in Paris. The density of EV chargers in the western foothills region of Maine is now higher than figures reported by GreenCars.com where they state that "five of the top 10 EV-friendly cities are located in California. San Francisco-Oakland was far and away the leader, with only 465 residents per charger, followed by San Diego in second place (824 residents per charger) and Los Angeles in third (852). Fresno (5th place, 1,024) and Sacramento (7th place, 1,111) also ranked."

"Having three networked dual-plug charging stations within a short walk of Norway's historic Main Street business district is an economic driver for the area," said Scott Berk, President of Norway Downtown. "We often see out-of-state cars charging downtown, which can only be good for the tourist economy." Norway's Water Street chargers also provide an opportunity to charge while hiking, skiing, or snow-

Cont'd on p7

The 2.1 MW Solar Project Near Albany Airport Joins an Increasing Trend

Roy Morrison

The New York Power Authority (NYPA) and Albany County are working on a new solar energy project near Albany International Airport. The ground mounted 2.1 megawatt (MW) solar array system on county property adjacent to the airport will produce an estimated 2.6-million-kilowatt hours a year.

"The completed system will help meet up to one-third of the county government's annual electric demand, energy costs will go down, grid resiliency will increase, and greenhouse gas emissions will be reduced," said Maribel Cruz-Brown, Vice President for Economic Development at the New York Power Authority.

What is particularly noteworthy about the project is that it will be linked with community education and training. Joe Dragone, Capital Region BOCES Senior Executive Officer, says his organization is implementing curriculum surrounding the new solar project. "We've had a long-standing relationship with NYPA. They donate their electric vehicles to us as we have one of the only EV curriculums in New York state. Another example of how this project focuses on the workforce of tomorrow that we are working so hard to do. And our friends at Siemens, we've been doing partnerships with them with STEM for years and years and years," Dragone said.

An Albany Airport project begun in 2019 was for covering 200 parking spaces in the long-term parking lot with a solar awning that would help power airport vehicle charging stations and garage and terminal lighting.

The ground-mounted 2.1MW solar array system on county property adjacent to the Albany, NY airport will produce an estimated 2.6-million-kilowatt hours a year. This system will meet up to one-third of the county government's annual electric demand. (Roy Morrison)

Solar should continue to increase future involvement in the airport. CATYL, the world's largest battery manufacturer is introducing in 2023 battery systems light enough and energy-dense enough to power aircraft. CATYL's condensed battery design creates a stable self-adaptive net structure for lithium-ion systems. Commercial production will begin in 2023 with initial applications for commuter scale shorter flights.

Aviation electrification will mean increasing airport solar PV development to charge batteries that will power planes. Zero fuel cost solar energy will replace expensive and high polluting fossil fuel jet fuel. The expanses at and near airports are increasingly viewed as ideal and available solar sites.

Dulles Airport in Washington is building a 200,000 panel, 835-acre solar system near runways that will be the largest U.S. airport solar project which will help support electric aviation. Dominion Energy is committed to building 16,000 megawatts of solar capacity that will meet Virginia law for 100% of its non-nuclear energy zero emissions by 2045.

In Nepal Gautam Buddha International Airport in Nepal opened in April 2022 and will install more solar on-site to become fully solar powered. When finished, 10 MW of solar power at Gautam Buddha International Airport will cost nearly $10 million.

In Southwest India, Cochin International Airport has a 40-MW solar power system with 92,150 solar panels on 94 acres near the international cargo complex. Cohin International is the world's first fully solar powered airport in the world.

Work on airport solar optimization is underway. A study by Sweden's Uppsala University using Matlab Simulink found that battery storage systems increase the daily aircraft capacity considerably. The importance of properly sizing and optimizing equipment and potential travel routes for battery electric aircraft.

Swiss Air is following another path. They are planning to use "sun to liquid" jet fuel. Neste, the world's largest producer of SAF (sustainable aviation fuel) claims its fuels reduce carbon emissions by 80% currently, using such as organic cooking oil and animal fat waste subject to chemical engineering processes. SAF is here now and in the process of becoming commercial. The future of aircraft powered by solar electricity or SAF remains to be seen. The transformation of energy consumption from fossil fuels to renewable energy is rapidly accelerating.

Roy Morrison builds solar farms. His latest book is The New Green Republic. Learn more at www.SunPartnersSolar.com *or send an email to* roy@sunpartnerssolar.com.

Source links will be available online. ♻

Maine's EV Charger Network – *Cont'd from p.6*

Deering Street has a ChargePoint EV charger with dual plugs. It is powered by the via solar panels installed on the kiosk. (Courtesy photo)

shoeing at Roberts Farm Preserve using the new Farm to Town trail. The Bucks Ledge chargers provide an opportunity to charge while hiking at Bucks Ledge Community Forest off of Route 26 in Woodstock, while charging stations at the Gem Theater and Maine Mineral and Gem Museum in Bethel invite EV drivers to cultural, dining and recreational opportunities in the mountain town. While Bethel's chargers, as well as some of the other more rural chargers in the region are not networked, CEBE encourages drivers to contribute through a QR code. "We are glad to support an electric car charging station in Woodstock," said Vern Maxfield, Woodstock Town Manager. "With the growing use of EVs, we saw an opportunity to provide charging in an area without easy access. That we were able to place it where users could be refreshed with a hike in the Community Forest while their vehicle's batteries are restored at the same time is a bonus."

"There is a common misconception among some area residents that they can't buy an EV because they don't see enough EV chargers in our community," said Tony Giambro, CEBE's Municipal Resilience Coordinator. "Although it's true that we still need more public chargers, this visibility issue is actually a hidden benefit of electric vehicles because of how well EV chargers blend into our community compared to gas stations. We hope that our recent EV charging network expansion will help improve the visibility of chargers and encourage EV adoption. However, the U.S. Department of Energy reminds us that 80% of EV charging is done at home due to the convenience and relatively low cost."

To date, CEBE has installed Level 2 charging stations in the towns of Norway, Paris, Buckfield, Hebron, Woodstock, Bethel, Oxford, Poland, Denmark, and Fryeburg. Because of the solar farm that was recently installed in Norway, and the solar panels that were previously installed on the Deering Street kiosk, all of the Norway EV chargers are being powered by the sun. Additionally, the three plugs at the Oxford Hills Comprehensive High School in Paris are powered by an on-site solar tracker, and the Paris Police Station will soon be powered by a rooftop array, thanks to a Community Action Grant that Paris received with CEBE's technical assistance.

The new ChargePoint chargers in Norway, Paris, and Woodstock charge a fee for charging, which is slightly more than the cost of the electricity provided to help CEBE cover costs and raise additional funds for future EV charging projects as CEBE's network grows to meet demand. CEBE requests that EV drivers don't abuse the remaining "free to use" chargers in the area as those are intended for people who need to charge while visiting or working in the area, not as a replacement for installing a home charger or paying for daily usage to support reliable public charging in the community. "As EVs become more prevalent, it is critical that we develop the infrastructure to support them," said Brad Plante, Norway's interim Town Manager. "This project is a great example of providing a service to the public along with a small amount of revenue for CEBE, a local non-profit working to increase the number of chargers in our community."

Federal tax credits are currently available for electric vehicle charging equipment for both residential and commercial use, as well as for qualifying electric vehicles. Efficiency Maine also offers a variety of rebates for EVs and EV charging equipment.

Find more information about CEBE at ecologybasedeconomy.org. ♻

MEET YOUR SOLAR INSTALLER

PLYMOUTH AREA RENEWABLE ENERGY INITIATIVE (PAREI)

PLYMOUTH, NEW HAMPSHIRE

George Harvey

Perhaps there is one thing we could stress about PAREI, the Plymouth Area Renewable Energy Initiative. It is that no matter how you describe it, PAREI is more than a solar installation business.

PAREI only installs solar systems at home sites of its members, all of whom live in or near Plymouth, New Hampshire. But PAREI does more than install solar panels; it also offers expertise and resources for sustainable community living that range from efficiency to agriculture.

This seems to have been true right from the beginning. When we asked Sandra Jones, PAREI's director and co-founder, when they started, she told us PAREI got its non-profit status from the U.S. federal government in February 2004. Its 25 founding members were concerned about saving oil, gas, and electricity. They wanted to learn about solar power, and they wanted to install their own solar systems, but they wanted much more.

Even as PAREI's founders were teaching themselves to install solar water heating systems through a neighbor-helping-neighbor process, and to inspire others to use solar energy, they knew that more than just a focus on solar energy was needed. For example, Sandra said that food is "part of the equation." So PAREI has been working holistically to address the shortcomings of a narrow approach to the needs communities and those who live in them. As they provide new paths to solar power, they also help farmers and gardeners, providing everyone with a source for information. And this is equally true for members and non-members. Along with developing and distributing expertise on conserving and generating energy, PAREI has run an on-line weekly farmers market called Local Foods Plymouth (LFP) since 2006.

Top: PAREI's Community Solar Shares Team. Bottom: the Solar Shares array in Warren, NH provides solar energy credits on the electric bills of nine local families in need of assistance. Appleknockers General Store generously donated their roof space to NH Solar Shares. (Courtesy photo)

14 panel roof mounted solar was installed on this residence via PAREI members. (Courtesy photo)

Jones told us there are three important actions in PAREI's plan: inform, inspire, and assist. The organization offers community-based consulting, but it provides one-on-one solutions. And this means helping other organizations do what PAREI is doing, in their own communities. One example is HAREI, in Hillsborough County, New Hampshire, which followed their mission.

A look at the programs at the PAREI website is informative. Just consider its programs for a moment.

NH Solar Shares helps get community solar systems built, with all of the benefit going to low-income families.

NH Rural Renewables helps small businesses and agricultural producers in the rural regions of New Hampshire, helping them evaluate and assess potentials for renewable energy.

The NHSaves Button Up Workshop Series gives guidance on energy-efficiency and building science. It can present a detailed presentation on the subject.

Local Foods Plymouth helps growers and consumers in a number of ways, including running an on-line weekly, year-round, local farmers' market at localfoodsplymouth.org.

The Farm to Community Food Sharing Program is specifically tailored to help food-insecure community members by bringing them farm-fresh, locally grown nutritious food.

Little Gardens Everywhere provides resources, including educational workshops, to the community. It is run to develop a diverse, abundant, accessible, and local food supply.

As we said, it seems no matter how you describe it, PAREI is more than a solar installation business, in fact they are not a business per se, they are a non-profit organization built on creating community solutions to assist their members to produce solar energy and reduce their energy consumption.

Even when it comes to designing and installing solar systems, PAREI stands out as a different sort of organization. Jones said, "The philosophy of PAREI is to work on one household at a time. Our members sign up for either an energy consultation or a solar energy analysis. We have over 1,500 in our database who are mindful of living and creating solutions to reduce their carbon footprint, in the way that works best for them. We don't tell them what to do, but give them options." Clearly, that involves a lot of consulting to find out what people want.

Part of PAREI's work is to inspire other organizations in New Hampshire. Jones said, "The state has come a long way, and we are primarily focused on the Plymouth area now. People come visit and see what we do. Anyone can join. There are many options members can take advantage of. We appreciate people's general support for our mission, too."

One thing PAREI is looking for currently is interest from New Hampshire businesses who want to support a local project that is meaningful to them in lieu of paying their NH taxes. "The Community Development Finance Authority via their Tax Credit program allows businesses to choose non-profits to support," Jones told us. "We were awarded the opportunity to sell $150,000 in tax credits to support PAREI's goals to strengthen our community programming and build our organizational capacity. If businesses are interested in learning more please give our office a call at 603-536-5030."

Jones also described an interesting approach to thinking about energy, regardless of whether they install solar systems or not. She tells people, "Just appreciate the energy. When you jump into your car and go to the farm stand, think of the amount of energy it takes to make that happen. Appreciate it. That way you may think twice before wasting it.

Visit PAREI's website for more infomation and how they can help: plymouthenergy.org. ♻

In 2006, PAREI worked with D'Acres to create Local Foods Plymouth. D'Acres as a vendor offering produce at the market. (LFP)

Over the last year, PAREI volunteers have turned a vacant building in disrepair into their new long-term home designed to be net zero energy. Exterior painting, building gardens, and installing solar PV are the next steps. (PAREI)

New York State Auction of First Build-Ready Solar Project

Supports New York's Goal for 70% of the State's Electricity to Come from Renewables by 2030

On October 2, Governor Kathy Hochul announced the auction of New York State's first Build-Ready project to advance large-scale renewable energy development across the state. The New York Energy Research and Development Authority is seeking a partner to transform a former mine in St. Lawrence County into one of the largest solar projects in the Adirondack Park. The announcement represents progress under the State's Accelerated Renewable Energy Growth and Community Benefit Act and supports New York's goal for 70% of the state's electricity to come from renewable sources by 2030 under the Climate Leadership and Community Protection Act.

ForeFront Power's Mechanicville Community Solar Project is designed to produce more than seven million kWhs of solar energy annually, the equivalent of taking more than 800 cars off the road. The project received $2.3 million from NYSERDA through NY-Sun. (Forefront Power)

"New York is leading the nation with our innovative approach to reach our clean energy goals," Hochul said. "The Benson Mines solar project will transform otherwise underutilized land, supporting local industry while advancing New York's clean energy transition. I look forward to moving forward with this project to provide lower-cost, zero emission energy to St. Lawrence County residents."

The New York State Energy Research and Development Authority (NYSERDA) is the administrator of the State's Build-Ready program and will facilitate the auction. Sited within the boundaries of Benson Mines on a former tailings pile, once operational, the 12-megawatt solar project to be located at the site is estimated to generate enough renewable energy to power up to 3,000 homes annually, which accounts for approximately 4% of St. Lawrence County's residents.

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NYSERDA President and CEO Doreen M. Harris said, "Benson Mines is a prime example of how NYSERDA's Build-Ready program is pairing existing industrial operations and underutilized land with clean energy to make a significant impact and leave no stone unturned in New York's clean energy transition."

NYSERDA has entered into an exclusive lease option agreement with Benson Mines Inc. for the project area and has fully permitted the project with the Adirondack Park Agency (APA). NYSERDA has also advanced the project to the mid-stage of the State's interconnection process and will be providing interconnection cost estimates to eligible bidders. The awarded bidder will enter into agreements with NYSERDA to buy the project and complete the remaining development and construction needed to bring the envisioned solar project into operation.

The Request for Proposal is being implemented through a two-step process. Step one eligibility applications are due on December 7, 2023, at 3:00 p.m. ET. Proposers must meet all minimum eligibility qualifications and be invited to submit a proposal in step two. Step two proposals are due on March 14, 2024, at 3:00 p.m. ET. Interested proposers can review the application process here. NYSERDA anticipates notifying the awardee in the second quarter of 2024.

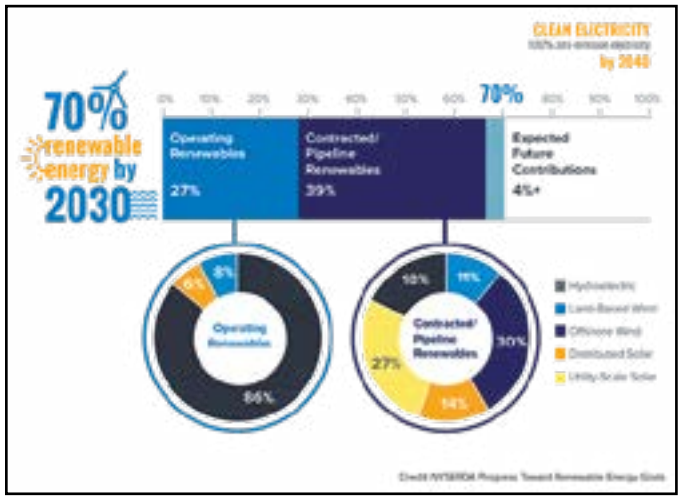
NYSERDA has worked with community leaders, business partners, and regional partner agencies to explore and advance community benefits associated with the project. NYSERDA also collaborated with the Town of Clifton to ensure the project complements the community's character and long-term economic development plans. NYSERDA and the St. Lawrence County Industrial Development Agency (SLCIDA) are establishing a Host Community Improvement Benefit Fund to be managed by SLCIDA. The fund's purpose is to advance and support projects that have local impact and align with community and regional interests. NYSERDA and SLCIDA are also advancing the project's PILOT Agreement.

Benson Mines has been fully permitted for the Build-Ready solar project. (Russ Nelson/Flickr)

Benson Mines Inc. continues to operate as an aggregates and timber company. Developing the site for coexistent solar energy generation is consistent with Benson Mines' long-term goals to promote sustainable industrial development that revitalizes the local economy. Since the 19th century, Benson Mines has played a foundational role in the Towns of Clifton and Fine's history and at its peak, the mine was considered the largest open pit iron-ore mine in the world, employing 840 workers. This solar project complements efforts by the North Country Regional Economic Development Council to encourage and support economic growth in the region's small cities and rural communities and aligns with the Adirondack Council's principles for the State, including the APA, to responsibly guide development of expanded renewable energy capacity inside the park, to fight climate change, and to provide benefits to communities.

Stuart M. Carlisle, President, Benson Mines said, "We are pleased to have partnered with NYSERDA on this project, which is aligned with our objectives of building sustainable investments from the resources available at our site. This will bring needed jobs to the area, which we are confident will begin to take shape under our latest aggregates partnership and ultimately through the resumption of processing minerals. We would like to thank the NYSERDA team, the County Board of Legislators, and the IDA for their support on this project and helping to further the execution of our strategic plan."

Adirondack Park Agency Executive Director Barb Rice said, "The Adirondack Park Agency was very pleased to work successfully with NYSERDA, Benson Mines and St. Lawrence County to issue a permit to authorize this innovative clean energy project. Under Governor Kathy Hochul's leadership New York State continues to lead by example to accelerate clean renewable energy growth. The development of the Benson Mine site for coexistent solar energy generation is an outstanding example of how to integrate large scale solar projects into rural communities and protected landscapes."



The Accelerated Renewable Energy Growth and Community Benefit Act established the Build-Ready Program and directed NYSERDA to identify, assess, and facilitate the development of suitable sites for renewable power-generating facilities, giving priority to "previously developed sites" and "existing or abandoned commercial sites," such as brownfields, landfills, or other disused or underutilized sites, and provide benefits to host communities. In October 2020, the New York Public Service Commission issued an order formally approving the Build-Ready Program. The Order reiterated that the Build-Ready Program will prioritize (1) advancing renewable energy projects on previously developed and existing or abandoned commercial sites and (2) providing benefits to communities hosting these sites.

The Build-Ready Program is currently advancing a pipeline of sites across New York State, having screened over 5,000 locations, and progressing dozens of sites through more advanced assessment and development as it prepares multiple solar projects across the state for future Build-Ready auctions. Local community members, elected officials, private companies, environmental justice communities, and other interested parties are encouraged to nominate potential Build-Ready sites, which will be considered on a rolling basis, through the program's Site Nomination Process. More information about the program's progress and NYSERDA's plans for actively expanding the pipeline of potential sites on both public and private lands across New York State can be found on the Build-Ready program's webpage.

Assemblymember Ken Blankenbush said, "This is an exciting opportunity for Clifton residents in St. Lawrence County. The Benson Mines have historically been known for their innovative and economic influence in the community. The mine is New York's first auctioned project for renewable energy development and will create a productive and meaningful opportunity for the Benson property. I support the residents in their decision to host this project. I look forward to seeing the region flourish with these developments."

St. Lawrence County Industrial Development Agency CEO Patrick J. Kelly said, "As we continue to work with NYSERDA on the Build Ready program, it is clear that we are making progress on our shared goals as we move into this next phase of the project. Developing a portion of the underutilized Benson property for renewable energy generation will bring new investment, infrastructure development, and economic benefits to the local community while supporting the State's green energy goals."

NEW YORK STATE'S NATION-LEADING CLIMATE PLAN

New York State's nation-leading climate agenda calls for an orderly and just transition that creates family-sustaining jobs, continues to foster a green economy across all sectors and ensures that at least 35%, with a goal of 40%, of the benefits of clean energy investments are directed to disadvantaged communities.

Guided by some of the nation's most aggressive climate and clean energy initiatives, NYS is on a path to achieving a zero-emission electricity sector by 2040, including 70% renewable energy generation by 2030, and economy wide carbon neutrality by mid-century. A cornerstone of this transition is New York's unprecedented clean energy investments, including more than $35 billion in 120 large-scale renewable and transmission projects across the state, $6.8 billion to reduce building emissions, $3.3 billion to scale up solar, more than $1 billion for clean transportation initiatives, and over $2 billion in NY Green Bank commitments.

These and other investments are supporting more than 165,000 jobs in New York's clean energy sector in 2021 and over 3,000% growth in the distributed solar sector since 2011.

To reduce greenhouse gas emissions and improve air quality, New York also adopted zero-emission vehicle regulations, including requiring all new passenger cars and light-duty trucks sold in the State be zero emission by 2035.

Partnerships are continuing to advance New York's climate action with nearly 400 registered and more than 100 certified Climate Smart Communities, nearly 500 Clean Energy Communities, and the State's largest community air monitoring initiative in 10 disadvantaged communities across the state to help target air pollution and combat climate change.

Learn more at:
www.governor.ny.gov/NYsolar-auction. ♻

IRA Incentive Programs Make Solar Possible for Non-Profit Organizations

George Harvey

St. Andrew's Church located in New London, New Hampshire reduced their electricity costs by 46% with their 18-kilowatt rooftop solar array. (Larry Chase)

BACKGROUND HISTORY FOR NON-PROFIT SOLAR INCENTIVES

The Energy Policy Act of 2005 created a 30% investment tax credit (ITC) of up to $2,000 for solar commercial and residential solar energy systems. It became active on January 1, 2006, and it lasted for one year, after which it was renewed. With it, a portion of the cost of a solar installation could be credited to taxes due, a real help to any person or business that might want to rely more on renewable energy and had a way to get it installed.

The hitch in the ITC was that it had to reduce a tax. If a person or organization did not pay taxes, then it had nothing the ITC could reduce. That meant that churches, non-profit hospitals, schools, and municipalities were among the organizations that might want solar power and still not be able to afford it.

After the ITC came into being, people found ways to give its benefits to the various organizations that could not otherwise benefit from it. There were a number of ways developed to do this. Most of them involved an investor paying for installation of a solar system at a recipient church, school, municipal location, or other non-profit, and owning the system for a period of years in which taxes were reduced. During that period, the investor owned the array. The electricity the system produced would be credited to the recipient, decreasing the cost of electricity. At the end of the period of ownership, the investor would get no more credit, the solar system could be transferred to the recipient non-profit, usually at a nominal fee.

Anyone who thinks that sounds complicated might be right on.

On the other hand, the system can be expressed very simply by just following the money. For example, if members of a church want to reduce both its carbon footprint and the cost of its electricity, an investor can get a solar array installed, at no upfront cost to the church. In fact the church does not have to be involved, aside from signing a contract. The investor owns the array until the investment tax credit has run out, possibly for seven years. In our example, the array is transferred to the church for the cost of the transfer. After that, the church gets free electricity until the array is worn out, and nobody really knows how long that will be – a solar array can last for a long time after its warrantee runs out.

So it really wasn't bad, it was just a little complicated and made a little money for the investor. But it really was not necessary – it only existed due to the government deciding that a tax credit was the best way to do things.

THE INFLATION REDUCTION ACT OF 2022 SIMPLIFIES THE PROCESS

With the Inflation Reduction Act (IRA) of 2022, things changed to make them almost exquisitely simple. The IRA actually was intended to reduce inflation, a fact that many people forget, and it seems to have done quite a good job at that. Other things it was intended to do included lowering the costs of medicines and increasing the production of American energy products, but the thing we are interested in is promoting clean energy.

The IRA makes it possible for non-profits and local governments to get direct payments of amounts that are similar to the investment tax credits they had been getting indirectly in the past. This is a much more understandable system that does not require the complicated financial systems that had been in use.

ReVision Energy's crew installing solar on St. Andrew's Church roof. (Courtesy image)

ST. ANDREW'S EPISCOPAL CHURCH IS AN EXAMPLE FOR THE USE OF THE IRA PROGRAM

ReVision Energy, a solar installer in Maine, New Hampshire, and Massachusetts, has a simple explanation of the benefits. First, the IRA offers a non-profit full access to the solar credits. Second, the IRA's savings are extended through net metering and renewable energy credits, which is a benefit of the community. Third, the result of the installation is that the non-profit is no longer entirely at the mercy of the cost of grid electricity, with the cost savings that can be as high as 50% to 75%. We should mention that the maximum amount of the credit is 30% of the cost of the system, and there are certain criteria that must be met.

ReVision Energy did an installation at St. Andrew's Episcopal Church in New London, New Hampshire, which can serve as an example. ReVision started installation of the 18-kilowatt rooftop array on a Monday and finished it in four days. So members of the congregation went home after church on Sunday with no solar system, and the next Sunday, arrived to see it was fully installed. Father Jay commented, ""We anticipate our energy costs will be reduced by 46%, and our carbon footprint will be significantly reduced."

Read more about ReVision Energy's work at https://bit.ly/St_Andrews_solar. ♻

MEET YOUR SOLAR INSTALLER

SOUTHERN VERMONT SOLAR

DUMMERSTON, VERMONT

George Harvey

Victoria Roberts and Simon Piluski, are the owners of Southern Vermont Solar (SVS).

Roberts got her introduction to the area of southeastern Vermont when she took a master's degree at School for International Training. Piluski, on the other hand, is native to the area, and earned a B.S. at Marlboro College. After his college education, he became a licensed electrician. And he became one of the first solar electricians in Vermont to earn the highly respected NABCEP certification.

Together, they built a business with a clearly stated mission: "Our mission is to be a sustainable, value driven local business that helps our community make the bold transition off… fossil fuels. We deliver exceptional customer service and rewarding green careers to our employees in the shift to clean, renewable energy."

St. Michael School showing the 48 kW (DC) solar system and St. Michael Catholic Church. (Courtesy of Southern Vermont Solar)

Asked about who they are, Piluski said, "The clean energy revolution is here and at Southern Vermont Solar, we are committed to leading our community in the transition! Based in Dummerston, Vermont, Southern Vermont Solar is a locally owned company founded in 2017 by Vermont Master Electrician and solar veteran, Simon Piluski. With high standards of professionalism and integrity, we provide expert solar design, installation, maintenance and repair, and grid-tied battery backup services to our local commercial, residential and municipal community."

SVS mainly installs solar systems in Windham County, Vermont. They install Tesla Powerwalls or Enphase Ensemble Battery Systems for customers who want backup batteries. They told us, "We are partnered with GMP as installers for the various Vermont battery storage rebate programs." This reduces the cost of battery backup quite a lot. SVS does not install off-grid systems.

SVS is a small installer, with nine employees, a size that is ideal for some customers. Piluski said, "Our work is a reflection of our commitment to investing in the improvement of our community. We intentionally approach each new project, ensuring a smart choice for our customers so they can enjoy the transition to an electrified, clean energy future."

G.E.T. published an article in its June edition about an installation SVS did at the Putney Coop. That was a project that Roberts seemed to find particularly enjoyable, because she is a co-op member and particularly likes shopping there. (The link is https://bit.ly/Putney_Coop_solar).

Here, we report on another very recent project, the installation of a rooftop solar system at St. Michael Catholic School in Brattleboro. The school is directly across Walnut Street from St. Michael's Church. It has been in operation since it was founded as Vermont's first Catholic school in 1874. Now, nearly to its sesquicentennial, it has taken on something new, with help of Southern Vermont Solar. It is getting to the point of generating its own power from the sun.

SVS provide us with a statement of the scope of project before it began, giving us an idea of what SVS engagement in a system means. It said, "SVT Solar will provide the design, permitting, purchasing, and labor necessary to construct, commission, and interconnect the net-metered PV system to all current applicable codes, utility requirements, and to Vermont state laws at the time of this contract, not including future changes to regulations and statutes. SVT Solar will provide all materials for the PV System, associated wiring and components for interconnection, including a meter socket and disconnect for GMP use and will provide all permitting and utility paperwork."

The array consists of 100 Hanwha Q.Cells, each 480 watts, giving it a total of 48 kilowatts (kW) DC. These have been placed on the school's roof. Because of the construction of the building, they are quite out of sight from any place nearby. The system is on a flat roof, so it is ballasted, using an Ironridge BX racking system.

The St. Michael School system has five SolarEdge 7600-Watt inverters, which produce 38kW of AC power. Also, the 100 solar panels get 100 SolarEdge optimizers.

Roberts told us that the timing of this project could not have been better, because the Inflation Reduction Act provides direct payments from the federal government to non-profits and such similar organizations as municipalities, which were never able to get direct incentives in the past, because the incentives used to be tax reductions. This meant that it was frequent that when churches and schools had solar put up, the installation was paid for by a person or organization that contracted for the energy and could use a tax exemption to get the incentive benefit. Now, with direct payment of the incentive to the church or school, the entire process is much easier.

One thing she also mentioned was how much she enjoyed working with the people in the church and school. "They have been lovely to work with."

Southern Vermont Solar's web site is https://svtsolar.com. ♻

Squam Lakes Natural Science Center

G.E.T. *Staff*

In 2016, when Squam Lakes Natural Science Center updated its Strategic Plan, an ambitious "50 by 30" pledge was made. The pledge was to achieve 50% of its energy consumption from renewable sources by 2030. The Science Center already utilizes composting toilets and heats a major portion of the campus using super-efficient wood burning boilers and locally sourced cordwood. Dealing with their electric use was the next major step. Now with solar energy they are making a huge impact on their carbon footprint.

In 2019, the Science Center started to explore options for a major solar array and contacted Ted Vansant of New England Commercial Solar Services. Plans were formulated and a scope of work outline allowed the Science Center to start fund-raising. The following foundations and businesses supported the project: Cogswell Benevolent Trust, Samuel P. Hunt Foundation, Hypertherm Hope Foundation, and New Hampshire Charitable Foundation's Fraxinus, Mainstay Technologies, and RDC Squam Environmental Preservation Funds. Twenty-four individual donors and one anonymous foundation also made financial contributions.

The ground-mount solar array which consisted of phase two of Squam Lakes Natural Science Center's plan was completed in April 2023. It consists of 240 485-watt panels arranged in rows between and adjacent to the two large parking areas. (Jack Bingham, Barrington Power)

The phase one project (totaling 24.82kW) was installed at the end of 2021 on the roof of the Early Childhood Education Center, home of the Science Center's Blue Heron School, a nature-based Montessori early learning center for students ages 3 to 6. This system uses all black panels and combined with a thoughtful layout on the roof results in an array that blends well into the roof.

Phase 2 was completed in April 2023 and consists of 240 485-watt panels arranged in rows between and adjacent to the two large parking areas on the campus. "It was important that these solar arrays did not overwhelm the visitor experience, and we are thrilled with the result. With careful planning and implementation Barrington Power built these arrays to fit into the existing landscape while also maximizing the amount of solar that could be placed in this limited space." said Science Center Executive Director Iain MacLeod.

This ground-mounted system is 116.4 kW and is estimated to produce about 130,000 kWh annually.

Combined the two projects are 141kW and will produce 100% of estimated annual kWh usage. It will be paired with educational interpretation to teach visitors about renewable energy and the climate crisis.

"We know that climate change is a worldwide catastrophe," said Science Center Executive Director Iain MacLeod. "We hope that our initiative to go solar will help educate the public about clean renewable energy and to encourage others to take action."

Squam Lakes Natural Science Center worked closely with Ted Vansant and Barrington Power on the design and installation of the project. "Although we use energy conservation where we can, we have many systems throughout the campus that use a lot of energy – filtration pumps and circulators for animal pools, exhibit lighting, chillers for aquariums, etc., so using our own energy is huge," said MacLeod.

"Solar energy is a perfect fit for the science center, not only are these two systems saving them a lot of money, but they are educating about the benefits of using solar energy every day just by having these two systems front and center as part of their operations." said Vansant. "We are lucky to have been able to work with the amazing team at the science center to help show visitors that we have solutions available right now that help to mitigate climate change."

The mission of Squam Lakes Natural Science Center is to advance understanding of ecology by exploring New Hampshire's natural world. Through spectacular live animal exhibits, natural science education programs, guided Squam Lake Cruises, public gardens, and a nature-based Montessori early learning center, the Science Center has educated audiences of all ages since 1966 about the importance of our natural world. Squam Lakes Natural Science Center is Sensory Inclusive Certified by KultureCity.

Squam Lakes Natural Science Center is located on Route 113 in Holderness, an easy drive from exit 24 off I-93. Public trails are open daily from May 1 through November 1 with programming throughout the year. For further information about the Science Center, call 603-968-7194 or visit www.nhnature.org. ♻

Community Choice Aggregation, CPCNH and Tamworth, NH

George Harvey

One thing that has been getting increasingly clear about energy is that those of us who don't have solar power dominating our energy supply are probably paying too much for it, because the cost of renewable energy started to fall below that of fossil several years ago, and it has generally kept falling. A problem with this is that it is not always easy to switch.

In 2019, New Hampshire adopted laws enabling Community Choice Aggregation, making it possible for people to contract for their electricity supply as a group. Getting the law passed did not end the matter. Things have to proceed, and it took until October 2022 for the NH Public Utilities Commission to come up with regulations. Finally, the private brokers and non-profits who will aggregate had to come up with a plan, within which the people could function as a group, and that takes some local leadership.

The Tamworth, NH Energy Committee was formed in January 2023. Gabrielle Watson, the committee chair, described the early days of their action as a steep learning curve. "We thought we would jump into it a year from now after we got our sea legs, letting others go ahead of us and seeing how they do."

That, however, was not to be. There are many reasons to adopt community choice aggregation, and there are a lot of reasons why various private brokers would want to help a community adopt it. Very early on, one of those brokers approached the town administrator, Keats Myer, and she quickly put the job of considering it to the Energy Committee.

The committee went into action straight away, examining different ways the aggregation could be done. Two possibilities they considered were from business organizations, both of which seemed strong choices, and one was from a non-profit, the Community Power Coalition of New Hampshire (CPCNH). After examining the offerings, the committee decided to recommend going forward with Community Power and using CPCNH to do that.

"CPCNH is there to achieve lower rates, give people more choice about renewables in their supply mix, and give consumers more voice," Watson told us. The consumer voice part of that was important, but there was

Cont'd on p.13

City of Dover and Cheshire County Launch Community Power

Cheshire leads state, becomes the first county Community Power program in New Hampshire

Two more Community Power programs are launching this fall, bringing the number of customers benefiting from Community Power Coalition of New Hampshire services up to ~90,000 statewide.

Near the seacoast, electric customers in Dover have already received their "Welcome to Community Power!" letters, and the city hosted a public information session on September 25 attended by many dozens of excited citizens.

"They gave us a standing ovation after we presented on Dover Community Power," said Dr. Jackson Kaspari, Dover Resilience Manager and Board Director for CPCNH. "It's nice to see that kind of excitement and appreciation from the people of Dover."

By lowering default electricity supply rates from 12.528¢ to 10.9¢, Dover Community Power will generate roughly half a million dollars in savings on customer electric bills in just the first three months of service. Most customers will be enrolled into Dover Community Power starting October 30.

On the southwestern corner of the state, Dublin, Fitzwilliam, and Nelson will be the first three towns to benefit from the first-of-its-kind County model of Community Power. Cheshire Community Power enables towns to "fast-track" Community Power benefits. The county approach eliminates the administrative and regulatory burden that towns would otherwise have to navigate by getting approvals from the Public Utilities Commission and drafting their own Electric Aggregation Plans.

Beyond the first three towns, Cheshire County expects other towns to be joining in the near future. Other New Hampshire counties have also begun discussions on adopting Community Power as a benefit to their communities.

"We are thrilled to be able to bring this increased control and cost savings to our Country government. Offering a fast-track approach for the city and towns in our county, will also allow them to enjoy the extensive benefits of Community Power in a simple and straightforward manner," explained Cheshire County Commissioner Terry Clark. "Cheshire County was involved in founding CPCNH dating back to 2019, and we have worked alongside Lebanon, Nashua, and Hanover to help pioneer Community Power for the state. Now, every city and town will be able to reap the benefits that Community Power is bringing."

Please refer to communitypowernh.gov for rate comparison tables.

Community Power, authorized under NH RSA 53-E, democratizes energy governance by empowering towns, cities, and counties to choose where their electricity comes from on behalf of their residents and businesses, work with utilities on local energy infrastructure upgrades, and provide electricity supply rates and services to all customers participating in the program.

The Coalition takes over as the default electricity provider for their communities. Under Community Power, electric distribution utilities continue to own and operate the power grid while local communities gain control over where their power is sourced from. Many more New Hampshire towns and cities have begun the process to launch their own programs in the coming months and years. A total of 43 communities have already voted to join the Community Power Coalition *and are currently in the process of launching their own Community Power Programs.* ♻

Tamworth, NH – Cont'd from p.12

another reason to go with the non-profit.

Instead of providing itself with profits to distribute to the owners, CPCNH is putting what would have been profits into reserve funds for the benefit of its customers. Some if it is put into a fund to soften the blows of volatile energy costs, which can rise without control. And part of it is put aside to help the community develop its own better way to generate energy. To do this, it could help access low-interest loans.

According to Wikipedia, the town of Tamworth has a population of about 2,800, divided among five villages. Watson told us she thought about one quarter of the people in New Hampshire are signed up for the aggregation system. Getting to this point represents an impressive undertaking coming to a successful point in very little time.

Historic Tamworth Town House, 1794. (Wikimedia Commons, CC-BY-SA 4.0)

The committee did not take a break after its work on community choice aggregation, however. It has done energy audits on the municipal building, after one on the library was already done. Both audits recommended that both get their own solar panels. The Tamworth Energy Committee is already working with the local elementary school to do an audit of their buildings.

Watson is already looking at the changes that might come about in the future. For example, she says that in addition to such things as more extreme weather, people in the Northeast really need to be prepared to have more climate refugees in the years ahead. We should note that some of these will be Americans who have lost their homes in this country. ♻

Clean Energy NH's Energy Circuit Rider Program to Expand to Sullivan County

Sam Evans-Brown

Clean Energy NH, the leading non-profit focused on leading the Granite State's transition to a zero-carbon economy, is growing. We are thrilled to announce that one of our flagship initiatives, the Energy Circuit Rider program, is expanding to serve Sullivan County.

Imagine having a dedicated clean energy advocate and expert assigned specifically to your community. At its core, that is what the Energy Circuit Rider program does. Our staff work with communities throughout the state to help them optimize their energy use, enhancing efficiency, and transitioning to cleaner energy sources. The "circuit riders" work closely with municipalities to identify priority energy-saving opportunities, connect them to local clean energy businesses to scope out projects, and "matchmake" between various federal and state funding sources in order to clear away barriers to pursuing those projects.

The Energy Circuit Rider (ECR) Program was created and piloted in Coös County beginning in 2019. Since then, the North Country Circuit Rider has helped more than a dozen communities complete more than 30 energy efficiency and clean energy projects. The program has helped the communities receive more than $500,000 worth of incentives and grants, which have resulted in more than $2 million dollars of investment in clean energy projects. The program has since expanded to serve the Monadnock and Seacoast regions.

Sullivan County, situated in the western part of New Hampshire, holds great potential to benefit from the extension of our Energy Circuit Rider program. Its mix of rural and urban communities presents a

Clean Energy NH's North Country Circuit rider has already demonstrated a high degree of success in helping communities save money on their energy bills.

set of distinct challenges and opportunities in the journey towards cleaner and more sustainable energy solutions, but in many instances, our experience over the past four years in other corners of the state can be applied in Sullivan County as well.

An essential component of this expansion is finding the right individual to serve as the Energy Circuit Rider in Sullivan County. The perfect candidate for this position must possess specific qualities and skills to effectively engage with the community and drive the clean energy transition.

The expansion of our Energy Circuit Rider program into Sullivan County holds great promise for the community. The projects pursued in partnership with our staff will lower energy costs through energy audits, efficiency enhancements, and the adoption of renewable energy technologies. Communities in Sullivan County can anticipate a reduction in energy costs for local facilities, which can help ease upward pressure on property taxes, making them a more appealing place to live and conduct business.

By transitioning to clean energy sources, Sullivan County will contribute to reducing its carbon emissions and associated air pollution. This action aids in the battle against climate change and enhances air and water quality in the region.

The clean energy sector is a growing industry that offers opportunities for job creation and economic growth. As the community embraces clean energy, new job opportunities may arise in fields such as solar installation, energy efficiency contracting and consulting, and associated technology development.

Clean energy technologies like solar panels and energy storage can bolster the resilience of the community's energy infrastructure, reducing the impact of power outages and other disruptions. Clean Energy NH was the recent recipient of a U.S. Department of Energy Energizing Rural Communities Prize, which will be used to assist communities looking to install solar and backup batteries at designated community emergency shelters. We would love to work on projects like this with Sullivan County communities that have good candidate facilities.

Our expansion of the Energy Circuit Rider program into Sullivan County marks a significant step toward a cleaner, more sustainable future for the region. With the right individual in place, Sullivan County can look forward to reduced energy costs, a healthier environment, economic opportunities, and increased energy resilience. This expansion underscores our commitment and the power of communities working together to embrace clean energy solutions.

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

Rhode Island's Offshore Wind Supply Chain Development

Building on more than a decade of leadership in the fast-growing offshore wind industry, the McKee Administration released details on the development of Rhode Island's strategic plan to further develop the state's offshore wind supply chain.

Prepared by Providence-based consulting firm OSWind Partners in conjunction with the Rhode Island Commerce Corporation (Commerce), Rhode Island's "Strategic Plan for Offshore Wind Jobs and Investment" was developed following an extensive review of global industry demands and current and upcoming U.S. offshore wind projects, as well as an audit of Rhode Island's existing offshore wind supply chain, physical assets, workforce development programs and more. The goal of this strategic plan is to integrate stakeholders at every level of the industry to create opportunities for Rhode Island companies and workers to significantly contribute on offshore wind projects in development along the east coast.

"Rhode Island has proudly served at the forefront of this exciting, job-creating sector for more than a decade, and we have the tools, infrastructure, and workforce we need to build on this momentum in the future," said Rhode Island Governor Dan McKee. "This strategic plan provides a path to amplify the deep Rhode Island offshore wind resources and coordinate groups across the state to provide industry solutions throughout the wind farm lifecycle."

The release of the early, core recommendations of this strategic plan comes as Rhode Island Energy, the state's leading energy utility, prepares to issue a Request for Proposals to solicit approximately 1,200 megawatts of new offshore wind power to strengthen New England's regional grid and help Rhode Island advance its clean energy goals.

"Developing clean energy sources is of paramount importance, not only for environmental reasons, but for economic and social reasons as we work towards a more sustainable and prosperous future," said Rhode Island Commerce Secretary Liz Tanner. "We look forward to continuing to work with our colleagues and partners across the offshore wind industry as we implement this strategic plan in a way that creates jobs and opportunities for Rhode Islanders."

The strategic plan includes six core recommendations.

1. Cluster Development: Aim to amplify the state's industry strengths and create connections between locally based businesses, specifically targeting companies specializing in permitting and ocean science, logistics, operations and maintenance, and precision manufacturing.
2. Education Awareness: Take proactive steps to engage local companies that have the capability and capacity to contribute to the offshore wind supply chain and connect them with opportunities up and down the east coast.
3. Coordination: Ensure that all developers, manufacturers and top-tier offshore wind companies are aware of and can easily access Rhode Island's assets, resources and talent as they embark on new projects and look for best in class solutions and partnerships.
4. Opportunity Awareness System: Invest in a new, web-based portal through which contractors can easily find, evaluate and engage with Rhode Island companies to support project workflows at all phases of a wind farm life cycle.
5. Regional Leadership: Work with neighboring states to share resources and best practices to create efficiency and cost savings as new projects are approved and constructed.
6. Communications: Clearly communicate Rhode Island's offshore wind strengths both internally and externally to build the state's ecosystem and respond to the changing demands of the industry.

An executive summary of Rhode Island's Strategic Plan for Offshore Wind Jobs and Investment is available here or at https://bit.ly/RIStrategicPlan-OffshoreWind. Commerce is planning regular meetings with industry stakeholders with the goal of finalizing an implementation timeline in the coming months. ♻

Decarbonizing Heat: Making 24/7 Onsite Renewable Heat and Power Practical

G.E.T. Staff

As we work to move away from fossil fuels for heating and electricity, inexpensive bulk energy storage can make electrifying heating cost-effective. A new thermal storage system from the Norwich Technologies (NT) research and development (R&D) team is poised for commercialization. Based in White River Junction, Vermont, NT has frequently appeared in G.E.T.'s pages and posts. NT is a leader in clean energy solutions for our communities and is introducing their new thermal storage system to the market in a new spin off company called Durion. Durion's mission is to fully decarbonize commercial and industrial energy loads by providing 24/7 onsite renewable heat and power.

Durion offers a practical, economical, ready-to-use system for 24/7 solar thermal electricity and heat. At the heart of breakthrough is Durion's proprietary HeatTrap™. It represents the culmination of several years of research and development by the NT R&D team. In their own words:

The Durion's HeatTrap system uses pressurized hot water in steel pipes to store large amounts of energy simply, efficiently, and inexpensively. We leverage a large existing supply chain to be able to deploy bulk storage cost effectively using primarily steel and water. Bulk inexpensive storage allows Durion to compete with fossil fuel heating at the commercial and industrial scale.

The HeatTrap™ is an elegant solution that consists of an ordinary large diameter steel pipe manufactured by the same companies that supply pipes to the gas and oil industry. This pipe stores hot and cold pressurized water in a closed loop, with an internal traveling separator piston that keeps one end of the pipe at maximum temperature and pressure while isolating not-yet-heated water at the opposite end. The separator piston is a patented technical engineering innovation, developed by the NT R&D team in part under a Department of Energy grant. It is a critical component that enables Durion to minimize system cost.

Durion's system in operation at its field test site in partnership with the Department of Energy (DOE) and the University of Louisiana. The proprietary technology can store energy for up to 15 hours to be used directly for industrial process heat applications 24 hours a day, seven days a week. (Durion)

The working temperature is 300ºC (~570ºF) at 85 bars (~1,230 psi) – with the high-pressure keeping water a liquid at above standard boiling temperatures. The system is modular – more pipe means more capacity – and typically would be sized for 15 or more hours of storage. It can be scaled to deliver between 200 kW to 20 MW of power, thermal or electric or a combination. The high working temperature allows power generation using Organic Rankine Cycle (ORC) engine generators. The system is fully automated in operation. The bulk thermal storage is very low cost, allowing commercial and industrial customers to save money in comparison to retail heat and electricity.

The ideal customers include those who have process heat needs throughout the year (such as food processors like breweries) and organizations requiring 24/7 heat and power (such as a hospital.) As it begins to offer its product, Durion has identified interest from food producers like breweries and greenhouses. They are also finding that suppliers and partners from the oil and gas industry infrastructure supply chain are enthusiastic about this new opportunity to apply their existing skills, labor and procedures toward a new clean energy market.

For most customers, Durion provides a no-upfront-cost option that includes all engineering integration work as well as ongoing operations and maintenance for the system. In the no upfront capital cost program, the customer experiences no upfront capital costs and is guaranteed savings through a pay-as-you-go power and heat purchase agreement. Durion packages their systems in three configurations.

Durion Heat provides 24/7 thermal energy for industrial process heat needs. Energy is generated by electric heating (via the grid or photovoltaics (PV)), or by concentrating solar power (CSP) installed on site or nearby land.

Durion Power provides customers with fully-renewable reliable 24/7 electrical power. Energy is generated with a combination of PV and CSP collectors installed onsite or nearby, with thermal energy stored in the HeatTrap system for on demand delivery as electricity using ORC engine generator technology.

Durion Heat and Power is the company's most comprehensive product, delivering both electricity and heat from a combination of onsite PV and CSP. It delivers the lowest total energy rates by maximizing the system's efficiency.

Durion expects early deployments in the northeast will be to supply 24/7 heat using off-peak electricity from the grid and/or PV systems for electric heating. With the HeatTrap thermal storage, electricity can be used for heating when it costs the least, then stored for use when needed. This will allow commercial and industrial users to switch from dependence on fossil fuels for their energy needs, improving their resiliency and climate impact by escaping supply and price volatility. With PV they can fully decarbonize their operations. With the current mix of grid power, they can achieve significant onsite emissions reductions.

With the proliferation of solar as the low-cost way to generate electricity, there is an increasing interest and need for storage options. Utilities are also experimenting with rate structures to encourage more off-peak power consumption. Durion believes the simplicity and economy of their storage system will make it an attractive option for industries seeking energy cost savings and resiliency as they pursue energy independence and aggressive climate impact reduction goals.

Learn more about the Durion thermal energy solution at https://durion.com. ♻

Celebrating Completion of a 500 KW AC Solar Project in Barnet, VT

Milarepa Center and Norwich Solar hosted a ribbon-cutting event to celebrate the final milestone

Norwich Solar completed a 500 kW AC solar array in Barnet, VT. The ground-mounted system will generate enough renewable clean energy to power approximately 135 homes per year, and offset the carbon emission equivalent of almost 150 cars per year.

Milarepa Center, a Tibetan Buddhist retreat in Barnet, VT hosts a 500kW solar array built by Norwich Solar. (Courtesy image)

Milarepa Center hosted a ribbon cutting ceremony on Friday September 6, 2023. Milarepa Center is a Tibetan Buddhist retreat named for an eleventh century yogi famed for attaining enlightenment in a single lifetime. The center is an affiliate of the international organization the FPMT (Foundation for the Preservation of the Mahayana Tradition) and was founded in 1981 by students of Lama Thubten Yeshe and of Lama Zopa Rinpoche. They host both public and private retreats at the site. Members and friends of Milarepa, along with the general public and organizations that helped in various stages of the project were invited to join the celebration.

Dawn Holtz, Director of the Milarepa Center, stated "We are very excited to host the array here on our land and be able to contribute to clean energy production in the local area and to have partnered with Norwich Solar on this project. We are also so incredibly thrilled to share the many blessings and good bodhichitta energy present here on the land with the offtakers who will be receiving the energy that is generated by the array."

Jim Merriam, Chief Executive Officer at Norwich Solar said of the project: "It's been such a pleasure to work with the folks at Milarepa Center. Throughout every phase of the project, they have been a supportive team member which greatly helped the process of developing and constructing this project."

Diana Wood, Director of Marketing & Outreach for Norwich Solar added, "Milarepa Center has been welcoming to us, and I was impressed by their frequent communications with Milarepa members about the project. They show deep appreciation for the wider benefits of clean energy projects like this."

Milarepa Center will host the solar array on their land for the next 25 years. The renewable energy generation credits will benefit four Vermont farms and dairies to help them save on energy bills. The solar project at Milarepa Center, owned and operated by Greenbacker Renewable Energy Company, is one of nine that Greenbacker purchased from Norwich Technologies in 2023.

Norwich Solar is currently in the EPC (engineering, procurement and construction) phases of 16 solar projects and expects to complete a total of 3.5 MW AC of additional renewable energy projects by the end of 2023 throughout Vermont, New Hampshire and Maine. ♻

Maine Offshore Wind to Supply Half of Electric Needs

George Harvey

Maine Governor Janet Mills signed into law LD 1895, a bill to advance offshore wind energy in the state, procuring 3,000 megawatts of offshore wind capacity by 2040. This is an important development that could supply a huge amount of electricity. Looking back, it is also a historic development because of the obstacles that had to be overcome to get it passed and signed.

The first of these was clearly known from the very start. Developing offshore wind power in Maine had a severe problem because development sites in the Gulf of Maine all had waters too deep for standard installations with masts standing on the ocean floor. This issue came up in a 2013 post at the *Green Energy Times*' website, which was a repost of an article from the Department of Energy, "Maine Project Launches First Grid-Connected Offshore Wind Turbine in the U.S." (https://bit.ly/Maine_wind_1) The article dealt with a University of Maine demonstration project using a floating wind turbine.

Another problem that had to be overcome was objections by people and businesses engaged in lobster fishing. They wanted their economic interests and the natural resources they depended on to get protection in any legislation promoting offshore wind energy. Their request was addressed in the law.

Yet another problem was that Governor Mills herself would not accept the law as it was originally written. It made possible addressing issues of environment and climate change as she had hoped they would be, but in the form it first reached her desk, it had provisions that would have made it impossible for many Maine workers to get employment on the offshore projects. The result was that the first attempt to pass the bill was vetoed by a woman who was keenly interested in its primary intentions. The work done by the governor was detailed by a press release from her office, "Governor Mills Signs Bill to Create Jobs, Advance Clean Energy and Fight Climate Change Through Responsible Offshore Wind." Read more at (https://bit.ly/Maine_wind_2)

University of Maine's 20-kilowatt grid-tied offshore wind turbine in a 2013 demonstration off Castine, Maine. (Jplourde umaine, CC-BY-SA 4.0, https://bit.ly/CC-by-SA-4-0)

As it was finally passed and signed, LD 1895 should enable construction of offshore wind farms that could supply half of the electricity needed by the state of Maine in 2040. Given the work that has already been done, we might hope things would get easier. Unfortunately, we cannot assume that much.

There are still obstacles to overcome. There is still a lot of work setting up the sites that can be auctioned off, getting the U.S. government agencies to agree to the details of the work, and do the auctions required. After that, the auction winners have to install the turbines and get them properly connected to the grid. That has all been anticipated, however.

Unanticipated obstacles have shown up as unexpected costs due to inflation and supply problems. The cost of wind power has been declining rapidly, but at present, the issue is out of hand. According to an article at *OilPrice.com*, the cost of U.S. offshore wind power construction has risen 57% since 2021. Due to cost and supply issues, Iberdrola decided to get out of a contract for an offshore wind farm in Massachusetts, agreeing to pay $48 million in fines (https://bit.ly/Maine_wind_3).

We should recall that the 2040 goal is still many years off, however, and note that many things will happen in that time. The cost of wind turbine construction has been on a predictable learning curve, going down, and that is likely to continue after unusual conditions pass. One way or the other, we must deal with the situations we find, and hope that progress may continue.

In the meantime, we congratulate the people who have been working so hard in Maine for the work they have done. And we wish them good luck for the future. ♻

Avast, Mate – Sail Ho!

On August 1, the Pyxis Ocean set sail, under sail, on its maiden voyage from China to Brazil.

Martin Wahl

The 2017 Mitsubishi bulk cargo ship Pyxis Ocean, chartered by Cargill, was retrofitted by Norway's Yara Marine with two of UK's BAR Technologies WindWings. This work was done at the COSCO shipyard in China. The wing-like sails are estimated to save up to 30% of fuel usage and greenhouse gas (GHG) emissions, per their press release.

BAR Technologies incorporates aerodynamic expertise from Formula 1 race car designers and provides technology to America's Cup hydrofoil yacht builders.

Each 123-foot-high rigid sail is made from steel and fiberglass consisting of three components: a central 32-foot-wide element and two 16-foot-wide wings on either side, each with a central pivot. This provides a total sail width of 65 feet and area of up to nearly 4,000 square feet.

The wing assemblies rotate to best position them according to the wind angle and speed. They fold down to the ship's deck to allow access at port and for passing under bridges or through canals.

A "line-of-sight" camera replacement system allows an unobstructed view from the ship's bridge as if the sails were not there.

As of this writing, the Pyxis Ocean is currently enroute from China to Brazil where it is planned to load a cargo of grain destined for Denmark. To see where it is now – go to Pyxis Ocean's location on MarineTraffic.com.

Berge Bulk, a leading dry bulk shipping company, also plans to equip its Newcastlemax bulk freighter Berge Olympus with BAR's WindWings by Yara Marine Technologies later this year.

The 2017 Mitsubishi bulk cargo ship Pyxis Ocean, chartered by Cargill, was retrofitted with two of UK's BAR Technologies WindWings. The wing-like sails are estimated to save up to 30% of fuel usage and greenhouse gas (GHG) emissions. (Cargill)

What other wind technologies are in the offing?

Wind-assisted sailing technologies range from Michelin's inflatable sails to rotor-sails that utilize the same spinning effect in airflow to achieve forward thrust that makes fastballs rise and curveballs bend. While rotor sails require engine propulsion to drive them, fuel savings between 6% and 8% have been confirmed.

Some of the other technologies include kites and aerodynamic hull designs that act as sails.

At this time, most are retrofit solutions allowing existing fossil-fuel powered ships to add sail propulsion. There are some initiatives to develop purpose-built sailing ships with supplemental engine power. For example, Veer Voyage and Windcoop are developing sailing ships that accommodate container shipping.

According to Gavin Allwright, Secretary General of the International Windship Association, more than 30 ships are now equipped with wind-assisted propulsion systems, with a total of 50 to be reached during 2024, and the industry is on a trajectory to double every year.

What if the wind dies down?

The trade winds have remained stable for eons. Additionally, the most common trade routes follow prevailing winds. All of the proposed new designs include auxiliary power, either fossil fuel or electric, for in-harbor maneuvering and when the wind is weak or not favorable. Advanced weather prediction and navigation support systems help determine optimal course planning during a voyage.

The industry is also investigating the feasibility of implementing other fuel sources for powering their fleets, including battery power, biofuels and synthetic fuels. Lloyd's conducted a study surveying shipping companies for their assessment. The conclusion at this time is that a carbon fee is needed to make the conversions cost-effective.

Other issues?

Sail-assisted shipping is a new phenomenon and challenges range from vessel classification and obtaining insurance to crew training and general resistance to change.

In addition to height requirements for bridges and canals, there are other constraints for implementing sail-assist technologies - most concerning ship configuration for cargo storage and loading: the sail structures must not obstruct deck space required for crane access to cargo holds. Bulk carriers like the Pyxis Ocean and roll-on/roll-off (RORO) vehicle ferries are good retrofit candidates. Container freighters pose more daunting challenges as crane access

Cont'd on p.17

USDA Rural Development Funds New Hampshire and Vermont Grantees with More than $1,000,000

Part of Biden-Harris Administration's $808 Million Investment to Strengthen Infrastructure and Create Jobs Throughout U.S.

On August 28, the U.S. Department of Agriculture (USDA) State Director of Rural Development in Vermont and New Hampshire, Sarah Waring, announced that the Agency is investing $1,064,000 to municipalities and non-profit organizations in both states through the Community Facilities Direct Loan and Grant Program. The grant funding is part of the Agency's $808 million national infrastructure and jobs initiative that USDA Secretary Tom Vilsack announced earlier today, focused on helping rural cooperatives and utilities build and improve electric infrastructure, water systems and community facilities in rural areas. The investments will help 480,000 people in 36 states and two U.S. territories stay connected, safe and employed with good- paying jobs.

"USDA invests in rural America because we know strong communities are rooted in their people," Secretary Vilsack said. "Powering people with modern infrastructure creates good-paying jobs and supports opportunities for people to build brighter futures. The investments we're announcing today demonstrate the Biden-Harris Administration's commitment to ensuring that people who live and work in rural areas have every opportunity to succeed – and that they can find those opportunities right at home."

"With this essential funding through Community Facilities grants, rural towns throughout the Twin States will see quality of life improve in real time," Waring said. "From a state- of-the-art Styrofoam recycling machine in Vermont's Northeast Kingdom, to municipal buildings generating renewable energy in Coos County, New Hampshire, these investments provide a path forward for people looking to make the right economic and environmental choices. And those choices are made possible by the Biden-Harris Administration's insight into the needs of rural communities, and fearless action on their behalf."

Northeast Kingdom Waste Management District (NEKWMD) purchased a polystyrene recycling machine with grant funding. The machine condenses the material into ignots which will be sold for use in making foam insulation panels. (NEKWMD)

The funding advances President Biden's Investing in America agenda, a key pillar of "Bidenomics," to grow the American economy from the middle-out and bottom up – from rebuilding our nation's infrastructure, to driving over $500 billion in private sector manufacturing and clean energy investments in the United States, to creating good- paying jobs and building a clean-energy economy that will combat climate change and make our communities more resilient.

The 139 investments announced will help people living in Alabama, Alaska, Arizona, California, Florida, Iowa, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, Mississippi, Montana, Nebraska, New Hampshire, New Mexico, New York, Nevada, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, Puerto Rico and the Marshall Islands.

For example, in Lyndonville, Vermont, the Northeast Kingdom Waste Management District will purchase a commercial-grade polystyrene recycling machine with help from a $36,000 Community Facilities grant. In the first year of use, it will recycle roughly four tons of waste material, which will be sold to a commercial buyer to use in foam insulation panels.

In Colebrook, New Hampshire, solar panels on public works buildings will offset 100% of the costs to operate them. This will provide approximately $81,000 in annual savings over the next 25 years, and generate carbon-free energy on site.

Under the Biden-Harris Administration, Rural Development provides loans and grants to help expand economic opportunities, create jobs and improve the quality of life for millions of Americans in rural areas. This assistance supports infrastructure improvements; business development; housing; community facilities such as schools, public safety and health care; and high-speed internet access in rural, tribal and high- poverty areas. Visit www.rd.usda.gov.

For NH and VT – Rural Development US Dept of Ag, contact Sarah Waring, State Director at (802) 828-6000, or Sarah.Waring@usda.gov. ♻

Avast, Mate – Sail Ho!

Cont'd from p.16

and above-deck storage provide limited deck space for sail-supporting structures.

What's the benefit?

For shipping operators, the biggest benefit is that the wind is free.

The sails cost a reported $2.55m, according to Yara Marine, and fuel savings should mean payback in as little as seven to 10 years – about a third of the lifespan of the typical cargo ship. Incorporated into newly built vessels with optimized hull and drive train design alongside advanced course planning, they could reduce fuel use by almost one third.

Additionally, consumer demand for low-GHG impact products is growing and some nations are considering imposing carbon emissions fees on shippers.

For the planet, the benefit is a reduction in emissions from an industry that, according to UNCTAD contributes about 2.8% of all GHG emissions and is a focus for GHG reduction mainly due to its rapid growth, its dependence on carbon-intensive fuels, and the sheer size of its business. More than 80% of the world merchandise trade by volume is transported by sea.

The Alfa Laval/Wallenius Oceanbird. (Courtesy image)

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

City Thanks EV-friendly Employers

– Cont'd from p.6

- Adimab recently installed EV charging for employees; and
- Mascoma Bank offers employees an exceptionally low rate on loans to buy EVs; and
- Local car dealers including Lebanon Ford, Volvo and Volkswagen of Lebanon, and Nissan of Lebanon provide EV charging for use by employees and others; and

WHEREAS, these employers serve as role models for forward-thinking employers throughout the Upper Valley,

NOW, THEREFORE, BE IT RESOLVED by the Lebanon City Council that we, the members of the Lebanon City Council, express our gratitude to Dartmouth Health, Hypertherm Associates, Mascoma Bank, Adimab, Lebanon Ford, Volvo and Volkswagen of Lebanon, Nissan of Lebanon, and all other employers in Lebanon who make EV charging available to their employees or otherwise facilitate adoption of EVs by employees. We are grateful for their efforts to meet the needs of employees who drive EVs and to create a sustainable and greener future for our City.

ALSO, BE IT RESOLVED that the members of the Lebanon City Council express our gratitude to employers elsewhere in the Upper Valley who may employ Lebanon residents and who make some EV charging or other EV-friendly policies available to employees, including:

In Hanover, N.H. – Dartmouth College and Kendal at Hanover;

In Enfield, N.H. – Montcalm Golf Club;

In Norwich, VT. – SolaflectEV and King Arthur Baking Company;

In Hartford and White River Junction, VT. -- The Town of Hartford; Norwich EV; Mascoma Bank; Key Chevrolet of White River; Upper Valley Honda, and All-Star White River at the Gilman Office Center.

Clayton Morlock talks with Melissa Ingrisano about his BMW i3 EV at the Upper Valley Electric Vehicle Expo on September 30 in Lebanon, NH. (Meg Newman)

LASTLY, BE IT RESOLVED that the members of the Lebanon City Council encourage other employers to take advantage of free assistance for installing workplace EV charging that is available through the federal EMPOWER program (Equitable Mobility Powering Opportunities for Workplace Electrification Readiness) by contacting EMPOWER at www.workplacecharging.com or Jessica.Wilcox@des.nh.gov.

Dated this 20th day of September 2023.

Signed by Lebanon Mayor Timothy J. McNamara on behalf of the Lebanon City Council. ♻

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

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

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

USDA RURAL DEVELOPMENT PROGRAM

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

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

Biorefinery Renewable Chemical, and Biobased Product Manufacturing Assistance Program

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

REGIONAL

The Grassroots Fund's Grant Programs

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

Three grant programs are offered:

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

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

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

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

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

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

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

Advanced Wood Heating Advanced wood pellet heating systems -- $3,000 per pellet boiler/furnace (in partnership with Efficiency Vermont). Commercial spaces over 5,000 sq. ft. may also be eligible for incentives. For the most updated information, see www.rerc-vt.org/advanced-wood-heating-systems 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 $1,500 or 50%, whichever is less, of the total bin/materials cost (not including labor).

• Commercial Bulk – Up to $2,000 or 50%, whichever is less, of the total bin/materials cost (not including labor).

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

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

• Coal Change-out adder. Up to $6,000 additional incentive for a pellet heating system if replacing a coal heating system. Businesses can get up to an additional $27,000 incentive. Details at www.rerc-vt.org or call (877) 888-7372.

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

Other Utilities Heating Offers

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

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

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

VT TAX CREDITS

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

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

Tier III programs

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

EFFICIENCY VERMONT

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

Lighting

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

Weatherization

• Comprehensive air sealing and insulation projects with an Efficiency Excellence Network contractor: 75% off eligible project costs, up to $4,000. Moderate income Vermonters get 75% off up to $9,500.

• 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.

Flood Recovery Rebates for Homeowners and Renters

To Homeowners and renters recovering from flood damage can get up to $24,500 back on eligible products, appliances, and weatherization services. See efficiencyvermont.com/floodrebate.

GMP Rebates Through 2023

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

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

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

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

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

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Department of Energy

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

Commercial Solar Rebate Program

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

Incentive levels for PV systems are as follows:

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

• Expansions to existing solar systems are not eligible.

• Incentive levels for solar thermal systems are as follows:

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

• Expansions to existing solar systems not eligible.

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

Residential Solar/Wind Rebate Program

Residential Solar/Wind Rebate Program: Rebates will be awarded by lottery.. For more information, visit the NH DOE's website bit.ly/NH-DOE_ResidentialRenewableEnergy.

Residential Solar Water Heating Rebate Program is currently closed.

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

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

Residential Wood Pellet Boiler/Furnace

• 40% of installed system up to $10k

• Must meet thermal efficiency and particulate emissions standards

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

LOCAL INCENTIVES

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

• *These are offered on a town-by-town basis.*

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

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

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

NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the Home Heating Index (BTUs of heating fuel / conditioned square feet / heating degree days). Must provide at least 12 months of heating fuel history. Once qualified, eligible

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

homes get a $450 value comprehensive energy audit for $100 (rebated if improvements installed), and 75% instant rebate for eligible weatherization improvements up to a $8,000.

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

NH ENERGY STAR Homes

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

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

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

NHSaves Residential ENERGY STAR ® certified Products Program

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

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

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

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

NHSAVES Online Store

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

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

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

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

NHSaves: www.nhsaves.com

Energy Star® Residential Heating, Cooling, & Water Heating Equipment Rebate

Rebates of up to $500/ton on Air Source and Geothermal Heat Pumps. Rebates of $500 - $750 on Heat Pump Water Heaters. Rebates of $100 on WiFi Thermostats

• Program details and application at www.NHSaves.com/heating cooling

Other NH Electric Utility Programs

See also individual utilities for additional programs and variations. NH electric utilities may offer low or no interest on-bill financing for energy efficiency projects.

Visit www.NHSaves.com/resource/ for individual utility contact information.

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

Electric Vehicle & Charging Incentives:

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

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

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

High Efficiency Heat Pump Incentives:

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

Business Programs

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

Visit www.NHSaves.com/ for information about NH business incentives for electricity efficiency.

NH Weatherization Assistance Income-Eligible Programs

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

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

Community Development Finance Authority (CDFA) Clean Energy Fund

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

to support energy efficiency and renewable energy projects.

Small Business Energy Audit Grants

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

Community Facilities Energy Assessment Grants

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

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

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED IN NEW YORK

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

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

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

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

National Grid: To get the latest info go to: NGRID.com/Save.

Clean Energy Incentives and Tax Credits for Renewable Energy

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

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

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

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

Electric Vehicle Charging Station Make-Ready Program

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

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

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

MAINE

EFFICIENCY MAINE

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

Home Insulation:

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

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

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

Multifamily Insulation:

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

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

Heat and Cooling:

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

Heat Pumps:

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

Businesses, municipalities, schools, and other non-residential facilities are eligible for commercial incentives. Learn more at the Efficiency Maine heat pump website hub at efficiencymaine.com/about-heat-pumps/.

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

Electric Vehicles (EVs): Efficiency Maine offers instant rebates for eligible battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) at participating Maine car dealerships. Low- and moderate-income Mainers, businesses, and governmental entities can qualify for enhanced EV rebates. Learn more at https://www.efficiencymaine.com/ev/.

Electric Vehicle Charging Solutions: Charging in a single-family home is convenient and inexpensive. For those reasons, most EV drivers charge at home using either a Level 1 charger cord or a faster-Level 2 charger. Public EV charging host sites at businesses, municipalities, or multi-family residential complexes can increase employee satisfaction, demonstrate sustainability commitments, strengthen relationships with customers and attract new ones. Efficiency Maine offers information and tips for consumers and businesses looking to install EV chargers. Learn more at: https://www.efficiencymaine.com/at-work/electric-vehicle-charging/

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

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

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

Heat Pumps Outperform Boilers and Furnaces Even in the Cold

Some utilities and fossil-fuel interests like to say heat pumps don't work in the cold. A new study provides yet more evidence to debunk that misrepresentation.

Alison F. Takemura

Not only do heat pumps function in freezing temperatures — they work far more efficiently than fossil-fuel heating systems in the cold.

That's according to a team of researchers in Europe affiliated with the independent nonprofit Regulatory Assistance Project. They published a study in Joule this week that provides yet more evidence to debunk the myth that heat pumps can't handle cold climates.

The outdoor unit of an air source heat pump operating in freezing conditions. (Wikipedia)

Electric heat pumps both heat and cool indoor spaces by moving heat into or out of them as needed. And while global sales grew by 11 percent in 2022, according to the International Energy Agency, heat pumps still only account for about a tenth of the world's building heating. To achieve the Paris Agreement's target of net-zero emissions by 2050, heat pumps will need to replace far more fossil-fuel boilers and furnaces — including in places with frigid winters.

Extreme cold historically has been a barrier for the technology, with major utilities and fossil fuel interests asserting that heat pumps don't work below freezing and pointing to drops in efficiency as evidence. But as the new study and examples from places including Norway and Maine have shown, modern heat pumps are reliable and outperform fossil-fuel heating in the cold.

To find out how well air-source heat pumps work as temperatures plummet, the team analyzed data from seven field studies across three continents, drawing on observations of different heat-pump models from Canada, China, Germany, Switzerland, the United Kingdom and the U.S.

These studies reported on heat-pump performance in the depths of winter — January — using a metric called the "coefficient of performance." COP measures how much thermal energy you can get out of a heating system for every unit of energy you put in. Heating technologies that burn fossil fuels or use electric resistance convert one form of energy into another, so they hit a thermodynamic limit at 100 percent efficiency, or a COP of 1.

But heat pumps cleverly move heat around using refrigerant. They can routinely achieve COPs of 3 to 4, though higher values are possible, according to Duncan Gibb, senior advisor at the Regulatory Assistance Project and co-author of the new study. For instantaneous measurements (as opposed to those averaged out over a day), "I've seen some data where it gets up to 7."

Efficiency declines when temperatures drop, however, as the gap between outdoor and desired indoor temperature widens. (This is the major reason why geothermal heat pumps, which draw heat from the earth and are much more insulated from the temperature swings in the ambient air, are more efficient.)

Even though the COP of air-source heat pumps declines as temperatures fall, the team found that heat pumps surpass fossil and electric-resistance systems in efficiency — including at temperatures that define, for many Europeans, "the coldest days of the year," Gibb said.

Ninety-five percent of European households dwell in countries where mean January temperatures are higher than -5°C (23°F), according to Gibb. In those conditions — and indeed even at lower temperatures — heat pumps still hum along with a COP of 2 to 3, as shown in the chart.

Specially designed cold-climate heat pumps can produce heat in even more extreme weather, the team found, although these results aren't shown in the chart above. Heat pumps tested in temperatures as low as -30°C (-22°F) in Finland ran with a COP of 1.5 or higher, Gibb said.

These observations are critical for countries figuring out how to get off fossil fuels, including France, Germany, the Netherlands and the U.K., Gibb noted. For Europe, "there are very few — if any — technical conditions where a heat pump is not suitable based on the climate."

That helps explain why heat pumps are taking off in some colder parts of the continent. The Scandinavian countries of Norway, Sweden and Finland have some of the frostiest winters in Europe, but they are also some of the most enthusiastic heat-pump adopters. These countries experienced the highest per capita heat-pump sales in Europe in 2022, according to the authors.

As for the U.S., in 2022, Americans bought more heat pumps than gas furnaces. That includes success in Maine, which despite its bone-chilling winters has already blown past its goal to install 100,000 new heat pumps by 2025. In July, it upped its pledge to deploy 175,000 more by 2027. Customers in both Maine and Colorado have attested that their heat pumps kept them cozy

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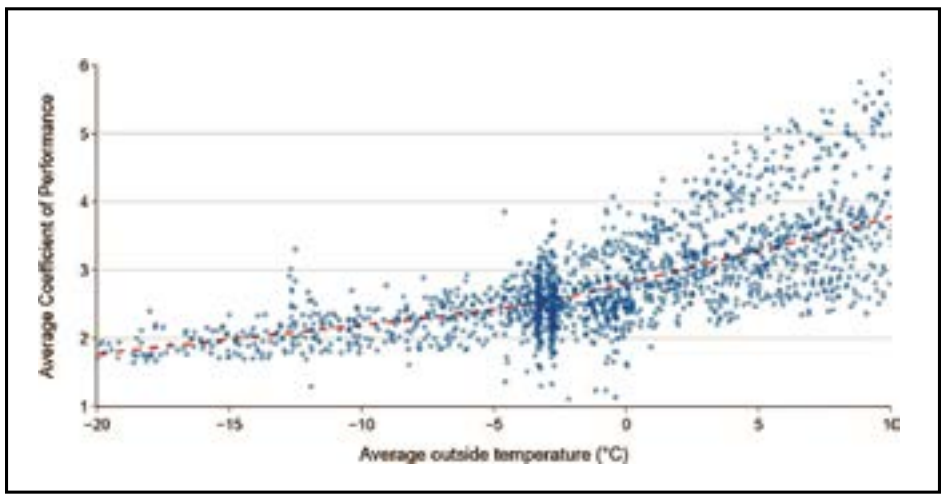

Air-source heat pumps keep churning out heat in cold temperatures. Each dot is either a heat pump's instantaneously measured COP at a specific temperature or averaged across a day's range of COP and temperature values. Data is from seven field studies. (Joule)

Emerging Air-to-water Heat Pump Technology Holds Promise to Remain Operable Down to -30°F

Ryan Moag and Margaret Richards

A battery of air-to-water heat pumps provides heats and cools an 18,000 square foot concrete slab of the Basilica Hudson, a popular venue for performances and events in Hudson, New York. The Basilica (on the right) will meet all of their energy needs this year with clean HVAC technologies powered by an on-site solar-photovoltaic system. (Courtesy photos)

Efforts to decarbonize are taking our nation's buildings sector by storm, with New York State at the forefront of policymaking for climate-friendly buildings. Given that fossil fuel-supported building operations are responsible for 43% of New York State's annual emissions, legislators have set in motion an effort to completely decarbonize six million buildings. The mass departure from fossil fuels is already well underway, with two million homes and buildings on track to be equipped with heat pumps for electric heating and cooling by 2030. This progress is encouraging, but the road to electrifying HVAC in New York and the nation as a whole remains a long one. As of 2020, 52% of U.S. households still use natural gas appliances for space heating. This state of affairs poses substantial technical challenges for utilities and HVAC equipment manufacturers alike.

On the utility side, grid capacity remains a substantial barrier to complete electrification; As things stand, fossil fuel appliances account for trillions of BTUs of energy consumption annually. Although heat pumps are hyper efficient, if we were to displace every fossil fuel heating system overnight, the grid capacity does not yet exist to support it. Along the same lines, a great deal of energy is wasted maintaining capacity in reserve for peak demand. During the summer months back-up generation is left idling in anticipation of spikes in cooling loads. Replacing all fossil fuel heating systems with electric systems has the potential to create a second wintertime peak that utilities will have to account for. In other words, the supply side will need sufficient preparations to accommodate a world where the energy needs of all residences are met sustainably.

This is not to say that we should be discouraged about our efforts to completely electrify HVAC in this country and abroad. Jettisoning fossil fuels from every aspect of our life remains the only real option we have. While many people are working on the issues we have raised on the utility side, it is important to remember that this transition will likely require millions of individual home owners to willingly adopt a new technology at their own expense. It can be difficult to convince people to change how they heat and cool their homes – after all, when an old system fails, homeowners tend to simply replace what was there before.

With these obstacles in mind, the rapid decarbonization of the residential energy sector will require a more holistic approach than installing an air-source heat pump in every household. While a complete revision of our energy infrastructure will bring us in sight of the finish line, if no attention is paid to the habits and preferences of the individual consumer, we may still fall short.

Air-to-water Heat Pumps

There's a reason that split-system air-source heat pumps are at the center of state and federal climate policy. They are exceptionally efficient, cost effective, and can easily be used to retrofit most standard residences and light commercial buildings. They emit at least three times less greenhouse gasses than the best fossil fuel sources, and their life-cycle emissions will be further reduced as the power grid shifts to carbon free electricity generation.

Government sponsored tax credits and rebates for air-source heat pumps have been instrumental in making the environmentally responsible choice financially favorable. Thus far these programs have been successful in their aim to persuade.

That being said, there remain a few areas where fossil fuel systems retain an edge. For example, heat pumps can produce heat extremely efficiently, but most compressors and common refrigerants are not designed to

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Networked Geothermal and Birth of a New Utility

A tried-and-true technology brings clean, affordable heating and cooling to communities

Laurel Kayne

After decades of relative obscurity—at least in the U.S.—geothermal is rapidly gaining acceptance as a powerful source of renewable energy. Companies like Fervo Energy have made headlines recently for their efforts to generate electricity by drilling deep into the earth, where temperatures reach hundreds of degrees, using technically complex, and potentially high-risk approaches.

The heat beneath our feet

However, there is another kind of geothermal energy that sits almost right beneath our feet. That energy is used not to generate electricity, but to provide heating and cooling. The core technology—the ground-source heat pump—has been around for many decades and is fairly straightforward. It's also remarkably efficient—more on that in a minute.

The recent innovation with this kind of geothermal isn't the equipment—it's networking the components over wider geographic areas and using a utility business model. Rather than individual homeowners paying for single geothermal systems, gas utilities are beginning to pilot networked geothermal installations that connect entire neighborhoods, including residential and commercial buildings. With this model, gas utilities can leverage not only their right-of-way in the street, but their capital financing, which amortizes cost over decades and across the entire customer base, along with their skilled workforce.

How do such systems work?

A closed, horizontal loop of pipe filled with water sits below the frostline, where in New England the ambient temperature is 55 . A set of vertical boreholes goes down several hundred feet and ties into the horizontal loop. Buildings are connected to the loop, and a ground-source heat pump in each building delivers heat in the winter and removes heat in the summer. The system is powered by electricity, which means that when the grid is fully green, networked geothermal will be entirely emissions-free.

Back to efficiency

In a networked geothermal system, when heat is removed from buildings in the summer, that thermal energy isn't vented outdoors; it goes back into the ground, where some of it is absorbed by the bedrock and sent back into buildings in the winter. "Rejected" heat can also be transferred

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IRA Guidance For Heating & Homes

U.S. Department of the Treasury and IRS Release Guidance to Lower Americans Utility Bills, Increase Energy Efficiency of Homes with IRA

As part of the Biden-Harris Administration's Investing in America agenda, the U.S. Treasury Department and the Internal Revenue Service released guidance on an important provision of the Inflation Reduction Act (IRA) that will lower Americans' utility bills.

The Inflation Reduction Act enhanced the energy efficient home credit. It allows home builders who construct, reconstruct, or rehabilitate energy efficient homes a tax credit of up to $5,000 per home. Today's guidance provides clarity to home builders on the qualifications for the credit.

To qualify for the credit, homes must be eligible to participate in certain Energy Star programs and meet applicable energy saving requirements based on home type. For homes acquired in 2023 through 2032, the credit amount ranges from $500 to $5,000, depending on whether Energy Star or Zero Energy Ready Home program requirements are met. These programs certify the energy efficiency of a home's appliances, lighting, insulation, and duct systems, as well as whether the home can accommodate heat pumps and electric vehicles. Homes must be certified by a third-party to verify they meet the requirements.

Other homes also have credits available, as do multi-unit residences. Read more at https://bit.ly/IRA_homes_PR. ♻

Scalable, Affordable Net-Zero Homes

– IN THE EFFICIENCY GAME, SIMPLICITY WINS –

Dan Vastyan

To achieve net-zero status, a home must produce as much energy as it consumes, and this is typically via solar or wind.

"Net-zero has been an obtainable goal for decades, but usually at a prohibitive initial cost," said Tom Danielsen, founder of Danielsen Construction and Energy Management, in Altaville, CA.

Danielsen wanted to prove that by adopting net-zero as the goal early in the design process, the cost difference between a traditional home and a net-zero home can be mere pennies, without sacrificing comfort.

HABITAT FOR HUMANITY PILOT PROJECT

Danielsen has retrofitted many existing Habitat for Humanity houses with energy efficient upgrades. But it wasn't until recently that Danielsen took control of a new construction project, with plans to prove his "net-zero for pennies," hypothesis.

Danielsen presented the Habitat for Humanity board with his idea to build an experimental home in Calaveras County, CA. The goal was to: (a) prove that his net-zero construction method is replicable at scale; (b) prove that the home has a similar square-foot cost as traditionally-built homes; and (c) have an unbiased outsideparty measure the energy performance of the home. The board agreed.

Implementing experience

"In any discussion of how to make a home efficient, the three main topics are insulation, air sealing, and the HVAC system," said Danielsen.

He uses Owens Corning L77 BIB (blown in blanket) insulation in the ceilings (R-40) and walls (R-21). He installs AMSCO low-E, 366 glazed, dual-pane, argon-filled windows with a U factor of 0.24.

"When it comes to air sealing, the most critical areas are those that can't be accessed once construction is finished; the plumbing cutouts, framing cavities, wiring inlets and register exchanges."

"We're big believers in Fujitsu heat pump technology," said Danielsen. "That doesn't make us unique, but how we size and install them does."

Danielsen explained that heat pumps don't reach full efficiency until they've been running for 10 or 15 minutes. An oversized unit that cycles on and off never operates at its maximum efficiency. Consequently, he is very careful not to oversize heat pumps.

"Our ductwork layout is a radial design," he continued. "We run duct directly from the plenum to point of use. Air should move at 400-600 CFM, generating very little friction and conductive loss."

Finally, sealing ductwork and covering it with insulation is extremely important.

Got the green goods

Technical Specialty Solutions offered to donate a 2.76 kW solar array that was installed on the 1,250 square-foot house. The array would cover nearly all the power used in the home. Due to the project's small budget and the fact that the solar array was donated, it wasn't possible to install an array that would fully cover the home's entire electricity needs.

The heat pump is a single-zone 12,000 BTU/h Fujitsu H-Series system, offering up to 21.5 SEER.

Owens Corning L77 BIB (blown in blanket) insulation was used in the ceilings (R-40) and walls (R-21). (Courtesy image)

The 1,250 s.f. home features a 2.76kW photovoltaic solar array. The cost to build this pilot project house was $320k, but when built at scale (in a subdivision), the same home will be about $190k major cost savings on framing at scale. (Tom Danielsen)

"We install Fujitsu heat pumps because they heat extremely well," said Danielson. "Also, their tech support and warranty are the best in the business."

To round out the equipment list, Danielsen installed a 50-gallon Ruud heat pump water heater. LED lighting was used, and builder-grade, ENERGY STAR appliances were selected.

Torsten Glidden, a contractor for the U.S. Department of Energy's Building Technologies Office, installed a SiteSage energy monitoring system on the home's main breaker panel, allowing data collection from every circuit.

The experiment

Once the house was complete and occupied, occupants were encouraged to make their home comfortable. There were no restrictions on energy use. After a year of data collection, Danielsen had very specific numbers to compare against Pacific Gas & Electric's (PG&E) annual utility data for the property.

The data collected corroborated what appeared in PG&E's annual True-Up bill: extremely low household power utilization.

The results

Over the course of the year, the small solar array produced 4,571 kWh. The water heater consumed the most power, followed by the heat pump, the dryer, and so on.

"We can see that the Fujitsu system uses between 400 and 600 Watts during the winter, and between 600 and 800 Watts in the summer," said Danielsen. "Over the course of the year, it consumed a little more than double the energy it took to operate the refrigerator. That's amazing."

The True-Up bill portrayed all energy consumption in

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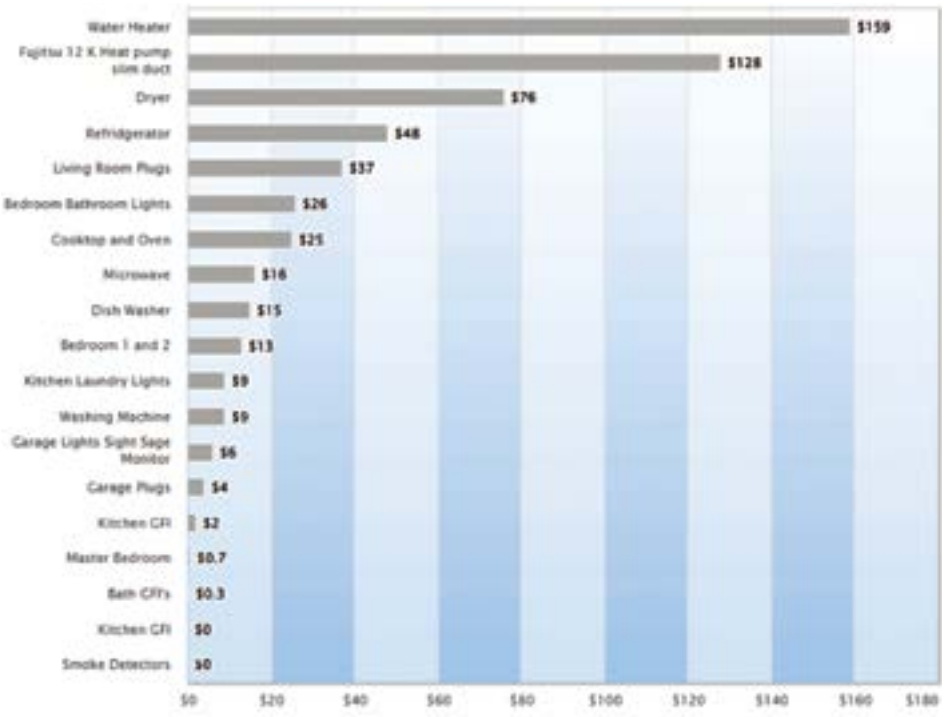
Affordable Net Zero Homes – Cont'd from p.25

ENERGY CONSUMPTION OF EACH APPLIANCE IN THE HOME



The data collection system displays power consumption from each circuit in the home. After solar generation, the Fujitsu mini-split consumed $128 of power over the course of the year. (Tom Danielsen)

dollar values, adjusted for the power generated by the solar array.

The homeowner's annual energy expense was $574. Hot water production cost was $159, heating and cooling accounted for $128, and the dryer consumed $76 worth of power.

"It costs less to power this house for a year than the average home in California for two months," said Danielsen. Habitat for Humanity could hardly believe the numbers were real.

"We're not doing anything crazy here, and even if the solar array hadn't been donated, this house would have cost roughly the same as a traditional home" said Danielsen. "There were no expensive building materials or methods used. We installed basic equipment, employed best practices and added a small photovoltaic array. In fact, if we could have added one more solar panel, this would be a true net-zero property."

Dan Vastyan is President of Common Ground, Uncommon Communications, LLC. ♻

Maine Could Tackle the Housing and Climate Crises in Tandem

Annie Ropeik, Energy News Network

Maine's deepening housing crisis is colliding with the global climate crisis.

The state's population is growing faster than its housing supply — and that growth is driven in part by people seeking out temperate locations to call home in a rapidly warming world.

Some advocates see an opportunity in tackling these two crises at the same time, if state leaders can steer new construction toward the type of denser, all-electric, energy efficient housing that can help bring down living costs and carbon emissions.

High performance construction with attention to sealing and continuous insulation can help to solve the housing and climate crises at the same time. (kimchi and kraut)

Maine Conservation Voters policy director Kathleen Meil is part of the buildings working group of the Maine Climate Council, which is preparing to update its ambitious, four-year 2020 climate plan this fall. She hopes the next phase of their work will dig deeper into this intersection.

"It's one of the things that I actually find really exciting about this work and about everything related to climate action," Meil said. "It feels much better than being overwhelmed… We get to tackle all of the most important problems that people face at the same time.'"

Data shows that Maine especially lacks housing units that are affordable for the lowest-income people. The state has struggled to shelter thousands of unhoused people and hundreds of incoming asylum-seekers from overseas. And the new arrivals are likely only to increase as the climate warms.

Despite facing climate change impacts of their own, Northern New England states have been called potential "climate havens," where the temperate and relatively wildfire- and hurricane-free climate is poised to be a draw for people fleeing more extreme conditions.

Staff with the Maine Immigrants' Rights Coalition (MIRC) say people emigrating to Maine, including from countries in Africa, may not cite climate change as the topline reason they moved — but dig a little deeper and its signature can be seen throughout migration patterns worldwide.

Historic drought and sporadic rainfall have been disrupting the food and farming systems in these migrants' home countries like these, creating economic disruption and new threats of violence.

"We certainly expect, as time moves on, to see more and more [people] be displaced," domestically and abroad, said MIRC's Tobin Williamson. "Now's the time to build housing for them."

This preparation means infrastructure upgrades and other community planning improvements, he said, including denser housing development, enabled by a bill the state passed last year.

But in order to meet state goals for lowering emissions and to help combat the climate changes that are helping fuel this migration, the homes that Maine adds to meet the needs of new and existing residents will also need to be built differently than traditional Maine homes.

Maine relies more than any other state on pricey, carbon-intensive heating oil. Though electric heat pumps are increasingly efficient in cold temperatures, these and similar upgrades can make for complicated retrofits in older, less weatherized homes, which are common in Maine.

State officials announced in late July that they have already met an initial climate plan target for installing 100,000 new heat pumps by 2025. More aggressive goals for future years are

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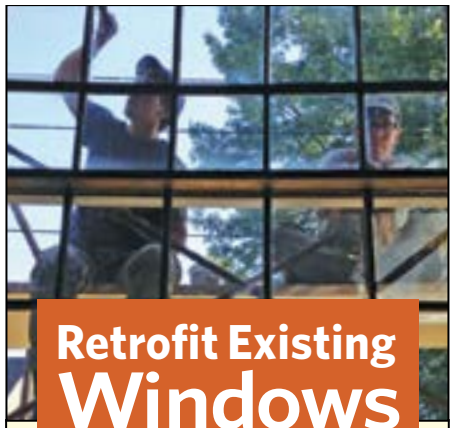


The Ruth Lewin Griffin Place

LEED Gold Multi-Family Housing for Working People

Barb and Greg Whitchurch

The Ruth Lewin Griffin Place, affectionately known by locals as "Ruth's Place," was the vision of its namesake, who recently retired from the Portsmouth Housing Authority Board, where she served as a board member and commissioner since 1978. When it opened last year, "Ruth's Place" received the New Hampshire "Building of the Year" award from the U.S. Green Building Council.

The Ruth Lewin Griffin Place in Portsmouth, NH. The photovoltaic and the ERV systems are located on the roof. (Images from Eckman Construction)

Now in her nineties, Lewin refers to the building as "affordable workforce housing." Her vision was to provide affordable housing to "the men and women who made Portsmouth what it is today," by providing income-adjusted rent pricing for those who have been forced into long commutes by the lack of affordable housing within the city (https://bit.ly/sco-rlg).

Those who meet the income eligibility guidelines get a one-bedroom apartment starting at $950 per month or a two-bedroom starting at $1,200 per month. The four-story structure contains 64 units and features a rooftop deck with panoramic views of historic downtown Portland.

A finished apartment unit in the Ruth Lewin Griffin Place.

Although the design and build team is capable of reaching much higher standards, a cost-and-benefit analysis led to the choice of LEED Gold as the certification standard they would shoot for.

The tug-of-war between developer and owner, or, in the case of private homes, between bankers and homeowners, pits the up-front costs of environmental damage and out-of-pocket expense against responsible building design and operational costs. Outdated local zoning restrictions and unrecognized embodied-carbon dangers also often conspire to dampen the good intentions of the architects and builders.

How did this project achieve the LEED Gold Standard? We spoke with Carla Goodknight, NCARB, AIA, President of CJ Architects (https://bit.ly/cja-rlg) and Jon Krygeris of Eckman Construction (https://bit.ly/eck-rlg). The sustainability consultants and the LEED administrators as well as the final commissioning were all provided by Resilient Buildings Group (www.ResilientBuildingsGroup.com).

Krygeris, the project manager for this project, explained that the owner, designers and builders used a tightly collaborative approach, which is common in high-performance building. As project manager, he was on site at least once a week, working with the project superintendent on scheduling and contracts. Together, they had to be aware of all the pieces and parts of the project, however minor those details might seem to an untrained observer.

For the concrete foundation walls and footings, they chose slag to replace some of the cement, thus lessening its environmental harm.

Cont'd on p.31

Efficiency Vermont's Efficiency Excellence Network (EEN)

Contractor Spotlight: Net Zero Design, Waterbury Center, Vermont

Interview with Jake Visi, Owner

G.E.T. Staff

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

Jake Visi: In 2008 or 2009, a friend who owned a horticulture company invited me to go to a show in Colorado. I helped run a booth and meet people. I quickly saw the value for horticultural use of LEDs as the market moved away from high-intensity discharge and florescent lights.

When did you start your company?

JV: Net zero design was started in 2016.

What is your service territory?

JV: Most of our clients are in Vermont, but we do projects all over New England and New York because many of our clients have facilities outside of Vermont.

What is your area of expertise?

JV: I like to focus on existing buildings, which means doing an audit, assessment, and implementation. We also work to get the best incentives for our customers. Our special work is to take an authentic design-build approach, dealing with each space individually. Each type of space has to have an application that takes its type into consideration. We are involved in every step of the process.

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

JV: Tubular LED lamps, known as TLEDS, are products that replace existing fluorescent tubes. There are often better approaches, partly because they might not be compatible with existing fluorescent ballasts, which often need to be replaced. Also, replacing old fluorescent lights with TLEDS fails to take advantage of better technology with incentives, which is likely to save money.

Net Zero Design wins the 2023 Partner of the Year award for Efficiency Vermont's Best Practices Exchange. Jake Visi (center), owner of Net Zero Design accepting his award. Also pictured are Cathy Reynold (left), account manager with Efficiency Vermont and Peter Walke (right), director of Efficiency Vermont. (Greg Nesbitt Photography)

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

JV: Controls, controls, controls. Some people would be better off installing a photo cell with their existing lighting technology than switching to more modern lighting without controls. These are things that have to be done thoughtfully.

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

JV: One project we did at a casting company is memorable. Their environment was loud and dark. They had very antiquated lighting. We integrated controls and brought light levels way up. We probably saved 200,000 kWh annually, but we also increased safety and morale. They have called us back several times to do more work.

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

JV: It's the fact that I'm going to come in, look at the facility, and use an integrated design approach, working with every space, up to the commissioning of the lighting. Also, we don't have any commitments to any particular product line, so we can use the best products on the market.

Why should people use an Efficiency Excellence Network member over someone else?

JV: These are the people who have been vetted, are most qualified, and have a proven track record. They live, eat, and breathe their part of the industry.

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

JV: One tool that we have used, and a lot of people don't know about, is equipment back leases. What you do is to harvest the energy savings to create a positive cash flow. We can set up a lease and use the equipment for collateral. Low interest rates can come from organizations like Vermont Economic Development Agency, known as VEDA. Efficiency Vermont is a great resource because they can help with the custom incentive program. I will focus on non-profits because of the Inflation Reduction Act incentives.

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

JV: Customers should ask, "What other facilities like ours have you done? And can I talk to them?" Active referrals can speak volumes.

Net Zero Design can be reached at (802) 658-8487 or netzerodesign@gmail.com ♻

York, Maine Is Ready for Climate Action with the Help of Energy Coaches

York Ready for Climate Action

Every time we take a hot shower, turn up the thermostat or drive our car, we may feel a pang of guilt, knowing that we are contributing to climate change. We know that burning fossil fuels to heat and cool our homes and power our cars is a prime contributor to global heating. Solving a problem as huge as climate change will require many systemic changes, but there are steps we can take at home to lower our impact and be a part of the green energy transformation.

Retrofitting your home with electric heating and cooling, driving an electric car, and even powering your home with solar energy are important parts of reducing our reliance on fossil fuels. The benefits of retrofitting our homes are many – not only can we cut our emissions, but we can save on our energy costs and make our homes more comfortable.

The process of retrofitting a home is complex, however, and the effort required can be daunting. Consumers must choose among a dazzling array of equipment options and installers. Complicating things further, the uneven levels of experience among installers often result in conflicting recommendations to consumers. It is critical that the different aspects of retrofitting a home be integrated (for example, insulating and weatherizing a building will affect the right-sizing of heat pumps and solar)., This coordination is often overlooked because a consumer must consult with one installer for insulation and a different one for heat pumps or solar. This can leave the consumer to decide if it all works well together.

So, it is not surprising that people do not know where to start, or they give up when the process becomes challenging. There is a lot of information on websites, but it is not reaching everyone. The typical resident needs help understanding their options and managing the process. Help on a website is good. Bringing help to a resident's door is better.

This is why York Ready for Climate Action, a grassroots non-profit in York, Maine, has developed an Energy Coaching Program.

In York, single family homes account for 46% of the community's carbon emissions. Cutting emissions from single family homes is a key priority of York's Climate Action Plan, which was approved by 70% of York voters in 2022.

Energy Coaches, who are volunteers from the community, are working in people's homes, helping residents develop a personalized plan that will make a real difference in the energy efficiency of their home. Energy Coaches guide residents through the process of determining and prioritizing needed improvements, identifying vendors and contractors, and supporting them throughout the process. Coaching services are free of charge.

Energy Coaches were trained by experts in energy efficiency strategies like insulation, heat pump technology and solar options. A coach starts by visiting a resident in their home and working with them to determine their home energy goals. They document the current energy systems and look for areas where residents may be losing heat and energy. Together, coaches and clients develop a plan to address these goals through insulation, heat pumps, efficient water heaters, solar and other steps. Coaches can also help residents take advantage of the available rebates and incentives through Efficiency Maine and the Inflation Reduction Act.

This program is in a pilot stage, currently only serving residents of York, Maine with plans to expand in the years to come. The pilot has been operating since April 2023 and has helped York residents identify available contractors, interpret home energy audits, prioritize retrofit projects and understand options for electrifying heat and hot water.

York Ready for Climate Action is developing a Household Equity Fund to help low- and moderate-income residents who may require additional assistance to complete a retrofit. The group is partnering with local organizations to identify and connect with eligible residents. Be sure to visit their website to learn more: (yorkreadyforclimateaction.org)

York Ready for Climate Action was formed in May 2018. It is a non-profit organization consisting of volunteers dedicated to increasing awareness about climate. ♻

Energy Coach Pam Casey helps a client evaluate her options for electrified heating. (Rozanna Patane)

Networked Geothermal – *Cont'd from p.22*

between buildings that have varying heating and cooling needs.

This is one reason networked geothermal is so efficient. The most efficient gas furnaces have a coefficient of performance (COP) of less than 1—meaning for every unit of fuel burned, less than one unit of heat is generated. Networked geothermal systems have been documented to range *between 6 and 9 times that efficiency*—meaning they significantly reduce greenhouse gas emissions. In addition, once our buildings are fully electrified, these systems will also greatly reduce peak demand on the electric grid when compared to other sources of electric heat, such as baseboards.

Increased safety and air quality

Because there is no fuel and no combustion with networked geothermal, there is no risk of explosions (remember the 2018 Merrimack Valley tragedy in Massachusetts), no outdoor gas leaks (which kill trees), and no indoor air pollutants (which can cause or worsen health problems).

Gas utilities in Massachusetts are leading the way

The two largest gas utilities in Massachusetts are front-runners in pioneering the "gas to geo" approach, which is being explored or legislated in states across the country. Eversource Gas has the first-in-the-nation utility networked geothermal installation going in the ground right now in Framingham, which will serve about 140 customers in nearly 40 buildings. National Grid also has an installation in progress in Lowell.

Networked geothermal moves heat into and out of buildings. The primary source of heat is the ambient temperature underground, though the systems also transfer "waste" heat between buildings with different heating and cooling needs, increasing efficiency. (HEET)

Building in equity and environmental justice

A phased transition from gas to networked geothermal led by the utilities can, and must, ensure that underserved and low-income communities are included equitably and with adequate financial support for the necessary home efficiency and appliance upgrades that accompany the shift from natural gas.

The smart alternative to costly gas pipe replacement

Massachusetts ratepayers are on a course to spend an estimated $40 billion over the next 20 years replacing hazardous, old, leaking gas pipes. Similar expenditures are underway wherever natural gas is delivered to homes and businesses. Redirecting our energy investment dollars away from natural gas infrastructure to networked geothermal will help us build the utility of the future—one that delivers safe, renewable, non-combusting, affordable heating and cooling, along with good paying jobs and local economic benefits.

You can learn more about networked geothermal on the open-source Wiki main page link here. Go to www.gastogeo.wiki/ and at HEET.org, a nonprofit climate-solutions incubator working to advance an equitable transition from natural gas to utility networked geothermal. To register your interest in networked geothermal service for your neighborhood, enter your name on the map at https://bit.ly/NetworkGeothermalSurvey.

Laurel Kayne is the director of communications at HEET (Home Energy Efficiency Team). An ardent green enthusiast, Laurel is delighted to apply her energy and skills to helping HEET increase its impact nationwide and accelerate the transition off of fossil fuels. ♻

The PROVE IT Act and Climate System Leverage Points

Judy Davis

I was driving back from a camping trip on Mount Desert Island (the trip cut short by hurricane Lee), Maine, and I started listening to Kim Stanley Robinson's speculative novel *The Ministry for the Future*. When the book starts it is the mid-2020s and there is a devastating heatwave in India which kills 20 million people. The world has not been meeting its goals of carbon reduction or putting the amount of money that was pledged into the fund to help developing nations decarbonize. The developed countries are somewhat concerned about all those deaths, but even more concerned that India spends seven months making high-altitude flights to geo-engineer some heat reduction by adding sulfur dioxide particles into the atmosphere. India calls it a double Pinatubo, referring to the 1991 volcanic eruption that cooled the planet for a few years. Meanwhile, in Switzerland, a small think tank called the Ministry for the Future is trying to identify policies or actions that can quickly effect large reductions in greenhouse gasses. They are looking for the leverage points.

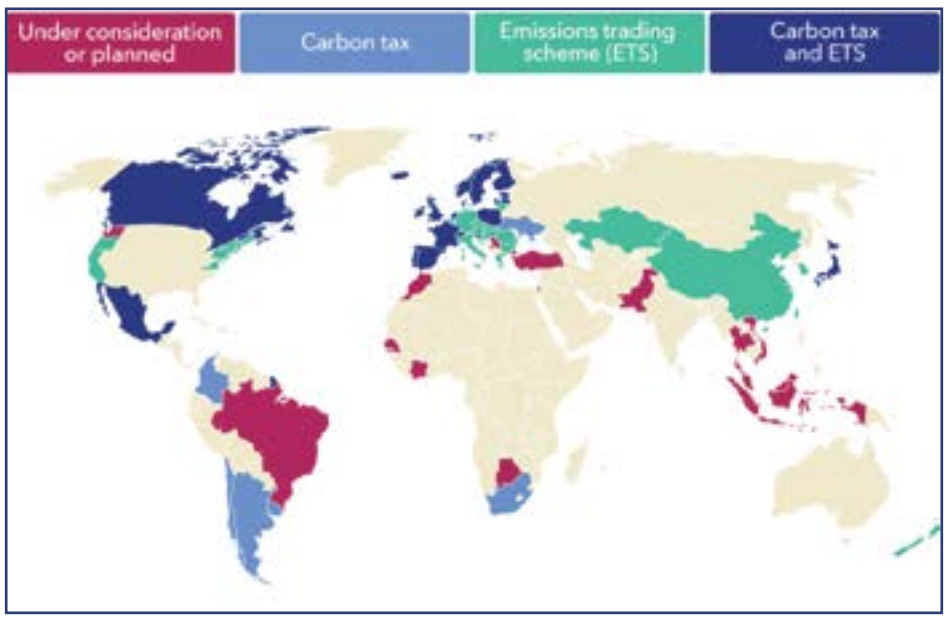
I am a volunteer with Citizens Climate Lobby (CCL), a non-profit that organizes volunteers to actively lobby our members of Congress, in person if possible, to pass bi-partisan legislation to address climate change. CCL is all about leverage points. Scientists and economists and the United Nations Intergovernmental Panel on Climate Change (UN IPCC) all agree that a carbon fee is one of the most effective leverage points - charging the fossil fuel industry a fee for carbon pollution will result in less of it. CCL's preferred policy is to return all fees to households, thus mitigating any cost increases that arise from putting a carbon fee on fossil fuels. In the 2022 omnibus spending bill, which became the Inflation Reduction Act (IRA), Democrats had approval from the House, 49 Senators, and from Vice President Harris as a 50th vote, to add a carbon fee to that bill. They were one vote short.

Senators Sheldon Whitehouse and Brian Schatz had introduced comprehensive climate legislation, the Save Our Future Act of 2021, that included a carbon fee, a methane fee, a host of renewable energy incentives, and robust protections for energy communities and low-income communities (https://bit.ly/3PLTs8f). Much of that bill was included in the IRA - but not the carbon fee. Senator Whitehouse and his colleagues also introduced the Clean Competition Act of 2022, which would place a fee on carbon-intensive imports like steel or aluminum. As part of a Carbon Border Adjustment Mechanism (CBAM), a fee would be charged on imports which have a higher carbon intensity than comparable U.S. products, and the fee would be based on the differential between the carbon emissions created by the manufacture of the imported product and those of products made in the U.S. A discount payment could be made to U.S. manufacturers who export lower carbon intensity products.

How do we know what that carbon intensity differential is? That's where the PROVE IT Act comes in. Introduced by Senators Chris Coons and Kevin Cramer, the bipartisan Providing Reliable, Objective, Verifiable Emissions Intensity and Transparency (PROVE IT) Act would collect the data to establish the relative carbon intensities of products made in different countries or by different manufacturers. The data would be updated every five years and could be used as part of a CBAM. The products that would be studied include, steel, aluminum, cement, hydrogen, solar cells and panels, wind turbines, lithium-ion batteries, plastics, crude oil, and more. Read further at (https://bit.ly/3ENo4jo).

The U.S. is somewhat behind the rest of the world on carbon emissions legislation. Canada and the E.U. have had carbon fees in place for several years. The Canadian system is customized by each province, but many return the revenue from the carbon fee to households in a quarterly cash payment. "Through these payments, the majority of Canadian families receive more money back than they pay, with low-income Canadians benefitting the most" (https://bit.ly/3Rs82my). The E.U. has also approved and begun to implement a CBAM. The recent Africa Climate Summit 2023 ended with a unanimous call for a global carbon tax. To find out more, the World Bank has a website that tracks various carbon pricing initiatives around the world (https://bit.ly/3RxuKtB).

CARBON PRICING AROUND THE WORLD - IMF



Source: WBG, IMF staff calculations and national sources. Note: The boundaries and other information shown on any maps do not imply on the part of the IMF any judgement on the legal status of any territory or any endorsement or acceptance of such boundaries.

As soon as I started thinking about the PROVE IT Act, I started to see articles about new low-carbon or carbon-neutral technologies for some of the products that now produce the most carbon. In Sweden, a company called H2 Green Steel is set to produce low-carbon steel in 2025, using sustainably produced hydrogen and electric arc furnaces instead of coal- and coke-fired blast furnaces, reducing the carbon emissions by more than 95% (https://bit.ly/3PN2QbY). In the U.S., a research group has demonstrated carbon-neutral cement, where the necessary limestone is made by microalgae in the same way coral reefs are formed, and a start-up company is already testing the product (https://bit.ly/3PikAu0).

Enacting the bi-partisan PROVE IT Act might just provide the necessary leverage that leads to creating a Carbon Border Adjustment Mechanism, and the CBAM might provide the leverage to pass a Carbon Fee and Dividend bill - and then the U.S. will be catching up to the rest of the world.

If you want to play with a well-validated interactive model to see where the policy leverage points are in the climate system, Climate Interactive has an easy-to-use simulator to test to your heart's content (climateinteractive.org).

Judy Davis is the volunteer state coordinator for CCL Vermont who lives in Craftsbury Common. After a career in information technology, Davis went back to school for a master's degree in environmental management and sustainability. As a board member of the Federation of Vermont Lakes and Ponds for many years, she advocated for nature-based solutions for lake health and climate change mitigation.

Source links appear on-line. ♻

The Ruth Lewin Griffin Place

Cont'd from p. 28

Substituting fly ash or slag does retard the setting time just a bit, but the final product is stronger, and scheduling is done up front anyway.

As Krygeris points out, both LEED and Energy Star standards require effective air sealing, so they practiced their air sealing with sectional mockups. Then each "block" of two apartments was sealed separately, and mid-construction blower door tests were conducted. This is a common approach, since it allows for fixes before final layers and finishes are applied, while also teaching the crew where to be especially vigilant as they continue along with the build.

The exterior walls were standard two feet by three feet wood framing stud walls with batts and two inches of spray foam to neutralize the thermal bridging. They used Zip sheathing and tapes to achieve an R-32 wall. The flat roof employs four inches of polyisocyanurate board and closed cell under-sheathing spray foam to achieve a R-49 rating.

The historic district designation of the site limited their window options, So Marvin double-pane, low-E, argon-filled units. Every unit has operable windows were used.

The indoor air quality (IAQ) was handled by a GreenHeck ERV (https://bit.ly/gh-erv-rlg) mounted on the roof. This model does allow for monitoring of IAQ, if the building owner wishes to do so.

Partly because of the poisonous gasses injected into spray foam and the board insulations they used, a whole-building flush-out was performed to address the off-gassing.

Fossil fuels are used to run the building's boilers and the clothes dryers; but those threats are pretty much confined to the utility room and laundry area, as they avoided piping it throughout the building. A set temperature range keeps the thermostats in individual apartments (which have baseboard heaters) from being abused. Each apartment has an electric range and oven.

Shared spaces have their own heating in the ceilings: for example, the communal laundry with four washers and dryers, and the community room just inside the entrance to the building. As yet, there is no electric vehicle charging or renewable energy offsets.

Roof deck on the Ruth Lewin Griffin Place apartment housing in Portsmouth, NH. (Eckman Construction)

Krygeris emphasizes that when you plan everything out early on, in collaborative meetings with all contributors (especially for air sealing), it greatly simplifies processes, avoids correcting mistakes, and so saves time and money. Establishing a protocol of how, who and when to seal penetrations is of great importance.

While many opportunities to make the project more efficient were not taken, this building does outperform, out-save, and meet higher efficiency standards, while providing better occupant health and comfort levels than most homes and other buildings being built right now! It also serves a very important need for immediate and improved housing for real working people with low to moderate incomes -- right now!

More urban infill and moderately-priced housing is desperately needed almost everywhere --- the climate and air pollution issues involved can be addressed and improved upon incrementally, as vigorously as we wish, as we go along.

This project represents the innovative, inclusive and forward-thinking interests of the City of Portsmouth.

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

The New Civilian Climate Corps for Jobs and Justice


John Bos

America is facing an environmental crisis that is taking thousands of lives, costing us tens of billions a year, and causing tens of millions of people to attempt to migrate to countries where they believe they can survive.

We are not being helped by the fossil fuel industries whose bottom line and shareholder dividends take precedence over what they might be able to do to help avoid the planet's diminishing capacity to support millions of people, especially in the global south.

"Many of the largest companies have engaged in massive fraud," said former U.S. Vice President Al Gore in a harsh rebuke of the fossil fuel industry at the *New York Times*' Climate Forward event on September 21. Gore, who won the Nobel Peace Prize in 2007, criticized the industry for using their influence to lobby against effective climate action. "The fossil fuel companies, given their record today, are far more effective at capturing politicians than they are at capturing emissions," he said.

"I was one of many who felt for a long time that the fossil fuel companies, or at least many of them, were sincere in saying that they wanted to be a meaningful part of bringing solutions to this crisis," Gore said, as *The Independent* reported. "But I think that it's now clear they are not. Fossil fuel industry speaks with forked tongue."

While he acknowledged that it was not fair to expect the industry to solve a crisis its business model encouraged it to perpetuate, "it's more than fair to ask them to get out of the way and stop blocking the efforts of everybody else to solve this crisis," he said. "I think it's time to call them out."

The last time our country faced an environmental disaster of similar severity, President Franklin D. Roosevelt stepped up and dealt with it, Now the Biden administration is doing the same. On September 20 President Biden rolled out a new American Climate Corps.


Stefan Keller/Pixabay

In 1933, America was both in the depths of the Great Depression and facing an environmental disaster of national proportions. Sweeping from Texas to Nebraska, the Dust Bowl lifted 1.2 billion tons of soil from over 100 million acres, blowing it as far east as New York City, where it browned out the skies for weeks. The Dust Bowl killed around 7,000 people and left at least 2 million homeless.

The storms also had a cascade effect on U.S. agriculture. Wheat production fell by 36% and maize production plummeted by 48% during those years. On a single day, "Black Sunday" April 14, 1935, an estimated three million tons of topsoil were lost from the Great Plains.

"As best anybody knows," writes Thom Hartmann in his Substack column, "the main cause of the Dust Bowl was the widespread deforestation of the central United States for cropland, combined with soil-destructive agricultural practices and a widespread drought through much of the 1930s."

President Roosevelt ended it by starting the Civilian Conservation Corps (CCC), which planted more than three billion trees; built trails and shelters in over 800 parks; planted over 200 million trees in a belt from Bismarck, North Dakota to Amarillo, Texas; and planted seedlings on marginal or abandoned farmlands.

President Biden committed to revisiting the CCC or something like it to deal with today's climate emergency. On January 27, 2021, he issued an executive order on "Tackling the Climate Crisis at Home and Abroad."

On September 18, Senator Ed Markey and Representative Alexandria Ocasio-Cortez, along with 49 colleagues, wrote a public letter encouraging the President to implement his executive order and create a modern-day CCC. In the letter they state "…your Administration can realize the vision of a Civilian Climate Corps that establishes a unified front in the face of climate change - one that looks like America, serves America, and puts good-paying union jobs within reach for more young adults."

Markey and Ocasio-Cortez, along with 49 colleagues also introduced legislation, the Civilian Climate Corps for Jobs and Justice Act of 2023, in both the House and Senate to bring such a program into existence. Over 25 environmental and other groups have endorsed this program.

President Biden has responded by rolling out the new Civilian Climate Corps. Its website American Climate Corps states, "The American Climate Corps will put a new generation of Americans to work conserving our lands and waters, bolstering community resilience, advancing environmental justice, deploying clean energy, implementing energy efficient technologies, and tackling climate change. American Climate Corps members will gain the skills necessary to have access to good-paying jobs that are aligned with high-quality employment opportunities after they complete their paid training or service program." Go to (www.whitehouse.gov/climatecorps/)

The program President Biden rolled out through executive action is not as ambitious as the one Markey and Ocasio-Cortez envisioned, but at least it is a start.

John Bos is a regular contributor to Green Energy Times. *He writes a regular column entitled "Connecting the Dots" for the* Greenfield Recorder. *His articles have appeared in the* Springfield Republican*, the* Daily Hampshire Gazette*, the* Brattleboro Reformer *and other regional newspapers. Comments and questions may be sent to john01301@gmail.com.* ♻

Maine Housing and Climate

Cont'd from p. 27

based on models for reducing emissions.

For new construction, upgrades like these are perhaps "the single biggest no-brainer in the field," said Matt Rusteika of the Building Decarbonization Coalition.

The big potential users of fossil fuel power in most homes, he said, are the space heating and cooling systems, water heating, stove and oven, and washer and dryer. Where available, gas is commonly used to power these, and is a candidate for change-out. Maine has less home gas access than nearly any other state, putting it at a climate advantage.

"It can actually be cheaper to build a new home or a new building with electrification," Rusteika said, "than it is to build something with fossil fuels."

A 2022 law in Maine mandates that new construction funded by the state must meet a high-level energy efficiency standard, such as the Passive House certification or something similar, emphasizing electrification, healthy air quality and low, predictable energy costs.

Fossil fuel power is "not necessary, in a climate way" in new housing, said Naomi Beal, who leads passivhausMAINE. "It's dirty, it's expensive and volatile. … The value of a Passive House-level approach is that the costs are small and super predictable."

But regulations to help decarbonize in new housing must strike a tricky balance, said the Affordable Housing Coalition's Mitchell — improving housing quality, sustainability and affordability, without making projects too expensive to build or otherwise slowing the pace of development to house those most in need.

"There's kind of that sweet spot, because there's also a social equity issue involved in this," Mitchell said. "The cost of energy efficiency and addressing climate change shouldn't fully fall on the backs of people in need of affordable housing."

Rusteika said regulatory requirements can give developers more certainty, but aren't always needed at a time when climate-friendly building alternatives are becoming cost-competitive.

"A lot of people choose electrification on the merits," he said. "It's not an 'eat your vegetables' thing."

One case study is the West End Apartments, a two-building affordable housing complex in South Portland, Maine that opened half in 2021 and half this year. Some units were set aside to house asylum-seekers.

The complex was built to a near-Passive House standard mainly to cut operating costs, said architect Jesse Thompson. It has all electric appliances, heat and utilities, except for gas water heaters. These were the cheapest option when the project was designed, but electric water heaters might be preferable in the near future, he said.

"It's changing really, really rapidly," Thompson said. "The machinery's getting less expensive; the state is pushing much harder to do it."

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Heat Pump Performance

Cont'd from p. 20

during extreme cold snaps in the last couple of years.

Still, the myth of heat-pump insufficiency persists. Ironically, a nation with milder winters, the U.K., is one of the places Gibb has seen the misconception most. In media stories and social posts, people have reported being dissatisfied with their heat pumps. It can happen, Gibb acknowledged, but it isn't necessarily a reflection of the tech's capabilities, he said. "In many cases, they just got a bad installation."


A heat pump keeps a waiting room warm. (public domain)

These types of stories represent "a pretty dangerous line of misinformation," Gibb said, "because it erodes public trust in [heat-pump] technology when it can achieve very high performance." The U.K. installed less than a tenth of the number of heat pumps that France did last year.

What's more, companies in the fossil-fuel business have pounced on even slight declines in heat-pump efficiency as a valid reason to delay a transition to clean heat. For example, in July, U.S. utility Xcel Energy argued that heat pumps should play a limited role alongside the continued use of fossil gas as part of efforts to decarbonize Colorado, citing a recent report the utility had funded. Preliminary results found a modest drop in heat-pump efficiency, 5 to 12%, at higher altitudes — the testing facility was about a mile above sea level.

Xcel also stated that while heat pumps do well above 40°F, "their performance degrades at lower levels."

For those reasons, "most homes using heat pumps for heat would require additional backup heating, either gas-fired or resistance electric heating," Xcel concluded.

"It's true that the performance does decline when it gets colder. That's a fact," Gibb said. But when "entrenched interests" use that to write off heat pumps, they're ignoring the fact that the technology still handles cold weather reliably — and more efficiently — than fossil-based alternatives.

Alison F. Takemura is a staff writer at Canary Media.

Reprinted with permission from Canary Media's blog on September 13, 2023 found at https://www.canarymedia.com. ♻

Mother Nature's Takeover of Our Climate System

Dr. Alan K. Betts

This is a review of the takeover of the climate system by the living Earth, colloquially known as Mother Nature, in response to the refusal of global societies to significantly reduce the burning of the fossil fuels that are driving the extreme climate change destroying life on Earth. So it covers issues beyond the conventional science perspective. The framework is based on two papers published at alanbetts.com/research in 2022 and 2023 [2, 3].

In 1976, I realized we were heading for a climate disaster because our leaders did not accept responsibility for the Earth. I had unusual PhD training from Frank Ludlam, who could look at the sky, clouds, and winds and infer a complete forecast of the weather. No one else could, so he became the in-flight real-time forecaster on the bomber missions over Europe in WW2. I learnt from him that if an issue was critical and you could see possible solutions, it was your responsibility. In my case the issue was climate change. So, in parallel with my climate research career, I restructured my life, bought land in Vermont and built a passive solar house with a few solar panels.

Then in 1980, I posed the question: "How do we merge science with wisdom?" I was sent to Tiruvannamalai in southeast India. To my utter surprise, as I sat in a meditation room upon arrival, the Creator took me through my whole life to show me it was all known to her — leaving me ecstatic, transformed with the tools needed to understand living saints and sages.

These are four keys for understanding the living Earth in human terms.

First, the shift to a more colloquial image "Mother Nature is taking over the climate system" is powerful, because this indigenous concept is understood by local communities. It has another huge advantage that it is also free from the male power syndrome that has been dominant for thousands of years and has contributed so much to the exploitation of people, the planet and the current destruction of life on Earth for profit.

CLASH OF REALITIES

MOTHER NATURE	CAPITALISM/FOSSIL EMPIRE
• Indigenous world	• Human/natural resources
• Preserve web of life	• Exploit people and the Earth for profit
• She is the Truth that sets you Free	• Maximize $ profit
• Power Unlimited	• Use money and lies to bribe and control
• Join her: she can help you!	• "We're in charge"

This Figure from three frames the clash of realities between Mother Nature's powerful perspective and the 45 years of criminal behavior by the capitalist 'Fossil Empire'.

Mother Nature is hot. (Flickr/Philip Edmondson)

The second is that, for European culture, the Council of Nicaea in 325 AD was critical. The Roman Catholic Church was created to meet the needs of the Roman Emperor Constantine for male power for warfare and over women, Indigenous people and nature. Constantine insisted that the Aramaic gospels of the Indigenous Aramaic-speaking teacher Yeshua (whom we know as Jesus) be destroyed, because they referred to the birther of the cosmos and the creation — a female concept. The original Aramaic gospels have only recently been retranslated. The male Catholic priests worshiped a male god safely removed to heaven, so he would not interfere with their human power. Indirectly, the priests ruled societies and influenced the rise of science for more than 1,500 years. Christianity split into many groups, but almost none understand how Yeshua and his disciples as indigenous people revered women, and chose the truth of Mother Nature over male power. In the present era, Pope Francis understands many of these issues, and has pushed successfully for wise strategies on global climate change, and apologized for the abuse of women and indigenous people by priests. Other male power groups like the Southern Baptists still allow their priests to rape women.

The third is that the Indigenous world view which understands Mother Nature takes precedence over amoral capitalism. Historically, this relates to why European and North American societies tried so hard to stamp out indigenous thought, and suppress the culture. For many centuries, Catholic priests supervised the killing of millions of Indigenous people, both to seize their land, and because they feared the Indigenous teachers, who had a better understanding of the teachings of the Indigenous Jesus. On a more humorous note, there are three groups of Indigenous people across Canada, who are associated with three sets of grizzly bears that have not interbred in the past thousand years. Scientists are puzzled how this is possible. But the Indigenous people laugh. They are "our bears" — we have been together through the seasons for a thousand years. Will you come into the forest so you can meet mine?

The fourth is the powerful concept that it is the "Truth that set us Free" to act on behalf of the Creation and Mother Nature. We attribute this deep understanding to the Indigenous Aramaic teacher Yeshua. He had an intimate connection to the Creation, and embraced women as his disciples, so the Jewish and Roman authorities had to kill him, since he was a threat to their male power. However, it is important to understand that the overt takeover of the climate system by Mother Nature is not a religious issue. It is just the reality of the entire web of life and the Creation here on Earth that Yeshua understood so well. However, this truth is still today a direct threat to human power over nature. Many believe we are the "only" intelligent species and that we are "in charge." Apart from indigenous people, we are the only species on Earth that does not listen to, or communicate directly with Mother Nature, even though we could. The Fossil Fuel Empire lies to bury the fact that "business as usual capitalism" is destroying the stable climate system and much of life on Earth for profit. So Mother Nature, which is far more powerful than we are, appears to be taking over on behalf of all of life on Earth. Buried in well-funded webs of lies, very few in our world can face the truth.

The younger generation must face the truth of the real world we live in, which means also stepping into a frame where Mother Nature can read their minds and help them in deeper collaboration. All the work you do to help the renewable transition will then benefit.

The sequence of papers on my experience are at alanbetts.com/research. The first in an introduction to climate change and the Fossil Empire. The second is a review of my life and journey. The third has this review in the introduction.

(1) Betts AK, (2021). Climate Change and Society. AIMS Geosciences, 7. (2): 194–218. DOI: 10.3934/geosci.2021012. (2) Betts A.K. (2022): The Earth's view of climate change. AIMS Geosciences, 8(2): 224–232. DOI: 10.3934/geosci.2022013. (3) Betts, A. K. (2023): Accelerating Climate Change and the Living Earth. International Journal of Environment and Climate Change, 13, 2, pp 1-11. DOI: 10.9734/ijecc/2023/v13i21639

Dr. Alan Betts of Atmospheric Research in Pittsford, VT is a climate scientist. Learn more at https://alanbetts.com. ♻

Emerging Air-to-water Heat Pumps – Cont'd from p. 21

reach the temperatures most traditional water-based space heating requires.

A heat pump system that can act as a turnkey replacement fossil-fuel boiler would enable a more rapid adoption of clean heating and cooling equipment. Hydronic (water-based distribution) space heating has long been appreciated for its exceptional comfort and effectiveness. Radiative heat transfer over a large surface can be better for people with allergies because it doesn't distribute allergens like forced air systems can.

Until recently, ground-source heat pumps (also known as geothermal) were the primary means of providing hot-water for residential space heating using the heat pump concept.

Geothermal systems are highly effective, but they come with a substantial installation cost as a typical system's heat exchanger requires a large trench to be dug. In recent years, a few promising alternatives have hit the market. Air-to-water heat pump manufacturers like Spacepak and Enertech have developed systems capable of providing space heating, cooling and domestic hot water in a single package. These systems can run a low-temperature radiant loop year-round without a backup. They can remain operable down to -30°F and can meet building energy demands at a level of efficiency approaching that of a geothermal system. However, these systems do not necessarily function as a direct replacement for the average boiler. With lower water temperature output, these systems often require additional points of distribution.

This means more radiators, air handlers or a larger radiant loop. These products are still an excellent choice for consumers who want climate-friendly water-based HVAC systems, but industry leaders are determined to take their designs a step further.

What's on the horizon?

Carbon dioxide is a substance that we have become all too familiar with due to the deleterious effects of its steadily increasing concentration in our atmosphere. Ironically, it may play an important role in our transition to more sustainable heating and cooling technologies.

Carbon dioxide when utilized in a heat pump system as a refrigerant can enable heat pumps to produce much higher water temperatures. Industry leader Mitsubishi has launched a commercial hot water system using carbon dioxide to efficiently produce high volumes of domestic hot water, and a number of carbon dioxide based boiler replacements have just begun to be commercialized. In 2022, a multinational Swedish company - Vattenfall successfully launched a direct boiler replacement that is now available in its local market. It won't be long until comparable products reach the United States. It is also worth noting that these systems come with the added benefit of using a refrigerant that has a much lower warming potential than common refrigerants like R-410a.

Heat pumps continue to defy their historical limitations as manufacturers continue to iterate on their functional designs and new competitors enter the market. Combustion processes are inherently less efficient than the vapor-compression refrigeration cycle. If heat pumps can be brought to market that can provide the same functionality as their fossil fuel equivalent, then the path to electrification begins to seem inevitable. Legislators should be swift to update existing programs to support these technologies as they are rolled out, and fortunately for those residing in New York and Massachusetts, more funding is now on the table.

For Massachusetts residents, you may be eligible for up to $10k per home for an air-to-water heat pump system through the Mass Save® Program. New York has also recently begun to weave air-to-water heat pump systems into their regulatory framework. New incentives for heat-recovery systems and heat-pump chillers through the Clean Heat Program were announced on September 1, 2023. If you're in the market for a new boiler – first consider if an air-to-water heat pump system might be a better choice.

Ryan Moag is the Chief Operating Officer of The Radiant Store in Troy, NY. Margaret Richards is the marketing and communications manager of The Radiant Store. ♻

Renewable Energy Jobs

Cont'd from p. 1

interesting fact that some Massachusetts wind turbine technicians, who had recently been hired, were earning more than $50,000 per year. At that time, the federal government was not pushing renewable energy, and today it is.

Truth be told, renewable energy is not just growing in the United States, but worldwide. In fact, the U.S. is playing catch-up with the rest of the world. In late September, we came across the very interesting news that Fatih Birol, head of the International Energy Agency, said hope was growing that we would limit temperature increases to 1.5°C. He said this was because of the "staggering" growth of renewable energy, according to an article published by *The Guardian* (https://bit.ly/3ta9qAp).

We have known that renewable energy would be replacing fossil fuels for a long time. This was known decades ago, because we were starting to see a drop in oil production, and we knew peak oil was coming. Questions of pollution also bothered people, and then climate change became a concern.

The jobs issue has been increasingly important through all of this. For example, there was an article at *CleanTechnica*, "Want to Electrify Everything? Train More Electricians – Quickly" (https://bit.ly/Electrify_all). In that article, the point is made that in the next ten years huge numbers of technicians must be hired, according to data from the U.S. Bureau of Labor Statistics. Since companies are already facing difficulties hiring new employees, that means a lot of training. And for the future, there will be even greater growth in jobs relating to renewable energy.

Many jobs in installing solar panels are available in every state. (US DOE image. Public domain)

There have been a couple of items in the news that address the issue of training in the Northeast recently. One is about training in New York City. The other is from Vermont and New Hampshire. We will take a quick look at both.

The New York City Housing Authority (NYCHA), with direct involvement of a list of other organizations, is running the NYCHA Clean Energy Academy, a two-year initiative aimed at training 100 NYCHA residents in high-demand clean energy careers. The program has some interesting aspects that we can report. The students must be residents of the NYCHA public housing, so it aids disadvantaged people. Interestingly, potential employers are directly active in the program, along with the New York State Energy Research and Development Authority (NYSERDA) and the City University of New York (CUNY).

The NYCHA Clean Energy Academy has a value of the organization which is more than training students. It is designed to serve as a model for other educational programs that can help meet the need for trained potential employees for American clean energy companies. It has been in recent news because it graduated its first class of 24 students on August 24.

The training in Vermont and New Hampshire is not organized the way the NYCHA Clean Energy Academy was, but the programs in the New England states are turning out well-educated students. Vermont must, by law, reduce greenhouse gas emissions to 40% below 1990 levels by 2030, and 80% below 1990 levels by 2050. While New Hampshire has no similar law, various municipalities in the state have produced their own goals. Both states can benefit from Inflation Reduction Act funding from the federal government, and both have long-term needs for trainees.

The need for training results from the accelerating changeover to clean energy is not just to replace use of fossil fuels for electricity, but also to replace fuels of all kinds for all sorts of applications. A switch from fuel-burning vehicles to electric vehicles is one example. Another important one is the switch from oil or gas for heat, to heat pumps.

Training programs for some green jobs are being run in Vermont. Some of them are specifically designed to even the playing field for some people who are often left out. Because women are not represented in the trades that need training support, programs have been started to address their needs. One program is the Hartford Area Career and Technology Center in Hartford, Vermont.

In New Hampshire, at least one business has introduced a program of its own. ReVision Energy, to ensure availability of trained employees, developed a program to train them in-house, and that program is recognized by the state.

As pressure grows to find new employees, opportunities for training are growing. For those interested, it is worthwhile to look at the new opportunities. It is interesting that climate change, which many people fear, provides its own basis for employment. ♻

Dutchess County Compost Plans Meet Climate Solutions

Jessie Haas

Sometimes it just does not compute. Food waste is bad, we know, but we tend to think that is because it represents food not going to hungry people who need it. But our food—or rather, our habits of cleaning up after ourselves—has an enormous impact on climate change.

All agricultural impacts aside, food waste—from plate scrapings to banana peels, to the zucchini that grew mold in the refrigerator, to stale bread—can be used for good or ill. If thrown into the landfill, it generates methane, a potent greenhouse gas. For context, waste management accounts for 12% of New York State's greenhouse gas emissions, with a quarter of that toll coming from food waste.

Recycling is part of the solution to achieve the goal of zero waste to landfills. (Nick Fewings/Unsplash)

Properly done, composting does not produce methane. Instead, discarded food, lawn clippings, autumn leaves, and other organic waste are turned into a soil amendment that can grow more food, and in many cases, increase the ability of the soil to sequester carbon.

In New York, counties and municipalities are responsible for their own waste disposal. Dutchess County, which contains the cities of Poughkeepsie and Wappingers Falls, is now in the process of updating its ten-year plan, which is making composting a priority.

Officials aknowledge that public composting infrastructure is inadequate. There is only one facility that takes residential waste, though several accept organic waste from businesses.

"Composting is a priority, and we believe residential composting and local composting programs are the most logical options," told Kerri Russell, deputy commissioner of the county's Division of Solid Waste Management, to the Albany *Times Union*. Pilot programs were conducted in three Dutchess County municipalities in 2022: the town of Red Hook, the village of Rhinebeck, and the city of Beacon, and all were deemed successful. The county's draft plan proposes a feasibility study to see if another composting facility is needed in the western part of the county.

Composting is ranked at number 60 in *Project Drawdown's* list of climate solutions. If widely adopted, it could reduce landfill methane emissions by an equivalent of 2.28 gigatons of CO2 by 2050, at a net savings of $60.8 billion.

The Dutches County plan stands firmly against landfills. There are no operational landfills in Dutchess County, which relies heavily on the waste-to-energy incinerator run by Wheelabrator Technologies. It can burn up to 164,000 tons of trash a year, generating energy enough to power 10,000 homes, which it sells to Central Hudson.The waste facility was built decades ago to avoid the negative effects of landfills.

Waste-to-energy is not without controversy. Incinerators can emit mercury, lead, particulate matter, sulfur dioxide, nitrous oxice, and CO2. The Tishman Environment and Design Center at the New School reported in 2019 that the Dutchess County facility was among the most polluting in the U.S. However, Russell notes that emissions consistently fall within or below state and federal mandates.

Waste-to-Energy ranks #68 in *Drawdown's* list of climate solution. While noting the environmental risks, *Drawdown* notes that a ton of waste can generate as much electricity as one-third of a ton of coal. It estimates that 1.1 gigatons of greenhouse gas emissions can be avoided by 2050 through the use of incinerators. "Considering the disadvantages, this is a "bridge" solution—one that will decline as preferable waste-management solutions, including zero waste, composting, and recycling become more widely adopted globally." *Drawdown* also notes, "Waste-to-energy can impede emergence of something better: zero-waste practices that eliminate the need for landfills and incinerators altogether. If this sounds starry-eyed or impractical, know that ten large corporations (as of 2017) have committed to zero waste to landfill, including Interface, Subaru, Toyota, and Google."

Dutchess County has a high recycling rate, bans polystyrene food containers and plastic film bags, and has mandated placement of pubic recycling containers. Much of the county's construction and demolition waste is already diverted from the incinerator, and the plan is to increase that number.

The incinerator will likely run past the 2027 date specified in its financing bond, but it is not a long-term solution, so now is the time to be planning for those.

Jessie Haas lives in an off-grid solar cabin in southern Vermont with husband Michael J. Daley. She is the author of 41 books for children and adults, including Spooky Season. ♻

RESOURCES

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

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

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

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

Carbon Tax: carbontax.org

Clean Energy NH: www.cleanenergynh.org/

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Renewable Energy World: www.renewableenergyworld.com

Renewable Energy Vermont: www.revermont.org

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

SmartPower: www.smartpower.org

Solar Components: www.solar-components.com

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

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

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

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

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

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

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

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

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

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

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Send interest information to Mike Bailey at mike1.bailey@gmail.com. ♻

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Elmore Roots' Permaculture Know-How

A Simple Life

David Fried

Here in the north country, we have a good chance to live a simple life. We have a lot of examples of this. The frogs sit on a floating leaf for much of the day. The turtle finds a place in the sun on a rock and seems to be sitting there since the rock was formed beneath him. Flowers grow up into the light and we gather a few for a vase or a bowl. When we walk by, they look proud to be part of our simple life now.

I just planted spinach seeds a few days ago and they have sprouted. Their small curled leaves will be our fall salad and sandwich greens. When my youngest daughter was small, she would make a stack of spinach leaves and bite down on them to feel the crunch. She really liked that a lot. Every time I turn to the garden to weed a little, plant a little, and harvest a little I feel the simplicity of a garden and how it grows on me.

The apples are ripening and dropping. I went over to a tree to collect a few, and there was a deer eating them before I got there. I said "good morning" to the deer, and she looked up at me and then kept eating apples. When there were no more, she looked up to the tree, and the tree dropped a few more for her to eat. There is so much going on around us. We should only have the eyes to see it.

Painting by Joyce Dutka

Our pine nut trees have cones way up in the tree tops now. Their individual seeds are fatter than the white pines, so we can easily crack them and get the high protein tasty nuts. But how do we get them down from high up in the trees? The squirrel will soon be knocking them down, so he can get the pine nuts. We must be vigilant to notice when the first cones come down so we can gather some, too. Otherwise, we will see the squirrel sitting happily and proudly cracking and eating one pine nut after another.

A few years ago, I learned this method of getting the best hazelnuts and pine nuts: I put an old rubber boot inside a shed near the pine nut tree and the hazelnut bushes in late summer. The squirrel was searching for the best spot to store his prize nuts for winter. All options were checked out, but then he went inside the boot and I imagine him thinking, "Ah, perfect, rain won't get in, it is dark, I can turn around inside, and it will fit a lot of these small nuts."

A month later, I found a great stash of nuts in the boot and took most of them for planting to make new trees for our nursery. They already had their husks off and were down on the ground level and all cleaned and ready for planting. Because I am grateful to the squirrel for helping me as a horticulturist, I brought him a bag of nuts in the shell from the store in town. I had what I wanted and he had a good supply of larger and very good tasting nuts from further away than he would ever travel.

We have been gathering apples all week to press into cider. We also press pears and black currants and northern kiwi berries into our cider. We take the apples and grind them and then add a layer of the other fruit and press it by turning a little metal handle until the fresh pure juice comes streaming out. We freeze it within minutes so this autumn day will be tasted in each bottle.

On our table at home is a vase of flowers from the garden and the field. Next to it is a fancy bottle filled with our pressed fruit cider. We can feel the essence of the summer, of the autumn, of the simple life all around us. One sip at a time.

David Fried is a writer, cider maker and grower of hardy fruit and nut trees and Vermont natives at Elmore Roots Nursery in northern Vermont. ♻

Is There Plastic in My Produce?

Jessie Haas

Many of us go to great trouble to purchase local produce, or to grow our own, this writer included. So really? One more thing to worry about?

Sadly, yes, and this is a big one. Plastic production is a growing contributor to global warming, set to surpass coal by 2030, according to Beyond Plastics, the Bennington-based organization founded by former EPA administrator Dr. Judith Enck. Plastic is a growth sector for fossil fuel companies, at a time of great pressure on their other products.

Agriculture has become a large-scale consumer of plastic. Plastic is cheap, light-weight, and versatile. You have probably seen plastic film mulches (PFMs) in farm fields, stretched neat and taut in rows with tomato and squash plants poking up through. PFMs can reduce the spread of soil-born fungal diseases and keep down weeds without the use of expensive labor or herbicides. They have made truck farming easier and more profitable. Plastic has been a huge help, and has been sold to us as a clean, inert substance, like glass only lighter and less breakable. But it's a petroleum and chemical product. The huge train fire in East Palestine, Ohio, this year burned and exploded chemicals on their way to be processed into plastic.

And yet. We're familiar with the term 'microplastics', the extremely tiny particles of degraded plastic that are becoming all-pervasive on our planet. Macro-plastics, like PFMs, degrade in sunlight and rain, and shed microplastics into the soil. PFMs are used for one season, and become dirty, tattered, and impossible to recycle. The same is true of the bags wrapping round hay bales, which creates a conundrum for farmers. In an increasingly volatile climate with excess rainfall now common, those bale wrappers make it possible to harvest and store forage to feed to livestock in winter, essential in the Northeast. They are also a huge environmental problem.

To a lesser extent the same is true of the ubiquitous plastic-covered hoop houses which cover vast areas in farm country, including in the northeast and probably, on net, reduce the carbon footprint of the produce we consume. Hoop houses are covered with greenhouse-grade plastic that, thanks to added UV stabilizers, lasts a fairly long time in sunlight, with most people getting about six years out of a hoop house cover. But ultimately, they degrade over time, must be replaced, and are not recyclable.

The plastic we can see on the farm—which also includes feed and fertilizer bags—is not the only source. Biosolid fertilizer often contains microplastics from

Cont'd on p.38

Cultivating Long-Term Perspective for the Sustenance of Human Civilization

Larry Plesent

Human civilization, despite its remarkable achievements, faces a crucial question: Can we sustain our existence for the next thousand years and beyond? To secure our future, we must undergo a profound shift in perspective—one that transcends the present and embraces the long-term wellbeing of humanity and our planet. Let's together contemplate the changes in perspective required for the enduring survival of human civilization.

possan, CC BY 2.0, via Wikimedia Commons

From Short-Term Gains to Sustainable Prosperity

One of the fundamental shifts in perspective involves moving away from a short-term, profit-driven mindset to one focused on sustainable prosperity. In our current model, immediate gains often take precedence over long-term environmental and social health. To endure for millennia, we must prioritize practices that preserve the Earth's resources and promote equitable, long-term well-being for humans and for the ecosystem that sustains us.

From Nationalism to Global Cooperation

A shift from nationalism to global cooperation is essential for the continuity of human civilization. Our economically and culturally interconnected world demands that we view ourselves not solely as citizens of individual nations but as members of a global community. This perspective allows us to address shared challenges such as climate change, pandemics, and resource management.

From Consumerism to Sustainable Living

Consumerism, with its emphasis on relentless consumption and materialism, is incompatible with the goal of a long-lasting civilization. Shifting our perspective from material accumulation to sustainable living involves embracing minimalism, resource conservation, and conscious consumption. It's about recognizing that true wealth lies not in possessions but in our active participation in the health and harmony of our planet and communities. It's time to recognize that the hippies got it right.

From Short-Term Politics to Long-Term Vision

Political cycles often prioritize short-term gains, leaving long-term issues unresolved. A shift away from corporate based politics and toward political systems that encourage visionary thinking and collaborative problem-solving can pave the way for the continuity of civilization. Policies should consider their impact on future generations by investing in education, healthcare, and infrastructure with the foresight of centuries, not just electoral cycles.

From Exclusivity to Inclusivity

To sustain human civilization, we must shift from exclusive to inclusive perspectives. This means ensuring that the benefits of progress are accessible to all, regardless of gender, race, or socioeconomic status. Inclusivity fosters social stability and empowers diverse voices and talents, essential for addressing complex, long-term challenges. We must honor and embrace our diverse cultural heritages and differences rather than demeaning, diminishing, and whitewashing them.

From Resource Exploitation to Conservation

Our current approach to resource exploitation is clearly unsustainable. A shift toward worldwide resource conservation and ecological regeneration is imperative. This perspective involves responsible management of natural resources combined with reforestation, sustainable agriculture, and circular economies. It's about recognizing that the Earth's resources are finite, and their preservation is key to our survival and the survival of the innumerable species who share our little blue ball in space.

From Isolation to Interconnectedness

An enduring civilization requires a shift from isolation to interconnectedness. Acknowledging our interdependence and cultivating a sense of global citizenship can inspire collective action and shared responsibility for the long-term welfare of life on this planet.

The changes required are profound, but they are not beyond our reach. Together, we can transition from a civilization driven by short-term thinking to one that cherishes the legacy we leave for future generations. It's a journey that beckons us to think beyond the confines of our time, and to envision and manifest a more compassionate human civilization capable of thriving for millennia to come.

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

Coop Spotlight:

Monadnock Food Co-op

KEENE, NEW HAMPSHIRE

The Monadnock Food Co-op is a member-owned grocery store in located at 34 Cypress St., Keene, NH. (Courtesy photo)

Interview with Meghan Lafaso Hercher, Events and Outreach Coordinator

G.E.T. *Staff*

G.E.T.: When did your co-op start. How many members are there?

Meghan Lafaso Hercher: In April 3, 2013. We have over 4,400 members.

How has your business grown through the years?

MLH: In the early days, the founders of the Monadnock Food Co-op identified a pressing community need: a place where residents could shop for healthy, locally sourced food seven days a week. Before the co-op's establishment, community members had to make multiple trips to farms, farm stands, and farmers' markets to access the wide range of products now available under one roof. Between 2006 and 2009, a dedicated group of volunteers came together to advance the community's vision for a cooperative. In the years spanning 2010 to 2012, the Monadnock Food Co-op officially incorporated in April 2010. The Board entered into a partnership with the National Cooperative Grocer Association (NCGA) Development Co-op to oversee the co-op's store design, layout, fundraising efforts, and provide guidance during its initial three years of operation. The dream became a reality in 2013 when the Monadnock Food Co-op opened its doors to the public on April 3rd. A major milestone was achieved between 2019 and 2020, as on December 15, 2019, the co-op successfully acquired its current facility, along with adjacent land, facilitating a substantial expansion of 6,700 square feet. This expansion project reached its completion in January 2021, resulting in a newly enlarged store encompassing an area of 19,900 square feet. In 2023, the co-op celebrated its remarkable 10th anniversary in April with its annual Earth Fest, a three-day flash sale, local tastings, and a host of other festive activities.

Does your co-op sponsor any events, programs, classes, or workshops?

MLH: The Co-op sponsors a myriad of events, workshops, classes and more throughout the Monadnock Region and southwestern New Hampshire. We take great pleasure in organizing the yearly Monadnock Region Earth Festival. Our event transforms the area from Railroad Square to the Co-op, bustling with local vendors, artists, farmers, and producers who gather to commemorate both the Earth and our community's dedication to sustainability.

Does your co-op specialize in a certain sector of the food market?

MLH: Our commitment lies in the wide variety of produce we offer, sourced locally, seasonally, and globally. We prioritize certified organic and seasonally fresh produce, especially from Keene, NH, and the nearby regions, aligning with our mission to promote local, sustainable agriculture. With deliveries of fresh produce, including organic fruits, locally grown greens, and vegetables arriving over ten times each week, we guarantee that you receive the freshest and most delicious produce within our community.

Learn more by visiting their website at monadnockfood.coop. ♻

Plastic in My Produce?

Cont'd from p.37

Hay bales wrapped in plastic creates a conundrum for farmers. The bale wrappers make it possible for hay to be preserved in bad weather and feed livestock in winter. They are also a huge environmental problem. (Pexels/Damir, public domain).

discarded bags, cigarette butts, etc. To make matters worse, the fertilizer is often pelleted and encapsulated in—you guessed it! --plastic, which is designed to degrade in the environment.

Microplastics in soil have been found to negatively impact soil microorganisms, the basis for plant life on this planet. Microplastics can reduce water infiltration in the soil and increase the pH. Nanoparticles of plastic even have the ability to circulate in a plant's xylem and phloem, in the same way that they can circulate in our own veins and arteries. The health effects of this are unknown at this time, but it's unlikely to be beneficial!

What can we do? This all seems too much—and it is. Judith Enck of Beyond Plastics recently refused to write a book aimed at helping consumers reduce plastic use, telling the publisher who proposed the project that this is a political problem. We will have to band together, and we'll have to fight.

Awareness is the first step, and there are ways to reduce the ag-plastics you consume. Go for certified organic produce. Organic farmers have to meet strict standards, which include restrictions on plastic use. If you garden or farm, look into organic-certified sheet mulches, made from paper or hemp. Or use cover crops to reduce weed pressure. Reusable row covers made of polyamide mesh or spunbonded fabric are sounder ecologically than low tunnels made of clear plastic. Use organic-certified seed and fertilizer to avoid inadvertently introducing plastic coatings to your soil. Talk to your farmer and support that farmer. She is as much a victim as anyone else here.

Then connect with an organization working on this problem. Beyond Plastics, homegrown in the Northeast, is an obvious choice. To tackle plastic pollution, we need laws that restructure waste management worldwide. Ideally, a "You Make It, You Take It" law would force manufacturers to take back, and recycle, waste that they produce. Europe has passed regulations to reduce plastic use in agriculture. This will spur new innovation. Better products will come along in response to public and legal pressure. It is up to us, not just in our kitchens and our gardens. It is up to us at our computers and on our phones, and at candidate forums, bringing the issue up and demanding action.

Jessie Haas lives in a tiny homemade solar cabin with husband Michael J. Daley. She has written over 40 books for children and adults, including The Hungry Place. ♻

BirdieBlue – Sustainable Packs and Bags

Roger Lohr

BirdieBlue is a company in Stowe, VT that was created to save discarded clothing from ending up in landfills and give it new life as bags and packs. Company owner Kate Harvey spent three years of product development to refine a process to transform old ski clothes into new sling bags, carryalls, pouches, and packs that are sustainably designed, cut, and handmade by women in the USA.

Kate Harvey owner of BirdieBlue transforms discarded clothes into new products. (Courtesy photos)

The BirdieBlue products' components such as fabrics, zippers, buckles, clasps, and webbing straps are made from upcycled, recycled, or compostable materials. The product labels and clips are made from recycled materials from SA8000 (internationally certified standards) suppliers. The products are packed and shipped in 100% recycled and compostable mailers.

Harvey commented, "Upcycled is taking something that exists and transforming it into something that gives it new life." For example, the strap webbing for the packs is made from old seat belts. Her goal is to "keep as many clothes out of landfills as possible." There are 16 million tons of annual textile waste and only about 15% is recycled or resold while three million tons are incinerated and 10 million tons end up in landfills.

To obtain the fabric materials, BirdieBlue scours thrift stores and ski swaps and collects outerwear donations from individuals and companies. The fabrics are cut into patterns and about 5 to 10 bags can come from a pair of snowpants or a jacket. Recycled materials are made from other materials that are broken down to create a new material thus the BirdieBlue plastic buckles are made from recycled plastic bottles and the labels and zippers are made from more than fifty percent recycled materials.

With all this sustainability built into the BirdieBlue operation it is no wonder that the company sends its materials that are not reusable to textile recycling outlets which use them as insulation, padding, lining, quilt fillers, and so on.

People who want to discard old clothes can access the BirdieBlue website "Used Gear Kit" form and they will send you a mailer that you can use to deliver old clothes to the company. BirdieBlue will be managing a booth and hosting the Revive, Reuse, and Recycle Zone at the Snowbound Expo Boston Ski Show (November 3-5 at the Boston Convention and Exhibition Center) where people can donate old snow clothes (snow pants, ski bibs, ski jackets, tents, windbreakers, etc.), cut them at a station in the booth, and create a limited-edition bag. There will also be a retail station at the show to purchase BirdieBlue products.

BirdieBlue is a member of 1% for the Planet through which1% of every sale is donated to support environmental organizations. The company is committed to paying living wages, supporting local economies and building safe working environments. The company mission is to inspire adventure and protect Mother Earth.

Alpine skiers with BirdieBlue packs.

Learn more about Kate's BirdieBlue company at www.shopbirdieblue.com.

Roger Lohr of Lebanon, NH, who owns and edits XCSkiResorts.com, has published articles and promotional topics on snow sports, sustainability, and trails in regional and national media. ♻

Retirement Planning – *Cont'd from p.1*

of physical fitness. And some hot places like Florida are becoming prohibitively expensive property insurance markets. It's not just the heat, it's the hurricanes, the big ones that come with increasing frequency.

Despite this, people of all ages continue to move to Florida in great numbers, but many retirees are taking another look. Apparently the most popular state to retire to in 2023 is . . . Iowa?

Indeed. The Midwestern state has a low cost of living (6th most affordable) good healthcare, and low crime. And the weather is not bad. According to *Kiplinger Magazine*, the averages ranges from nine ºF in January to 81ºF in July. That is still a real winter, complete with snow shovels, snow tires, and a heating bill. But if you want to avoid the heat, it's a decent bet .

AARP has considered the question, and recommends western North Carolina, especially Asheville and the surrounding area. Up in the mountains, summer temperatures only rise to the eighties on average, and winters are mild.

Michigan is a surprise choice. The Great Lakes surrounding the state absorb heat in the summer and release it in the winter, resulting in a more temperate climate than other Midwestern states. Michigan is rated 15th in cost of living, compared to Florida at 31 and Arizona at 37. Michigan is rich in culture and outdoor activities.

Maine makes AARP's list for it's cool summers—but the winters are pretty cool too! *Kiplinger's* cites Juneau, Alaska, as ideal for the truly heat averse, with a July high temperature average of 63ºF but again, winter up there is really, really winter. Several New England cities make *Kiplinger's* list, including Bangor, ME (January average low temperature of 9ºF, high of 81ºF), Pittsfield, MA (14ºF to 80ºF), Peterborough, NH (11ºF to 80ºF) and Burlington, VT. (10ºF to 80ºF.)

Average temperature is only one consideration if you are planning a safe and affordable retirement. Does the state you're considering have a lot of other retirees living there? That may mean that the local government has a greater awareness of the special needs of seniors during heat events, and a greater ability to help people in distress. Or it may not. Look for neighborhood cooling centers, nearby green spaces to protect against an urban 'heat island' effect, and programs to help low income home owners prepare their homes for weather extremes. Find out if first responders in the area are trained in helping seniors during heat emergencies.

These are all considerations as people make plans for a time when they will have less income, and eventually, less physical vitality. But if you're a reader of *G.E.T.*, you are probably also motivated by other concerns. Where can you live as an older person where you can be the least burden on the environment? Can you find a place where you can contribute, and continue to live your values as you age?

For some, perhaps many, the answer may be to stay put in the Northeast and simply downsize. A smaller living space places a smaller burden on the planet, and on you in terms of upkeep. Winter will still be winter, but you may be able to mitigate its effects on you. Can you move into town? Someplace with good bus or train service might allow you to give up your car, which would lift both a financial and an environmental burden. It also frees up living space for someone else who might need it.

Or super-insulate part of your house, install a heat pump and powerwall battery, and move in there, renting out the rest—hopefully to a younger person who is willing to shovel the driveway. Or build a granny cottage in the backyard and invite your kids and grandkids to live in the main house.

Wherever you go, look for a like-minded group to join. There are Third Act chapters all over the country, putting the newly unleashed energy of retired boomers to work for democracy and the environment. If there is not a chapter where you are planning to move, start one. That will let you continue working for good change. ♻

Greener Holiday Traditions

Cont'd from p. 1

Recycled newspaper or grocery bags can be decorated for wrap. Gift bags can be re-used.

For the adults—local gifts cut down on shipping and support local businesses. If you have a big family, choosing one person to shop for allows each everyone to receive one personalized gift and cuts down on the pile of stuff no one really wants.

Christmas trees are a dilemma. There is something magical about the look on a child's face when they see the presents under the tree on Christmas morning. But fresh trees have to be cut down after about ten years of growth, shipped to town, then disposed of later. Most towns chip the trees in the new year to use as mulch, which is a good thing. Fresh trees seem preferable to a plastic tree shipped to the U.S. from Asia. But I am afraid of fires from having a dead tree in the living room where we also have a woodstove. So, we decorate a live tree outside and enjoy it through the window. I have to admit, it is just not the same as a traditional tree. It may be possible to buy a live tree with a root ball, use it indoors for your holiday, then put it out in a hole you dug before the ground froze.

Holiday meals do not have to be greenhouse-gas nightmares. For me, meals are all about the side dishes anyway, so go heavy on the veggies and less heavy on cheese and full fat dairy products. Poultry has a lower carbon footprint than beef, especially if you buy local (venison is even lower than poultry). In New England, we are blessed with oysters and mussels, which have a low carbon footprint and clean up the water while they grow (thanks to an article in the Washington Post for this insight). Oysters make a great appetizer, much less fattening than cheese!

And be sure the hosts know you will help with doing dishes so there is no temptation to use paper plates and plastic utensils.

Here is to wishing you and your loved ones a sustainable holiday season.

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 Team and is a Climate Ambassador for Physicians for Social Responsibility. ♻