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A Deal to Move Away From Fossil Fuels!

CAN COP28 POLICE THE CLIMATE?

Martin Wahl

After heated debate about how far the conference would go asking for the reduction of fossil fuel production and use, the 197 participating countries agreed in overtime to call for *"transitioning away from fossil fuels in energy systems"* by 2050. While smaller island nations say the deal does not do enough to protect them, OPEC nations wanted the agreement to address emissions and not fuels. The road to compromise was contentious.

The conference got off to a mixed start on November 30: positive in that the *Loss and Damage Fund for developing countries experiencing the effects of climate change* was initially funded by countries promising to provide $425M; negative with the release of information that the conference host and president, Sultan Ahmed Al Jaber of the United Arab Emirates and head of Dubai's oil company ADNOC, had a 60 page talking point memo to guide him when making oil and gas deals with representatives of attending countries.

By December 8, *pledges to the Loss and Damage Fund* exceeded $700 million, a big number, but less than 0.2% of the estimated climate change-caused losses incurred by developing countries annually.

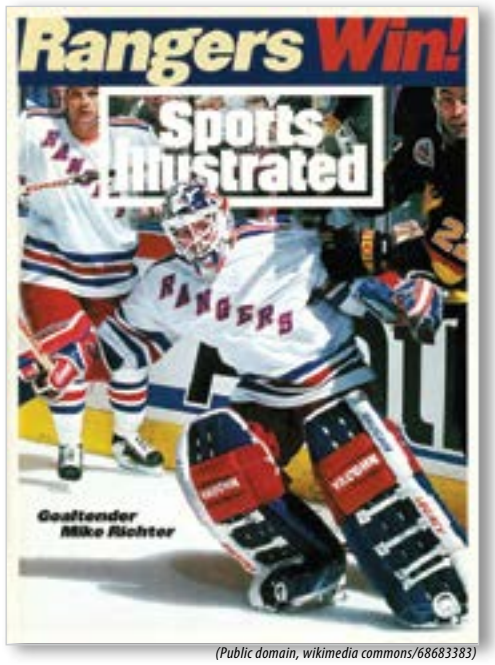
Things got testy when Al Jaber's earlier heated discussion with Mary Robinson, Chair of the Elders NGO and former president of Ireland was reported by *The Guardian*. Al Jaber *declared that* "There is no science … that the phase-out of fossil fuel is what's going to achieve 1.5°C…" Al Jaber later *retracted* some of the "no science" statement and said phase-down or phase-out of fossil fuels is needed. While some might equate Al Jaber's presidency of COP28 with Pablo Escobar hosting a drug abuse prevention conference, there is perhaps an argument to be made that a 'war on oil' may be as futile as wars on drugs have been unless the underlying demand for fossil fuels is addressed as well, much as tobacco use was reduced in the US by encouraging users to quit with advertising, publicity and incentives, despite the headwinds of industry counter measures.

Cont'd on p.3

Hockey Legend Mike Richter

Mike Richter helped win a Stanley Cup for the New York Rangers. Now he's bringing a new prize to town, decarbonized buildings and making them more energy efficient.

Mike Munsell



(Public domain, wikimedia commons/68683383)

Mike Richter and the NY Rangers win the Stanley Cup in 1994. Whether you play outside or at the rink, climate change is going to have an impact on your sport. What are you doing to green your game?

I don't watch a lot of hockey. When I got a pitch for my column inviting me to chat with an NHL legend-turned-climatetech entrepreneur, I texted a couple of my former college roommates who are die-hard hockey fans.

"Do you guys know the former hockey player Mike Richter?"

"Any self-respecting Rangers fan knows exactly who he is," responded one NY-based friend.

"The once and forever king Richter. Let's goooooo," texted the other.

After that initial due diligence, I took to Google and quickly learned that Richter is ranked among the top hockey goalies of all time, with a Stanley Cup, an Olympic silver medal and a World Cup of Hockey win to his name. Oh, and the best college hockey goalie every year wins an award named after him.

Richter retired from hockey in 2003 and soon after enrolled at Yale University. According to his *LinkedIn profile*, he earned a bachelor's degree in ethics, politics and economics with a focus on environmental policy in 2007. Since then, he's been in the clean energy field, largely using capital to fund energy-efficiency projects.

I talked with Richter about his path from hockey to clean energy and also about some of the work he's doing at the intersection of those two disparate fields. The following transcript has been edited and condensed for brevity.

Mike Munsell: Can you introduce yourself?

Mike Richter: Sure, my name is Mike Richter. I'm the president of Brightcore Energy. We're a full-service energy-efficiency deployment company. We go to commercial and industrial buildings and make them perform better, thus lowering their carbon footprint and their operating costs.

Munsell: I'd love to hear a little bit more about what you were doing before Brightcore.

Richter: I was a professional athlete for the New York Rangers. It was very fulfilling on a personal level and obviously very challenging. And it afforded me great opportunities to build up to a second career.

When you finish your athletic career, you have your whole life in front of you. I knew immediately that I was going to get into the finance-meets-environmental space. It's something that has always interested me, and there's no shortage of work to do.

Munsell: What led you into the environmental space? Was climate change on your radar?

Richter: The environment is such an important component of our existence. It's in everybody's interest to have it continue to function

Cont'd on p.20

Can the Electric Grid Keep up with the Transition?

George Harvey

The U.S. Energy Information Administration lists data from 2022, saying that of energy demand in this country, 37.6% were electric, 27.3% were for transportation, 23.1% were for industry, 7.1% were for residential use, and 4.9% were for commercial use (https://bit.ly/Energy-breakdown).

If we electrify everything, the share coming from electricity would be increased from 37.6% to 100%. That might seem to imply that the amount of electricity we need would have to grow to 266% (100/37.6) of what it is now. This, however, is not the case.

We might consider a comparison of electric cars with those powered by gasoline. The U.S. Department of Energy says this about electric vehicles (EVs): "EVs convert over 77% of the electrical energy from the grid to power at the wheels. Conventional gasoline vehicles only convert about 12%–30% of the energy stored in gasoline to power at the wheels." (https://bit.ly/DOEcarcompare)

A more complex, but more instructive example is comparing an oil-burning home heating system to one that centers on one or more heat pumps. If we look at gas furnaces, an 80%

New transmission lines are replacing the old infrastructure all over the capital region of New York State. Shown are old and new lines that cross New Scotland South Rd, near Delmar, NY. (N.R. Mallery)

Cont'd on p.15

Concentration of CO2 in the Atmosphere

421.66
parts per million (ppm)
December 11, 2023

Learn more at www.CO2.earth.

IN THIS ISSUE

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"What has become clear from the science is that we cannot burn all of the fossil fuels without creating a very different planet." — Dr. James Hansen

LETTER FROM THE EDITOR

Winter Wonders …

I write this while thinking about **COP28's historical deal** to move away from fossil fuels. I am so hopeful!

There is yet another forecast for a lot more **rain**. Is there going to be an end to so much rain this year? Is this what climate change is going to give us going forward? It's a problem here in the northeast, yet other areas in the country and world are screaming for rain. Here's an idea: perhaps we can stop using the gas pipelines and send water through them to places that need it. (Now, there's a thought, eh?) They have done this in China where cities with high rise apartment buildings have no water. (Can you imagine living on the 15th floor and hauling water up there to shower, wash dishes and drink?) Should we count our blessing for this record year of rain? Which is worse, flooding or droughts?

Back to **COP28**: I am hopeful that this outcome will benefit the future of us all living on this planet. No matter what happens now, we still must carry on doing all we can and more.

This edition of *Green Energy Times* shows that progress is happening, like **electric trucks**. Check out the **electric truck charging maps** in the planning for the northeast on page7, along with how **Albany, NY airport** is making significant advances to reduce its carbon footprint.

Solar is booming, but we have a long way to go. All clean renewable energy must move forward much faster if we are to get our emissions down in time to avoid the results of not doing so.

We must get past our dependence on dirty fossil fuels. This is not an easy transition, but it needs to happen. I smile as I drive past the power lines here in upstate New York, because I see so much of the aging **transmission lines** being replaced with new ones that will be able to assure our transition to a clean energy future happens. This is covered starting on the front page.

This issue includes **sports and music** features on the front page and centerspread on pages20-21. In the solar section, read about a Vermont company that has a solar solution for gatherings and many other applications. Winter sports are leading some to sustainability. The front-page article about a local hockey legend led him to a clean energy direction that many would not expect. A big hand goes to Mike Richter! We hope you all get outside this winter to enjoy the great sports we can enjoy outdoors.

With 2024 around the corner, so is **tax season**! National Grid Renewables is helping **communities beat their tax burdens**. On page 9, read how they helped two Ohio communities with huge tax revenue benefits. National Grid Renewables is all over the northeast. Many more communities in our own region can do likewise!

Of course, winter brings the **need to keep warm**. Staying indoors in a **healthful indoor environment** (p.28) is a must, because we find ourselves spending more time indoors this season. Heating homes without fossil fuels is a big win and makes so much sense, after sealing and insulating. Our solutions found in our heating section can help you afford to stay warm this winter without the dangers from using fossil fuels. Thinking of the gas or oil leak fumes that so many innocently inhale can lead to many health issues as well as life-threatening situations such as fire or explosions related to oil and gas and heating problems. Ground and air-source heat pumps are safer, cleaner, with more benefits beyond clean heat with cooling in the summers.

Are you planning to **build a new energy-efficient home** in 2024? On page 27, read about a local award-winning, woman-owned company who can help you with your plans for building a net-zero home.

The **Climate News** section is full of info you will want to read about the results of COP28.

Winter is happening and is covered in our It's a Green Life After All section (pages35-39). What happens to all the food waste and scraps that accumulate? It is still possible to **compost in the winter**. You can read about how to do so on page37.

We hope you **get outdoors and enjoy the winter wonderland** we have here in the northeast. Read about a local ski area west of Albany, NY that is taking sustainability seriously. **Maple Ski Ridge** is a great place to get fresh, clean winter air and feel good to support local (page39).

Thank you all for all you do.
May 2024 bring us a year of hope, health and happiness!

Think climate, think local, ast global. – Nancy Rae Mallery ♻

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Please note that interactive source links for all articles are available in the online edition on our website: www.greenenergytimes.org.

Climate-Related Damage Costs $16 Million/hour on Average

Paige Bennett

Over the past 20 years, extreme weather events globally, like hurricanes, floods and heat waves, have cost an estimated $2.8 trillion, according to a new study. The study authors estimate the cost of the extreme weather damages from 2000 to 2019 to average around $143 billion, which breaks down to around $16.3 million per hour.

The researchers analyzed studies that used a methodology known as Extreme Event Attribution (EEA), which connects human-related greenhouse gas emissions and changes in extreme weather events. They compared these analyses to socio-economic costs from extreme weather events to determine how much of the socio-economic costs of extreme weather events are linked to climate change.

Using this method, the team identified a dataset of 185 extreme weather events from 2000 to 2019. During these events, they found a net of 60,951 human deaths that could be linked to climate change.

The researchers noted that human-related climate change could be linked to a net of $260.8 billion in damages from the 185 studied events, or about 53% of total damages. The majority of the climate change-related damages were connected to storms like hurricanes, while 16% of damages were linked to heat waves. Flooding and drought each made up 10% of net damages, and wildfires were linked to 2% of damages.

Hurricane Irene causes Vermont's worst flooding in 83 years. The storm caused street flooding in Montpelier, VT (Flickr/Jim Griffin, CC0 1.0 Universal)

In total, the researchers found climate-change attributed costs of 185 extreme weather events from 2000 to 2019 to total $2.86 trillion, averaging $143 billion annually. Per year, the costs ranged from the low of $23.9 billion in 2001 to the highest annual cost of $620 billion in 2008. The team published their results in the journal *Nature Communications*.

While the figures are already significant, they are likely lower than the actual totals. Ilan Noy, study co-author and a professor at the Victoria University of Wellington in New Zealand, told The Guardian that for some extreme weather events, *data was limited*.

"That indicates our headline number of $140bn is a significant understatement," Noy explained, noting that heat wave data on human deaths was only available in Europe. "We have no idea how many people died from heatwaves in all of sub-Saharan Africa."

Further, authors Noy and Rebecca Newman, graduate analyst at the Reserve Bank of New Zealand, wrote in the study that there are also immeasurable effects from extreme weather, such as trauma, loss of educational access, and job loss that would further increase the costs.

The study authors are encouraging policymakers to use their methodology to help determine how much money to target for a fund that could help countries rebuild after extreme weather events, a plan that was set at the United Nations Framework Convention on Climate Change (*COP27*) last year.

"This attribution-based method can also increasingly provide an alternative tool for decision-makers as they consider key adaptations to minimize the adverse impact of climate-related extreme weather events," the authors concluded in the study. "This type of evidence can also fill, potentially, an evidentiary gap in climate change litigations that are attempting to force both governments and large emitting corporations to change their policies."

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

This article was originally printed by EcoWatch *at bit.ly/ClimateDamage.* ♻

Can COP28 Police the Climate? – *Cont'd from p.1*

The Big Issue: Phase-Out, Phase-Down, or "Unabated" Only

The most significant issue at the conference was the debate about reaching an agreement calling for fossil fuel phase out, phase down or unabated fossil fuel phase down only. None of these terms is *particularly well defined*; and only "phase out" has a timeline with a goal of 2050. The phasing out or down of "unabated" fossil fuels would allow the continued use of the fuels where CO2 emissions are "abated" through carbon capture and storage (CCS). CCS is *controversial*, as it is expensive and energy-intensive to implement, and may best be suited to industrial processes, like *cement production*, where there are currently no viable alternatives.

All agreements issued by COP must be unanimous with no dissenting votes. It took 26 years for the Conference to agree that coal should be "phased down." Energy Minister Prince Abdulaziz bin Salman said Saudi Arabia *would not agree* to a text that calls for a phase down, let alone the phase out, of fossil fuels, and OPEC sent a letter to its 13 members who own 80% of global oil reserves urging them to consider agreements concerning reducing "emissions" only and not energy or fuels per se.

Host Al Jaber made it clear he hoped for an agreement including phase out or phase down and convened a meeting on December 10 of all participant nations urging compromise, working especially with Saudi Arabia even before the conference to temper their stance. The host nation is at risk for sea level rise and launched renewable energy company MASDAR in 2006, so the seeds were planted earlier.

UN agreements are not enforced (don't expect black helicopters to be strafing the oil fields) so voluntary compliance will require continued diligence on the part of affected countries to keep the world on track.

Other significant developments during the Conference's first ten days included:

- Representing 40% of world-wide production, 50 oil and gas producers *pledged to cut operations-sourced emissions*, primarily methane, a dangerous GHG, including cessation of routine flaring which results in CO2 pollution. COP28 President Al Jaber led the initiative, saying "We must do all we can to decarbonize the energy system we have today." Participants complained that majors Chevron and ExxonMobil did not join the effort.
- During the December 7 recess the more than 70,000 participants enjoyed the amenities of the Dubai waterfront, hotels, and elaborate attractions, including a display of *pollution pods* - geodesic domes containing simulated air samples from Beijing, London, and New Delhi.
- The attendees included about *2,400 fossil fuel lobbyists*, indicating how important the conference has become to those industries. Some likened the conference to a *trade show* where companies show their wares and look forward to participating in an industry that promises huge investments in the coming years. While annoying to policy wonks, this demonstrates the normalization of the non-fossil fuel future.
- The US pledged $3B to replenish the Green Climate Fund that was created back in 2010. Others contributed $9.3B. *The Fund was first endowed* with $10.3B in 2014, and received an additional $10B in 2019.
- Climate envoy John Kerry announced that the US will work with other countries to make *nuclear fusion* a source of carbon-free energy. The hope is to have fusion power a reliable source of energy within 20 – 30 years.
- Sixty three countries, including the US, pledged to *cut cooling-related emissions* by 68% by 2050 compared to 2022 levels, and to establish energy performance standards by 2030. Demand for refrigeration and air conditioning cooling is expected to grow significantly as the world heats up further. Currently, about *20% of total electricity* is consumed globally to operate fans and air conditioners, so this is no small task.
- COP29 will be in *oil-producing Azerbaijan* – none of the other candidate venues would consider hosting a conference with more than 100,000 expected attendees.

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. ♻

'A Miracle Will Occur' Is Not Sensible Climate Policy

James Hansen, Pushker Kharecha, Makiko Sato, 07 December 2023

Dr. James Hansen

The COP28 Chairman and the United Nations Secretary General say that the goal to keep global warming below 1.5°C is alive, albeit barely, implying that the looser goal of the 2015 Paris Agreement (to keep warming well below 2°C) is still viable. We find that even the 2°C goal is dead if policy is limited to emission reductions and plausible CO2 removal. IPCC (the Intergovernmental Panel on Climate Change, which advises the UN) has understated global warming in the pipeline and understated fossil fuel emissions in the pipeline via lack of realism in the Integrated Assessment Models that IPCC uses for climate projections. Wishful thinking as a policy approach must be replaced by transparent climate analysis, knowledge of the forcings that drive climate change, and realistic assessment of policy options. The next several years provide a narrow window of time to define actions that could still achieve a bright future for today's young people. We owe young people the knowledge and the tools to continually assess the situation and devise and adjust the course of action.

Continue reading at www.columbia.edu/~jeh1/Miracle.2023.12.07.pdf. ♻

Ben & Jerry's Takes First Steps Toward Diesel-free Ice Cream with Electric Yard Trucks

Michael J. Daley

Everyone knows Ben & Jerry's premium ice cream is rich and dense, but did you realize besides the extra pounds you risk putting on, that pint also fattens up the atmosphere with another 3.3 pounds of carbon dioxide?

As part of the company's efforts to reduce each pint's footprint, two new electric trucks went to work in their St. Albans and Waterbury, Vermont facilities this October. Known as yard trucks, the electric vehicles will move box trailers filled with product to and from the loading dock and within the factory warehouse yard. They will eliminate 90 tons of carbon emissions and 9,000 gallons in diesel fuel per year, as well as four tons of nitrogen oxides and 500 pounds of fine particulates per year – pollutants that worsen asthma and other respiratory conditions.

EV yard trucks are used by Ben and Jerry's for loading product. This will eliminate 90 tons of carbon emissions and 9,000 gallons in diesel fuel per year. (Orange EV).

Speaking to media at the recent launch celebration, Jerry Greenfield, co-founder of Ben & Jerry's, said "It's going to be a big change in helping us with our environmental and sustainability issue. I think everybody realizes that all companies, but especially manufacturing companies, have a big environmental footprint. We have a responsibility to do as much as we can, and we're committed to doing that."

As we have come to expect, that's not just PR talk from this company. They plan to be 100% renewable powered by 2025. They impose a self-collected carbon tax that nets $1.7 million each year dedicated to internal climate initiatives. For example, a pilot project with three of its farm suppliers to reduce the carbon footprint of milk production by 50%. Anyone interested can track all its goals and progress by reading the annual Social and Environmental Assessment Report compiled by an independent evaluator and posted on the Ben & Jerry's website, www.benjerry.com.

They don't achieve this alone but by working with partners, in this case the Vermont Department of Environmental Conservation (DEC) and Green Mountain Power (GMP).

"We're thrilled to work with the state to find more ways for our business and partners to adopt new technology that improves ways of working, public health, and Vermont's overall environment," said Jenna Evans, Ben & Jerry's global sustainability manager.

DEC provided over $135,000 to help Ben & Jerry's purchase the two new electric vehicles tapping the Vermont Diesel Emissions Reduction Financial Assistance Program, which provides technical assistance and incentive funding for projects that reduce diesel emissions from engines, vehicles, and equipment. This award marks the first non-road vehicle electrification project funded by DEC through the program.

In the last round of funding, awards also went to the Town of Poultney, Bourne's Energy (https://bournesenergy.com), and Leader Distributions Systems, Inc. DEC expects to open a new round of applications this fall. Contact Leigh Martin at Leigh.Martin@vermont.gov to receive updates.

GMP provided an additional $26,000 towards both electric vehicles and their charging equipment through its Business Innovation program which helps organizations save with custom incentives when they switch from fossil fuel for their operations.

Ben & Jerry's said the next step is to begin the switch to electric trucks for long distance shipping. Maybe when that happens, they will celebrate their achievement with a new flavor – Diesel Sludge, anyone?

Michael J Daley for some twenty years taught renewable energy on the Great New England Energy Show Van of the New England Coalition which featured the first ever solar-powered ice cream freezer funded by Ben & Jerry's.

Source links available in the online version of this edition of G.E.T.. ♻

MAJOR AIRLINES COMMIT TO SUSTAINABLE AVIATION FUELS

– United Airlines to purchase One billion gallons!

Martin Wahl

Major airlines are putting their money where their futures are, securing long-term contracts with sustainable aviation fuel (SAF) providers.

Most recently, United Airlines entered a supply agreement for 1 billion gallons from Cemvita, calling for 50 million gallons (MG) per year over 20 years, the largest commitment to date. Virgin Atlantic has committed to buy SAF from Gevo, with partner airline Delta at San Franciso and Los Angeles airports in addition to SAF from Neste at its U.K locations. Other SAF purchase commitments include:

- American Airlines used 2.5 MG in 2022 and has committed to buying at least 620 MG between 2025 and 2030.
- Delta Air Lines in 2022 announced it would purchase 525 MG over seven years, starting in 2026. It further aims to scale usage of SAF in its fleet to 10% by 2030, 35% by 2035, and 95% by 2050.
- Southwest Airlines in 2021 said it plans to buy 219 MG over a 15-year term, starting in 2026. Last year SAF accounted for 0.1% of the airline's total fuel consumption, and it plans by 2030 to have SAF account for 10% of its total fuel usage.
- JetBlue Airways in 2021 unveiled a commitment to purchase 670 MG, from 2023 to 2033, for its flights using New York City airports.

United, JetBlue and others have also invested in a sustainable fuels fund now worth $200 million.

Whole lot of testing going on

United began using a SAF blend in 2016 in its Los Angeles -San Francisco flights and currently almost all major international and domestic airlines are testing SAF blends.

United Airlines Jet (courtesy photo)

The most recent significant testing news is that Virgin Atlantic has been granted a permit from the UK's Civil Aviation Authority to fly a 100% SAF-fueled flight from London to New York on November 28, a first. Otherwise, SAF can currently only be used in jet engines to a maximum blend of 50% with fossil jet fuel.

What is SAF?

Fossil jet fuel, along with diesel and kerosene, is a middle-distillate petroleum product between lighter gasoline and heavier lubricating and fuel oils. Requirements for jet fuel are stringent because of the environment it must perform in (freezing cold, with anti-static additives). Sustainable (bio-based) fuel must meet these requirements to be used as a drop-in replacement. Currently, there are seven approved types, or pathways, to produce sustainable aviation fuels that meet the standards for jet fuel that fall into three categories:

- Refining vegetable oils, waste oils or fats into SAF. Neste of Finland is a leading producer with this approach.
- Biomass, such as waste wood can be converted to syngas and refined into jet fuel; Fulcrum Bioenergy of California produces jet fuel this way.
- Turning waste into sugars (or starting with sugar) and fermenting it to alcohol as a feedstock for an alcohol-to-jet fuel process. Gevo and LanzaJet are leaders in this approach.

A drop in the bucket?

Aviation contributes between 2% and 3.5% of global greenhouse gas (GHG) emissions; about 2% of CO2 emissions, with 1.5% added to account for non-CO2 emissions contributing to global warming, including contrails in high-humidity regions, nitrogen oxide emissions, and water vapor in the stratosphere. This all adds up to about 1.04 billion tons of GHG emissions, resulting from the annual global consumption of 106 billion gallons of jet fuel (20% of that in the U.S.).

Total U.S. production of SAF was 15.8 MG in 2022, less than 0.1% of the jet fuel consumed by major U.S. airlines that year, but a significant increase since 2016, when the 1.6 MG of SAF produced constituted only 0.01%.

While aviation emissions are relatively small compared to those of other sectors, air travel constitutes a large part of the individual emissions for the increasing number of people who travel by air – a couple of long-distance flights can wipe out CO2 savings generated by other actions. See the EPA's Carbon Footprint Calculator to determine an individual's contribution: https://bit.ly/CFootprintC

More good news

- The European Union is setting a requirement that fuel suppliers ensure that 2% of fuel made available at EU airports is SAF in 2025, rising to 6% in 2030, 20% in 2035 and over time to 70% in 2050.
- Airlines have begun to highlight their commitment to, and implementation of, SAF as part of their promotion campaigns.
- Passenger aircraft have become far more efficient over the past few decades, with CO2 emissions per "revenue passenger mile" decreasing from 3 kilos to 0.125 kilos since 1950. However, the number of passengers has grown significantly, from about 2 billion in 2004 to almost 5 billion in 2019 (pre-Covid).

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.

Links available in the online version of this edition of Green Energy Times (G.E.T.*) at www.greenenergytimes.org.* ♻

A Carbon Debt Question: Are Used EVs a Better Solution?

Jesse Lorre

If you are like most Americans, climate change is on your mind. According to Pew Research, 54% of voters in the U.S. view climate change as a major threat to our world (the number goes up to 78% for Democrats). But for the critical thinkers among us, the topic of how to reduce our carbon footprint related to transportation is a more complicated one. What is the actual impact of an electric vehicle (EV) versus an internal combustion engine vehicle (ICE) on greenhouse gas emissions, from a full-lifecycle perspective? Are EVs really better for the environment?

Transportation makes up the largest part of U.S. greenhouse gas emissions, according to the EPA, at 28%. A more detailed breakdown of personal carbon emissions by the Center for Sustainable Systems at the University of Michigan shows us that passenger cars and light-duty trucks make up 58% of transportation emissions, with heavy duty trucks, aircraft, ships, rail, and public transit making up the balance. It follows that if we could take the CO2 out of transportation, we could reduce the U.S. carbon footprint by over 15%.

But it's not that simple. The truth is, production of electric vehicles is much more carbon intensive than the production of internal combustion engine vehicles today, mostly because of battery minerals mining and battery production. The International Energy Agency (IEA), using data from a 2020 study by the Argonne National Laboratory, published a study showing that EVs are 33% more carbon intensive to manufacture than ICE vehicles, mostly because of battery mineral mining and assembly. However, the same study showed that even with EVs being powered by electricity that is generated through a blend of clean and dirty sources, EVs are less than half as carbon-intensive as ICE cars. If you are powering your vehicle with clean energy, then EVs are more than 80% less carbon-intensive than ICE cars (more on this later).

If you are powering your vehicle with clean energy, then EVs are more than 80% less carbon-intensive than fossil-fuel operated cars. (Argonne National Laboratory, CC BY-NC-SA 2.0 DEED)

The implications of this study are that after about 19,000 miles, or just under two years of average driving, an EV is carbon-neutral compared to an ICE vehicle. At that point, the EV has paid off its carbon debt and is a net positive for the planet from that point until end-of-life (15-20 years, according to a study by *Recurrent Automotive*) when its battery is repurposed for a solar farm, street light, or recycled into another EV, according to *Consumer Reports* and other sources. So, if you are looking to purchase your next car, and you want the choice that is going to have the best impact on your personal carbon footprint, get an EV that has at least 20k miles on it; someone else has paid off that vehicle's carbon debt, leaving you to drive greenhouse gasses- free for the next 180k-plus miles.

"But wait!" you say. "What about the electricity generation? We are not driving GHG-free if the power to charge our EV comes from a coal-fired power plant." That is true; in 2022, 79% of energy consumption in the U.S. was from fossil fuels. If you buy an EV, charge it at home, and do not have solar panels on your roof, then your clean EV just becomes a repository for GHG emissions created elsewhere.

The best framework to explain this conflict is the Greenhouse Gas Protocol, an international non-profit that develops and deploys accounting and reporting standards for GHG emissions. Under this framework, there are three types of emissions: Scope 1, which you create directly through burning fossil fuels; Scope 2, which is from purchased electricity (like home power supply); and Scope 3, also known as value chain emissions, which are emissions that are created by manufacturers of products you buy, or emissions created when you dispose of your products.

For your car, you can think of Scope-1 emissions as your tailpipe emissions, which amount to 8.887 kg of carbon dioxide for each gallon of gasoline you burn. If you own an EV, your emissions that come from charging your vehicle are Scope-2 emissions. Your car's Scope-3 emissions are the GHGs that are created when the car is manufactured, and its end-of-life-related emissions. Taking what we have learned from the IEA report, we know that a used EV with 20k miles has worked off its Scope-3 emissions, it has no Scope 1 emissions, and now the only concern is Scope-2 emissions. So how do we reduce our Scope-2 emissions?

If you live in New Hampshire, Maine, or Massachusetts, you get to choose who generates the electricity you buy. You cannot choose your delivery provider - that is the public utility which operates the transmission lines, reads the meters, and sends you your bill. But you can choose who your supplier is, and there are 100% clean and renewable energy suppliers out there! In NH, the Community Power Coalition offers clean power options in over 30 communities throughout the state. Plus, there are private companies like Think Energy that offer low-cost, fixed rate clean power options to ratepayers. If you want to be sure that the energy you buy for your EV charging is GHG free, you can explore your options and make the switch to clean power.

If you are looking to maximize your climate impact on your next vehicle purchase, the options are becoming more plentiful and more affordable. And according to the data available today, the most climate friendly option is a used EV with at least 19,000 miles, charged up with 100% clean and renewable energy.

Jesse Lore is the owner of Green Wave Electric in Hampton, NH. ♻

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COMMUNITY POWER COALITION OF NEW HAMPSHIRE
For communities, by communities.

Albany Int'l Airport's Sustainability Recognition

George Harvey

The aviation industry adds an estimated 2% of global greenhouse gas emissions. We have been aware of the work being done to reduce the emissions from burning aviation fuel, but a small part of aviation's emissions, about 0.1% of global greenhouse gas emissions, is from the airports themselves. That amount may not seem like much, but of the things that drive climate change, most are small enough that we might not think them urgent. And yet they all must be addressed, if we are to address climate change.

The Airports Council International (ACI) has been working on helping airports reduce their emissions with an accreditation program, which it runs globally. The Airport Carbon Accreditation (ACA) program rates airports for their position on managing and reducing carbon emissions. The ACA gives accreditation to airports in four levels, depending on how advanced their programs are. The first level is Mapping, which is done as an airport evaluates its carbon emissions and begins to address them. The Reduction level is awarded when carbon emission management and reduction can be shown to be underway. The Optimization level indicates that other parties are engaged at the airport. The Neutrality level requires that all carbon emissions have to be eliminated or offset in some way.

The program is voluntary, but it brings participating airports several benefits. Not the least of these is reduced costs that come with increased efficiency. The ACA program helps airports take stock of where they are in their approach to efficiency.

Solar Array on Roof of Concourse A at Albany International Airport. (Courtesy image)

The Albany International Airport (ALB) announced it has earned accreditation from ACI, with a Mapping level, for its ongoing commitment to identifying and reducing carbon emissions, while pursuing their eventual elimination from its operations. ALB is one of only 72 airports in North America, with 38 in the United States, with any level of accreditation. There are somewhat over 500 airports in the U.S. serving commercial flights.

The announcement of the accreditation was made in a press release. In it, Airport CEO Phil Calderone said, "Today's announcement underscores Albany International Airport's ongoing commitment to reduce our carbon footprint in recognition of the important role our industry must play in combating climate change."

He also seems to have given away the fact that ALB is working toward the next level of accreditation, when he added, "The airport is engaged in projects with our partners to examine the use of solar power, hydrogen power, sustainable aviation fuel, the use of methane gas, – a by-product of the airport's award-winning glycol recovery system – and the development of geo-thermal energy."

Though airport carbon emissions are far smaller than the emissions of the aircraft themselves, they result from just about everything else that happens at the site. Use of gasoline, diesel oil, natural gas and propane all contribute to the emissions, fueling trucks, buses, ground transportation equipment, stationary emergency power generators, and heat. Electricity use and waste management account for a large part of the rest.

Some of the work done to reduce emissions was focused on lighting, replacing much of the traditional lighting with LEDS. The areas cited were runway and taxi lighting, street and high mast lighting, and terminal and hangar lighting. That will reduce the carbon emissions from lighting quite a lot.

Emissions associated with transportation equipment took up its own effort. Electric ground support equipment was added, along with buses and trucks powered by compressed natural gas, hydrogen power, and charging stations for electric vehicles.

There were other actions undertaken. ALB installed solar power, including 154 solar photovoltaic panels. The airport expanded green spaces and gardens. The roofs of buildings were given reflective surfaces, which keeps summertime heating down, a system that can also reduce heat loss in cold weather when it is done right.

Finally, the airport improved its method of treating glycol from storms. On this point, it is worth mentioning a couple of things about glycol. It is used as a de-icing agent during winter storms, it is sprayed on the wings, and it runs off. The glycol used, propylene-glycol, is rather benign and is not listed as toxic, even in fairly high doses. People who smoke electronic cigarettes breathe it in as they do so. Nevertheless, it is gathered at the airport and fed to microbes, which gobble it up. There is a by-product from this process, which is methane gas. ALB captures the gas and uses it to heat two buildings.

Clearly, Albany International Airport has a good start on addressing the airport's own emissions and has a plan to get to better results. We will be watching with some anticipation. ♻

Kia Niro Plug-In Hybrid: A User's Experience

Russ Lanoie

When we were considering moving from our 2014 Subaru Forester to an electric vehicle (EV) we ruled out a total EV because of our location in the remote White Mountains of NH. Both my wife and I were concerned about the lack of charging stations in NH, so we figured a plug-in hybrid EV (PHEV) would allow us to at least go partial-electric to take advantage of our 2015-installed photovoltaic (PV) system.

Lanoies' KIA Niro parked below the PV array that powers the car for their local trips around the Conway, NH region. (Courtey photos)

We had been waiting for Subaru to make the new PHEV Crosstrek available in New Hampshire as we have a dealer a couple of miles from our house. But because NH does not concern itself with the California Emission Standards as every other New England state does; Subaru cannot sell them here. And because the PHEV Crosstrek was difficult to locate even from dealers across the state line in Maine, we ended up purchasing an available 2021 Kia Niro plug-in hybrid, though it was from a dealer also about an hour and a half away in Maine. The vehicle is a compact, front wheel drive, four door hatchback with a 26-mile EV-only range before the 1.6-liter engine comes to life.

It has not been much of a loss going from all-wheel-drive to front wheel drive only because our roads are well plowed here in NH, and we can take our Toyota Tacoma during snowstorms, if necessary. An advantage of the Niro over the Crosstrek is an additional ten miles of EV-only range. The Niro also features a 10-year 100,000-mile warranty.

Having had the car for almost a year and a half with no problems, we are happy to report that our fuel mileage averaged out by the car's electronics is almost 115 mpg. We have few trips that take us beyond the car's 26-mile EV-only range. In fact, the only long trips for us were to pick up *Green Energy Times* near Concord, NH, about an hour and a half from our home near Conway. Now that *G.E.T.* is being delivered directly to our door for local distribution, the only long trips from now on will be to see family and friends and appointments out of the area.

The only downside that I've found is that in cold weather the engine has to run to make heat for the occupants. Our solution is to not bother with heat if our trip is local, as we are bundled up to get to the car anyway. If we are going beyond our 26-mile EV-only range, however, I'll turn the heat up as soon as we start driving so that we can enjoy a warm car for the whole trip because we will eventually be using up our 26 EV miles anyway. My wife's complaint is that she likes to sit higher as in our old Forester.

The big advantage to my wife and me is that the power to charge our Niro comes from the solar array on the roof of our barn. Indeed, we have a large enough system that, even with the addition of the car, we have been banking kW's and are paying only the base "meter rate" to Eversource every month. We are charging the car overnight at a 10-amp rate through a #14 wire intended originally only to power a yard light over the carport. And then there was the advantage of the $4,500 tax credit available to PHEV buyers and not hybrid buyers because their cars do not run at all on renewable energy.

Looking under the hood of my Niro, I shudder at the thought of having to do anything beyond replenishing the windshield washer fluid. Not only are there all the components of the engine and six speed automatic transmission, but there's also an electric motor, and the three things together just about fill up the entire compartment. If this were an electric-only vehicle, there'd simply be an electric motor and the gearing to get its power to the wheels along with a very large storage battery either in the rear of the vehicle or built into its frame. Looking into a friend's new RIVIAN pickup truck, I was amazed to see the storage space available between the "frunk" and the pickup body in back.

So, a modern auto technician working on a PHEV needs to know modern automobile electrical principles in addition to most of the internal combustion engine workings. Fortunately, the hybrid qualities of EV's and hybrids have reduced much of the other maintenance required in non-hybrid vehicles in great part because of regenerative braking.

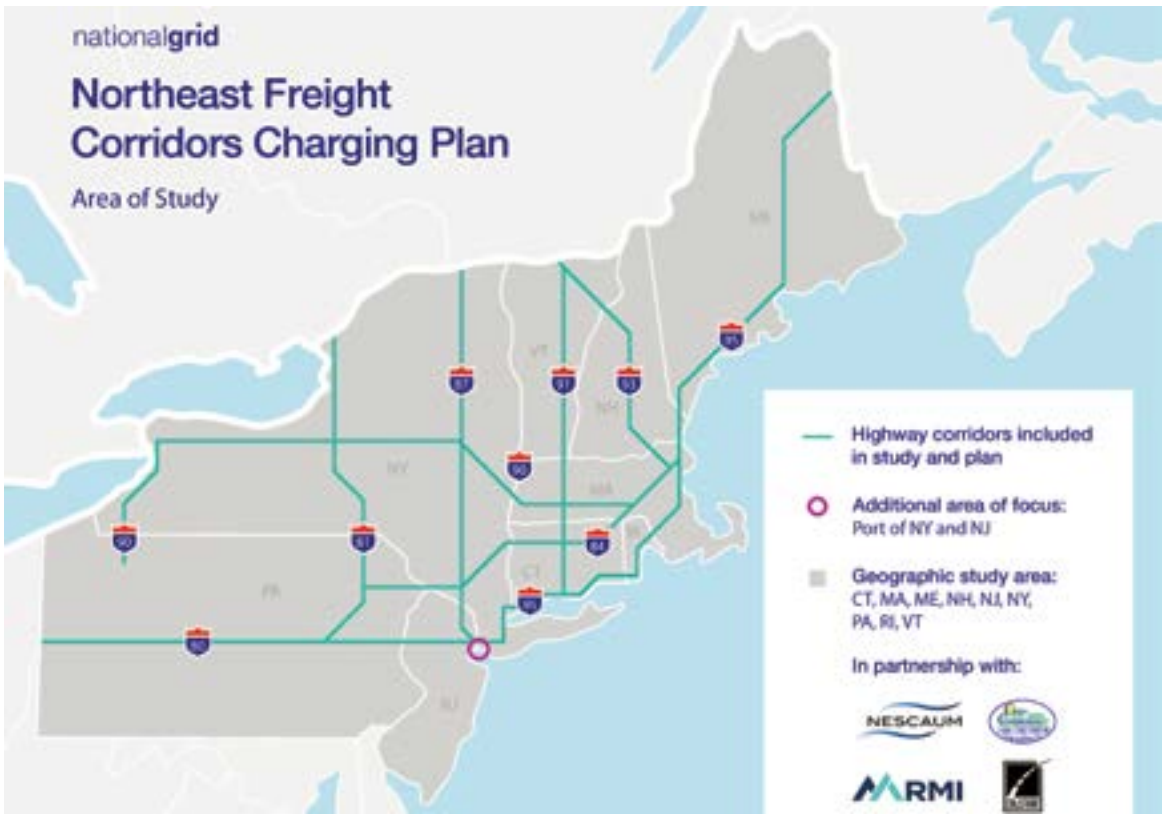
The engine compartment iincludes the internal combustion engine, transmission, and electric motor and the windshield washer fluid filler- bottom left!

Russ Lanoie is a long-time solar proponent in NH's White Mountains. He operated his Alternative Systems business in the 1970s-80s selling solar hot water systems, composting toilets and Window Quilts®. He and his wife have lived in their passive and active solar home with solar hot water for forty years, and 11kW of PVs on his barn since 2015. www.RuralHomeTech.com. ♻

Readying the Northeastern U.S. for Electric Trucks:

National Grid to Build DOE Funded Roadmap

National Grid announced the kickoff of a landmark study to support the electrification of commercial truck fleets on October 16th, 2023, mapping out truck charging needs across nearly 3,000 miles of major highways in the U.S. Northeast. Funded by a $1.2 million grant awarded by the U.S. Department of Energy (DOE), the two-year effort to build a **Northeast Freight Corridors Charging Plan** will focus on highways with heavy trucking traffic, including I-95 and I-90, and areas with commercial activity, like the Port of New York and New Jersey.



The study led by National Grid will develop 20-year demand forecasts for more than 100 sites across New York, New Jersey, Pennsylvania, and all New England states. This analysis could guide investment and policy decisions, while providing a clear path for states, utilities, businesses, and local communities to plan and build a charging network that supports large-scale electrification of the largest emitting sector of the Northeast's economy.

The Northeast Freight Corridors Charging Plan will expand upon National Grid's first-in-the-nation E**lectric Highways Study** (https://www.nationalgrid.com/us/EVhighway) released in 2022, which found that large highway fast-charging sites could require more power than a small town by 2045.

As more electric trucks enter roadways, grid and charging infrastructure must keep pace. Larger electric vehicles require frequent recharging on long haul routes, but charging options for electric trucks remain limited, with most charging stations equipped only to serve smaller passenger vehicles.

"Readying our grid infrastructure for electric trucks will require careful planning and close collaboration across state lines," said Bart Franey, Vice President of Clean Energy Development - New York, National Grid. "This DOE grant award brings the right stakeholders into the same room to chart a clear course for electric truck charging across the Northeast. This roadmap will inform efforts by states, utilities, communities, and industry leaders to create a seamless truck charging network across the region."

A Coordinated Effort to Build an East Coast Charging Network

National Grid is engaging with industry partners to drive transportation electrification in the Northeast and help communities keep pace with policy- and market-driven demand now and in the future. The company is leading this groundbreaking study effort in partnership with RMI, the Northeast States for Coordinated Air Use Management (NESCAUM), Clean Communities of Central New York, and DOE's National Renewable Energy Laboratory (NREL).

National Grid will also closely coordinate with CALSTART, the recipient of a similar DOE grant, to map out truck charging needs south of National Grid's study area. The two studies are set to cover a combined 3,700 miles of highways and freight corridors, including 1,300 miles of I-95 from Georgia all the way to the Canadian border – plotting out what could be one of the longest truck charging corridors in the country. When integrated together, this broader analysis will span 15 states, supporting more than 300 million tons of freight moving through ports on the East Coast each year, as well as several of the largest cities in the U.S. ♻

Moving Energy is the Key to Vermont's 100% Renewable Energy Future

Peter Sterling

There's good news ahead in the fight against climate change. Utilities, business owners and energy experts now acknowledge there's an affordable path to achieving what was once just a distant dream: a 100% renewable energy future for Vermont. This future includes more energy storage and conservation, weatherizing of our homes and a change away from fossil fuels and onto hydro, solar and wind power for all of our electricity.

This renewable energy future starts with the political leadership to change our laws at home- updating our 2015 Renewable Energy Standard to require utilities to get to 100% renewables by 2030. Once a leader in New England in the energy transition off of fossil fuels, Vermont is now the only state in the region to not have updated its renewables requirement in the last eight years as the reality of the economic, environmental and social costs of the climate crisis have sunk in.

For decades, passing such a law would have been impossible because no one could answer the fundamental question of how to provide affordable, reliable energy for millions of people when the wind isn't blowing and the sun isn't shining.

But the answer has now been given to us by a recent decision by the Biden Administration to support the Twin States Clean Energy Link. Twin States is a proposed renewable energy transmission project in Vermont and New Hampshire that will provide bi-directional capacity with Quebec to deliver an abundant source of existing, affordable and dependable clean energy to New England.

Typically, people have thought of power lines as moving energy one way from point A to B whenever it is needed. Makes sense in a world of gas and coal plants and not a lot of intermittent renewables. However, as more and more wind and solar has come on line, we now need to think of using or storing as much renewable energy as we can when the wind is blowing and the sun is shining and drawing down other clean power when we need it.

This is where the bi-directional capacity of Twin States comes in. We in New England are good at generating solar and wind power, while Quebec possesses enormous hydropower reserves. If we send our excess wind and solar north to Canada for their use, it preserves their hydro reserves which we in New England can then tap into when we need renewables most- at night when the sun isn't shining or on calm summer days when the wind isn't blowing hard.

The added benefit of two way "energy sharing" with Quebec is that it will greatly incentivize the deployment of new wind and solar which will not only bring the price of power down but help eliminate one of the great environmental injustices of our time- the 81 natural gas plants currently operating primarily in lower income areas of New England (none of which are in Vermont for those of you keeping score at home).

While we have a long way to go to curb all the impacts of climate change, a two-way energy connection to Canada puts a 100% renewable energy future for Vermont and all of New England well within our sights.

The Twin States Clean Energy Link where you can find a map of both states, Vermont and New Hampshire is: *https://www.twinstatescleanenergylink.com.*

Peter Sterling is the Executive Director of Renewable Energy Vermont, the non-profit trade association representing businesses working towards a fossil fuel-free future for Vermont. ♻

The NOMAD Solution to Replace Mobile Generators

George Harvey

Every once in a while, I come across an idea that is new to me but seems so obvious that it is really surprising that I have never seen it before. In fact, it seems to been unnoticed by everyone, until some bright person came up with it. Then, in hindsight, it really is obvious.

A company called NOMAD Transportable Power Systems, Inc. (NOMAD), based in Waterbury, Vermont, manufactures large transportable battery electric storage systems. The systems are on trailers and can be hauled about on roads, so anyone with a need for a big battery can get it to where it is needed. What is big? NOMAD's largest transportable battery has a capacity of 1 megawatt (MW) and 2 megawatt-hours (MWh). How much is 2 MWh? An American household of four people might use 2 MWh in about 2 months, unless they conserve, in which case it could last longer. Put another way, 2 MWh might power a neighborhood for a full day.

Some people would find the idea that a battery might be hauled to where it is needed a bit uninteresting. But I have no doubt they would see the point very clearly if they ever got emergency power from a nearby diesel generator for a few hours. In the past, emergency generators have been brought into use where they were needed. But they were nearly always noisy and polluting contraptions that cost a lot to run because of their fuel. NOMAD replaces the mobile generator with a mobile battery that is perfectly quiet and non-polluting.

The first commercial application a NOMAD system was used powered a factory for several hours while the local transmission system was under repair. Green Mountain Power (GMP) used the system to deal with the outage, because they knew the problem could be dealt with in just a few hours and the NOMAD system could provide all the energy needed.

Only a short time after that, there was a second use of a NOMAD system. Service was needed on part of the electric distribution system in Proctor, VT. Normally, the neighborhood would have lost power during the repairs, but instead GMP supported 230 houses using a NOMAD system to provide power to them while the repairs were being done.

Nomad Transportable Power System on a job site. (Courtesy photo)

GMP has purchased the 1-MW, 2-MWh configuration, the largest NOMAD offers, and plans for future deployments to support scheduled and unscheduled outages. There are also two smaller systems available, with capacities of 500 kilowatts (kW), 1.3 MWh, and 250 kW, 660 kilowatt-hours (kWh).

The real advantages of such systems becomes really obvious when we consider some of the other possible uses. For instance, what if a hospital is cut off from its electricity source? Hospitals generally have backup generators, but even so, it might be wise to use a NOMAD system and go without the backup power. Diesel generators are usually noisy, and most of them pollute the air badly. Patients in hospitals tend to be vulnerable, and the stress of the noise and polluted air they might get from an emergency diesel system should be avoided.

Another circumstance might be an outdoor concert. This is something that can be planned in advance and the question of where electricity will come from can be considered carefully. We know that an ordinary diesel power system is not acceptable because of its noise. A NOMAD power system could supply quite a lot of power for quite a few hours, nearly silently, so it doesn't take over the show, as a conventional transportable power system could.

Chris McKay, the Chief Operating Officer of NOMAD, provided some background on the company. It is three years old and came into being largely because of a vision by people at KORE Power, a battery manufacturer and KORE Solutions (formally Northern Reliability) an energy storage system integrator. After it was started up, NOMAD attracted a number of investments, but KORE Power still owns 30%. NOMAD now has sixteen employees in a building in Waterbury, Vermont, which it shares with a KORE Power office.

Unsurprisingly, the NOMAD power systems are built with KORE Power lithium-ion batteries. Each NOMAD system is a trailer that can be pulled by a tractor to whatever place it is needed. The tractor itself has to be substantial, because the large NOMAD systems are rather heavy. The largest units have batteries that weigh about 18 tons, but they also carry everyting needed to make the unit a "plug and play" connection with the sites they supply with power. Add the weight of the trailer itself, along with a hefty cooling system and whatever other ancillary equipment is needed, and we can see there can be a lot of weight in the transportable battery system.

Some obvious uses of the NOMAD transportable power units are for resilience and disaster relief and EV charging in areas without sufficient chargers. If an area is struck by a hurricane, NOMAD power systems could be sent to provide power to a community in places where they can be charged by local solar photovoltaic (PV) systems. It is important to note that PVs cannot power a section of disabled grid without the special equipment it needs to do so. The PVs need inverters to supply AC electricity, and without batteries they only work during the daytime, supplying power of irregular voltage. To support a local grid area, the amount of power supplied has to match demand, and that means more equipment. NOMAD systems have all such equipment built in.

Some things are so obvious, once you just see them. This is somenthing I didn't see coming. Now that I see it, I find it really exciting.

Learn more at NOMAD's web site which is www.nomadpower.com. ♻

Many thanks to our sponsor:

NOMAD

NHDOE FUNDING OPPORTUNITY

$1,000,000 in Low- and Moderate-Income Community Solar Photovoltaic Project Grants

NHDOE issued a request for proposals (RFP) seeking proposals for community solar photovoltaic (PV) projects that will provide direct benefits to New Hampshire low-, moderate-, or low- and moderate- income (LMI) residential electric customers who reside within the same electric distribution utility service territory.

Proposals must present a comprehensive plan that clearly demonstrates and quantifies the net direct benefits to participating LMI customers. The maximum grant request amount is $400,000.

Projects or portions of projects that have requested funds from the Department's Non-residential Competitive Grant Program, Commercial & Industrial (C&I) Renewable Energy Rebate Program or Generation Incentive Program are not eligible for funding under this solicitation, and projects or portions of projects that are designed to depend upon LMI EAP Community Solar designation are not eligible for funding under this solicitation.

Responses to the RFP are due no later than 12:00 p.m. (noon) on Friday, January 19, 2024.

Details regarding this RFP (2023-019) can be found at https://www.energy.nh.gov/rules-and-regulatory/requests-proposals. ♻

Solar Farms Produce Millions in Tax Revenues

Staff

National Grid Renewables has been very active building solar farms this fall. In early October, the utility announced in a press release that it had started operations at the Yellowbud Solar Farm in Ross County, Ohio. Yellowbud will supply electricity to Amazon under a power purchase agreement.

According to the press release, Amazon's Head of Energy, Water and Sustainability Nat Sahlstromis said, "Amazon is deeply committed to the state of Ohio, where we're investing in and scaling new renewable energy projects like Yellowbud that will help power our operations with 100% renewable energy, while also bringing new jobs, economic benefits, and new sources of clean energy to local communities." He added, "We're eager to continue contributing to Ohio's economic and environmental goals as part of Amazon's commitment to become a more sustainable business."

Care is being taken that Yellowbud is doing more for its community than just delivering electricity for Amazon. The project was developed intentionally to have a positive impact on Ohio generally, and especially the local community. It is expected to deliver jobs, income for land owners, and donations to charities, in addition to the **$90 million in tax revenues** that are expected.

The Yellowbud Solar Farm is located in Williamsport, Ross County, Ohio. Williamsport is a small but thriving village in Pickaway County, Ohio founded along the banks of Deercreek. According to the 2010 census, the village has a population of 1,023

Yellowbud Solar is an operating 274-MW solar photovoltaic (PV) farm in Williamsport, Ross County, Ohio. The farm brings in $90 million in tax revenues for the community and moves Amazon closer to its goal of net-zero carbon emissions by 2040. (Courtesy of National Grid Renewables)

After the jobs building the solar farm, there are both permanent jobs for direct employees and jobs for businesses that contract to work there. For example, a local landscape company, Optimal Outdoor Solutions, was given a contract for mowing on the project site.

Yellowbud is supporting the local chapter of Big Brothers Big Sisters with charitable donations. It has also started the Yellowbud PILOT program with Ohio University Chillicothe. Roberta Milliken, Dean of Campus and Community Relations, commented on the broader effects of solar farms in the state, saying, "Our partnership with National Grid Renewables enables us to find ways to bring the conversation about renewable energies to our students and to also equip teachers with relevant and beneficial information about it."

Blake Nixon, President of National Grid Renewables, said "It's both rewarding and exciting to see the project reach this pivotal point. We are proud to work with customers like Amazon, who share our community-focused values and not only help to bring clean, solar resources onto the electric grid, but also support our efforts to maximize a project's local economic and social benefits."

Just six weeks after this announcement, another came along to describe two more solar arrays that were also being installed by National Grid Renewables in Ohio, the 120-MW Ross County solar project and the 47.5-MW Fayette solar farm in Fayette County.

The Fayette solar project is a 47.5 megawatt (MW) solar development located in Fayette and Highland Counties, Ohio. Fayette Solar will span approximately 450 acres and will be connected to the electric grid via the existing Greenfield Substation. **The project is anticipated to positively impact the local economy by producing significant tax revenue**, short and long-term jobs, and annual contributions through a charitable fund. Fayette Solar is estimated to offset approximately 67,900 metric tons of carbon dioxide emissions annually during operations – the equivalent of taking an estimated 15,100 cars off the road every year.

The project benefits include :

- $22.4 million in direct economic impact over first 20 years of operation;
- **$8.5 million in new tax revenue over first 20 years of operation;**
- $190,000 in charitable giving during the first 20 years of operation;
- 79 construction and related service jobs, two full time operations jobs;

Like the Yellowbud solar farm, these two will be built by Kiewit Power Constructors. Also, they will use solar modules from First Solar, Inc., which has a solar manufacturing plant near Toledo.

The Ross County project is expected to produce **$27 million in tax revenues** for its area during the plant's 25-year operational lifetime. **The Fayette project is to provide $10.6 million in its county during the same period.** Between them, they are expected to donate $670,000 to local charities. And together, they should reduce greenhouse gas emissions by 145,000 metric tons each year, according to an Environmental Protection Agency calculator.

We could draw some conclusions from the announcements. The solar projects are intended and specifically designed to be beneficial to the communities in which they are erected. Their benefits are to go beyond employment opportunities to include educational benefits and donations to charities, in addition to the environmental improvements they provide. They benefit their host areas tax revenues. In these, they are not alone, as many other solar and wind facilities do very much the same.

Both National Grid Renewables and Amazon can be assured that when they sign power purchase agreements for renewable installations, there are specific benefits involved that can be shown to local people. These benefits are long-term, including donations and other help for charities and educational institutions.

National Grid Renewables and Amazon are not alone in wanting to support local communities and economies. This approach may become part of a trend toward greater positive involvement by big businesses. We can hope.

While rural areas of our country are battling urban sprawl and economic pressures, National Grid Renewables is committed to building renewable energy projects that can provide the opportunities needed to rejuvenate American communities. Learn more at https://nationalgridrenewables.com/communities/. ♻

Solar Manufacturing Costs in the U.S.A.

George Harvey

It is a sad fact, but the United States has fallen far behind China in the manufacture of goods for renewable energy and related fields. At one point, China was reported to be making up to 95% of all solar panels, and this meant the growth of solar installations in this country was all done to some benefit of Chinese businesses.

President Trump famously started a trade war with China, ostensibly because of unfair competition in the solar energy field (among other things). Unfortunately, this very much hurt American solar installers and customers because it made solar systems more expensive, but it did nothing to benefit solar photovoltaics (PV) makers in this country.

Solar businesses in the U.S. were not the only ones held back by an American disdain for renewable energy and for a move away from fossil fuels. However, the problem with solar power is particularly important because solar power is a key resource for dealing with greenhouse gasses.

The Inflation Reduction Act (IRA) was passed and signed into law to create a robust manufacturing base for renewables in the U.S. Its provisions made incentives dependent on the sources of components. To get the full incentive for something, the parts have to be made, as much as possible, in this country. So the incentives for a rooftop solar system depend on the panels, mounts, inverters, charge controllers, and other equipment being made in the U.S.A.

The effect of this law, which was signed on August 16, 2022, has been profound. Since it was passed, we have seen what seems to be an astonishing amount of investment in this country by foreign businesses. The investments are happening so those businesses can make their goods in the U.S.A. to avoid paying import duties and to preserve the incentives for customers. The investments are often very large, billions of dollars, and they lead to a huge number of jobs, both for building and for operating the plants.

One example of this is a factory built by Qcells in Dalton, Georgia. Qcells was started as a German company, and its engineering is still done in Germany, but the company is now owned by Hanwha, and it is based in Korea. It built its first plant in Dalton in 2019. To take advantage of the IRA, it expanded that plant, and it can now turn out 30,000 solar panels every day. Though the plant is highly automated, it employs 800 workers.

Solar module manufacturing plant, Dalton, Georgia, in 2019. (Qcells, CC-BY-SA 4.0. Wikimedia Commons)

Qcells is extending its investment further, with another $2.3 billion to build a larger factory in Cartersville, Georgia. This factory will start up in January, building solar panels and other materials, many of which are the components used to make solar panels. These materials start with the silicon itself, including ingots, wafers, and the actual cells that get assembled into panels. Together, the two plants will produce 45,000 solar panels per day.

We should note that Qcells' plants in Georgia, are just two among many that have been built to produce renewable generation products under the Inflation Reduction Act. Many different renewable energy plants are being built throughout the country. They are making not just solar PV products, but other things ranging from wind turbines and electric vehicles and batteries. These have come into being because of the Inflation Reduction Act, the effects of which are already being felt across the country. The Wikipedia article, "Inflation Reduction Act," says this about its effects so far:

"Research from climate policy analyst Jack Conness has revealed that $101 billion worth of 134 climate-friendly tech manufacturing investments within the United States, have been announced by companies since the passage of the Inflation Reduction Act, creating 81,400 projected jobs as of November 30, 2023." (bit.ly/WikipediaIRA)

That should feel quite good, of course, and we would think everyone would feel uplifted by the success. But that is not quite what has happened. Many people who are involved in the solar industries are pointing out worrying trends.

The solar market in the U.S. is not simple, and the issues that are raised in it can be complicated. Part of the problem is that the market can be overcome by an imbalance between supply and demand, an issue that might take years to be addressed by the market itself. Part of the problem is a difference of opinion. Some companies want the government to take a protectionist position, and other companies want the opposite.

Such problems are not confined to the U.S. market. They affect the entire world. Part of the cause is that China has been producing far more solar panels than the market needs. According to an article in the New York Times, market researcher Wood Mackenzie reported that China has invested $130 billion to "maintain its control over solar panel components," and this "has created enough capacity to meet annual global demand until 2032, with a cost of production that is 65% cheaper than it is in the United States." (bit.ly/TimesSolarManufacture)

Clearly, a shakeout in this market is likely. With experience and efficiencies of scale, American production of solar panels will doubtless lead to less expensive solar panels in this country, and that could lead us to long-term success. We will see how that develops. ♻

Efficiency Vermont's Efficiency Excellence Network (EEN)

Contractor Spotlight: Focus on Staffing Challenges

Integrated Solar Applications Corp., Brattleboro, VT

Interview with Katrina Wilson, V.P. of Operations and Sales

G.E.T. Staff

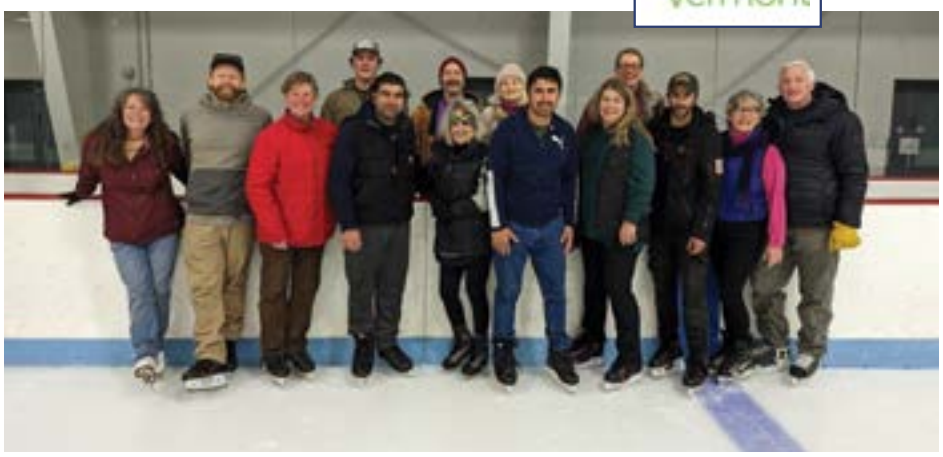
G.E.T.: Staffing has been a challenge for many contractors recently. How have you managed to keep a consistent workforce?

Katrina Wilson: Integrated Solar Applications (ISA) is a tight team. We offer competitive wages and other benefits. The benefits we offer include: a 3% match to the 401K plan even if the employee does not contribute; coverage of a portion of an employee's chosen health insurance plan; profit sharing; being as flexible as we can with employees needing time off for their personal to do list; and paid time off including vacation days (based on years employed), five sick days and three personal days.

We were introduced to the Ethiopian Community Development Council (ECDC). We have been blessed with being connected to Afghan-Vermonters by knowing one of the sponsor families. We have employed three full time employees through this program for just over a year now. They are great assets to our team.

How did you coordinate your current refugee resettlement workforce initiative?

KW: We were connected with the right people. Our part-time sales associate is an acquaintance with a mutual friend of the sponsor family just mentioned, whom is a volunteer at ECDC. He was talking about jobs possibilities and our sales associated mention us here at ISA. Also, ISA's owner, Andy Cay, knew this sponsor family through sports at Brattleboro Union High School (BUHS) for many years. The sponsor family has been key in assisting with communication, translators, and team building events.



The ISA team takes to the rink. (Courtesy of sponsor family)

Is the job training challenging for these workers?

KW: No. They are quick learners and their work ethic is impeccable. They are good with their hands and learned the tools and the trade quickly. They are proud of the work they do. Language is a barrier, but something we are able to work through. We have an incredible lead installer in the field that takes the time to understand his associates and is able to guide and teach them in a way that they are able to comprehend and add value.

How have you overcome any training challenges?

KW: Language is the biggest barrier. Connecting with the host families has been instrumental in clearing up communication issues. For meetings and in-house trainings, we bring in an interpreter.

Can other Vermont companies take advantage of this program?

KW: Yes, other Vermont companies can take advantage of this program by contacting ECDC. Many local companies have employed other Afghans through the ECDC organization such as Southern Vermont Solar.

How can a business learn more about the refugee resettlement program?

KW: he contact for ECDC for interested Vermont businesses to hire refugees is Abdul Rizwanzai. He can be reached at www.arizwanzai@ecdcus.org. You can learn more about this program at https://www.ecdcus.org/. ♻

A team of three workers have been employed by ISA from the ECDC refugee resettlement program. They have been a great addition to the ISA team and help fill the employment voids for ISA. (Courtesy photos)

New York Expands the Renewable Energy Industry & Clean Jobs

Supports Progress Toward New York's Climate Act Goals Including 70% of Electricity from Renewables by 2030

On October 12, Governor Hochul announced the release of a **new 10-Point Action Plan** to expand and support the growing large-scale renewable energy industry in New York, reaffirming the State's commitment to achieving the Climate Act goals. The plan outlines a comprehensive set of actions being taken to lay the foundation for a sustainable future for all New Yorkers through the expansion of the State's growing clean energy economy and renewable energy sector.

"Strong, continued support for expanding the renewable energy sector is critical to realizing the full potential of our green economy and protecting New Yorkers from the climate crisis," Governor Hochul said. "This **10-point action plan** underscores our commitment to addressing challenges that this sector is experiencing all across the country and hardens our resolve to ramp up our efforts in providing affordable and clean energy to all New Yorkers."

The 10-point Action Plan details a series of benchmarks and activities slated for the coming months, offering insight into how the Governor's Administration plans to overcome recent macroeconomic and inflationary challenges that have impacted the renewable energy sector.

Action 1: In the near future, NYSERDA will announce a historic suite of awards comprised of offshore and onshore renewable energy projects, along with major supply chain investments. These awards will mark one of the largest-ever renewable energy procurements by any state to date and will demonstrate New York State's commitment to supporting renewable energy projects and promoting large-scale renewables.

Action 2: NYSERDA will address the directives issued in the October 2023 Public Service Commission (PSC) Order and will assess the impacts on its large-scale renewables contracted portfolio in an expedited manner.

Action 3: NYSERDA will launch an accelerated renewable energy procurement process for both offshore and onshore renewable energy projects, aiming to backfill any contracted projects which are terminated. The process will be guided by core principles, including prioritizing competition, simplifying bid requirements, incorporating inflation indexing, applying critical labor protections and collaborating with industry to optimize the accelerated procurement timing, all while coordinating with ongoing transmission planning initiatives.

Action 4: New York will continue to actively engage with the Federal government to bring forward market solutions, from establishing a Memorandum of Understanding (MOU) with the U.S. Department of Energy (DOE) Loan Programs Office to access low-cost financing for large-scale renewable projects, to advocating for updated guidance on clean energy tax credits and a Federal-State revenue-sharing program.

Action 5: New York is investing in, and actively planning, a historic buildout of transmission infrastructure across the state including $4.4 billion in 62 local transmission projects to support clean energy integration in upstate areas; $4.1 billion in transmission upgrades to integrate offshore wind and increase reliability for Long Island and New York City; soliciting additional solutions to meet New York City's offshore wind transmission needs; and collaborating with other states and federal agencies on interregional transmission to reduce costs.

Action 6: New York is supporting the establishment and growth of a supply chain ecosystem to help the market scale, gain efficiencies, and reduce costs. The state is investing $700 million in offshore wind supply chain infrastructure while also working with other states and federal agencies to collaborate and reduce costs through a shared vision for a U.S. supply chain.

Action 7: New York is committed to building and expanding its clean energy workforce. NYSERDA has thus far committed more than $170 million for workforce development and training initiatives, which prioritizes benefitting priority populations, disadvantaged communities, and transitioning fossil fuel workers to clean energy careers. Starting in 2024, the New York Power Authority (NYPA) will further reinforce this commitment by contributing up to $25 million annually to the Department of Labor for renewable energy job training, ensuring a Just Transition for energy workers. Moreover, NYSERDA is at the forefront of prioritizing workforce development, inclusion, and equity within New York's large scale renewables industry.

Action 8: New York launched the Offshore Wind Master Plan 2.0 in 2022, which will provide a plan for the future of offshore wind development, including in deeper waters, that will allow for the expansion of the industry and ability to meet regional development targets. By planning for and seeking an increase in available lease areas, New York would expand access to necessary offshore areas to host projects, increase competition in the market and widen the pool of developers, while introducing new ideas and innovations to reduce costs.

Action 9: New York is actively engaging with industry stakeholders and will increase such outreach following the PSC order through roundtable discussions to receive input in shaping our clean energy strategy.

Action 10: New York is deeply committed to fostering public engagement, transparency, and collaboration recognizing the importance of involving various stakeholders in shaping our clean energy initiatives.

NYSERDA President and CEO Doreen M. Harris said, "NYSERDA remains steadfast in its commitment to develop renewable energy projects on behalf of New Yorkers and is proud to showcase this plan which effectively captures the strategic vision Governor Hochul has for growing a vibrant renewable energy industry. Over the coming months, we will demonstrate to the nation how to collectively recalibrate in the face of an evolving renewables marketplace and address the growing energy and supply chain challenges head-on in a comprehensive, cost-effective and responsible manner."

This Action Plan serves to reinforce New York State's dedication to clean energy development, sustainability, and economic growth and supports the State's progress towards achieving the Climate Act goals, including obtaining 70 percent of the State's electricity from renewable sources by 2030.

NYS'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, New York is on a path to achieving a zero-emission electricity sector by 2040, including 70% renewable energy generation by 2030, and economywide 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. ♻

Report: U.S. Energy Sector Reaches Turning Point on Transmission

- ✓ *Report from law firm identifies alignment of federal planning and state siting, permitting processes as keys to solving transmission problem.*
- ✓ *FERC reforms and DOE funding opportunities promise incremental gains.*
- ✓ *Market actors call for efficiency in connection and permitting, as well as support to address skills gaps, supply chains, and costs.*

The stars may finally be aligning to enable the build-out of significant new transmission capacity in the U.S. energy market, according to the latest industry insight report from law firm Troutman Pepper.

The report, *Unlocking U.S. Transmission Upgrades – Are We On The Cusp of Real Progress?*, launched November 27, reflects upon the views of a range of market actors seeking to plan, build or benefit from new transmission infrastructure. It argues that recent legislative reforms, funding opportunities, and improved state-federal coordination have created an opportunity for energy companies and regulators to converge on solutions and remove long-standing roadblocks to new transmission.

Chris Jones, Partner at Troutman Pepper, explained. "The traditional gap between federal planning standards and state siting and permitting processes has unquestionably impeded efforts to upgrade U.S. transmission infrastructure. But there are signs these previously divergent processes can begin pulling in the same direction. If the energy sector and its regulators are able to seize the moment, we could see a step change in building out the low carbon grid the U.S. so urgently needs."

Having interviewed transmission experts working on delivering transmission upgrades, as well as energy companies dependent upon their success, the report finds four major obstacles to progress.

1. Planning: The unpredictability of connection queues remains a severe headache for project developers. But transmission planners also suffer from the uncertainty created by speculative generation projects.

2. Permitting: Without a major streamlining of processes across state and federal jurisdictions, grid upgrades simply take too long to permit.

3. Practicalities: A shortage of skilled people and essential equipment threaten to present future pinch points unless addressed today.

4. Paying for upgrades: The build-out of new transmission capacity is capital-intensive and the industry will need to clearly communicate the benefits while passing a fair portion of cost to consumer bills.

Despite these obstacles, the report finds that recent and present regulatory reforms paint a reason for optimism.

1. The Federal Energy Regulatory Commission is seeking to **increase certainty for transmission planners**, most notably through its recent rule, Order No.2023.

1. Federal Government is looking to **boost FERC's leadership role**, with the notion of one agency in overall charge being well supported on Capitol Hill.

1. The Infrastructure Investment and Jobs Act and the Inflation Reduction Act have both provided legislative vehicles to **stimulate multi-agency coordination**, backed up by a raft of new programs, initiatives, and grants from DOE.

1. FERC has begun to engage with state policymakers and regulators, most notably through the 'Joint Federal-State Task Force on Electric Transmission'.

Bridging the traditional gap between planning and permitting holds the key to unlocking U.S. transmission upgrades. Having, the report found this to be well underway, and then concluded that, with a continued coordination from all parties, the prospects for a low carbon U.S. grid may be at an all-time high.

Unlocking U.S. Transmission Upgrades: Are We on The Cusp of Real Progress? can be downloaded at https://energylawinsights.com/.

Troutman Pepper is a national law firm with more than 1,200 attorneys strategically located in 23 U.S. cities. They provide legal solutions to clients' most pressing business challenges, including energy, financial services and more. Learn more at troutman.com. ♻

REV Workshop Inspires Activating Your Activism!

Barbara Whitchurch

Each year, Renewable Energy Vermont *(www.REVermont.org)* hosts a conference that explores how we in Vermont can best accomplish the transition to renewable energy.

Some of the workshops are extremely technical, but this year two of the workshops were about outreach: specifically, how professionals in the renewable energy industry can present the concepts and tools effectively, and how to use one's personal and professional "clout" to inspire the general public and draw them in. Below are some ideas shared during the workshops.

No tailpipe on this baby! (Whitchurch)

Use "backwards design." When preparing a presentation, talk, or even a conversation, ask yourself, "What is my end goal? What do I really want them to know? What is the BIG IDEA?"

Start by asking questions. For example, if you are talking about switching from gas to electric cars or electrifying your school bus fleet, ask "Do you drive a gas or hybrid car?" Remember that they are the experts on how they move around: car, public transportation, bicycle, scooter. Some of them will be conscious about their energy usage and exhaust, and some won't. Those are the main learners.

Meet them where they are. If you are talking one-on-one about cooking, ask them what they know about induction cooktops. Focus on THEIR concerns, such as the cost of buying new pots and pans.

If you arrange to go to someone else's event, ask to present for five minutes. If there are information hurdles to get past, have a fact sheet to distribute. Validate their concerns. Know how hard you can push people without losing them. How far can they go toward changing their behavior?

Avoid jargon, acronyms and anything that might make them feel ignorant. Written materials should be kept to the eighth-grade level. If you are using a slide show presentation, remember that some people are slow readers. Do not talk while there are other words on the screen; they cannot read and listen to you at the same time!

Help people identify what they are doing well. Celebrate successes! Look for positives. After your initial engagement with them, check in with them on a personal level. Ask them, "How are you doing with your switch to electricity?" Their well-being and comfort are important on their path toward green energy.

Be sensitive to how well they are understanding you. Are they now empowered to make changes or do further research? Suggest specific things they can do: "Can I put you in touch with _____?", "Let me get you a demonstration", "Google 'induction cooktop benefits'."

Prepare like crazy and know your audience. If you will be addressing a group, send out an email with questions about what they want to accomplish. Then, meet the goals that THEY identify. Do a lot of pre-work, right down to checking out the facilities. Know your data thoroughly. Video yourself or practice in front of a mirror.

Build trust with your audience. Maybe you will be chatting with your town snowplow driver. Find a way to identify with him, however basic. (We all live in Vermont; we all have to get around somehow; we all have to deal with snow; whatever!)

Tell stories. Stories are "sticky" (memorable). One power of storytelling is peer influence: other people are doing *this*, and *this*. Suncommon, a company with 10 thousand customers, wanted to promote residential solar. How did they engage the public? They hired a storyteller!

Our story? We were driving our Prius back from Canada after visiting our kids and grandkids in 2019. Realizing all the pollution we were creating that would harm them and their future, we vowed right then we would not do it any longer. We bought a new 2019 Kia Niro EV (electric vehicle) -- which we could NOT afford. (We could not take the federal tax incentive, because we do not have enough income to pay taxes; so, we leased to get the $7,500 and borrowed funds from a parent to make the monthly payments. Four years later, it is ours!)

Get people to let their guard down. (For example, one of the conference's opening speakers remarked, "Americans love to burn s—t!" We howled with laughter and really listened to him after that.) The messenger (you) is as important as the message.

Approach your legislator, town selectboard, or planning commission member. But remember that they are lay people. They might need you to explain things to them. If you are testifying before a committee, be brief and bring a draft with specific wording, especially for a proposed legislative change. If there is a related project, invite your legislator to come see it.

Repeat important things. You cannot do too much of that. Repeat important things.

Youth are the idealists; WE are the problem. Remember that. Apologize for the fix we have put them in and listen to them.

Get involved with your allies. When you show up at their event, people know you care about their issues.

Businesses, large and small, already have marketing engines. It could be an "ad" on Public Radio or a letter to the editor of your local paper. Ben & Jerry's started out selling ice cream. Later, they decided to expand their business model to include progressive social change. They are a powerful marketing corporation, and corporations can advance ideas. Their internal global campaign team created the "Reimagine the Workhouse Project" (renovate and repurpose a St. Louis local jail for social good).

Grassroots Solar, a much smaller company, organized a giving campaign to donate to *www.350Vermont.org*. Their advice: ask people to do something specific. If stuff is already being done, plug into it. Keep it fact-based and always be honest. People will be attracted to your reputation, and that's something that money cannot buy.

Maybe you have a friend or neighbor who owns a small business. Ask her about her company. Then you can talk to her about renewable energy, saving the planet, donating to a fundraising campaign, getting an electric delivery car, and so on. Use a light touch.

The "Yeah, buts…." There are risks in taking a political position as a business. Suncommon calls them "guard rails:" what we care about and what we WON'T engage in, despite the benefits. Know clearly what that line is and make sure all your employees know it, too. For example, "Don't worry about climate deniers; deny them."

Ben & Jerry's recommends having clear, transparent values and remembering that being political is part of being a member of a civil society.

And finally, whether you are at your house or a larger setting, no meetings without food!

If you are inspired to use these techniques to reach out, VEEP (*https://veep.org/*) sponsors training workshops.

Barbara Whitchurch is a frequent contributor to G.E.T., *which she and her husband Greg distribute using their electric cars, which are charged by their solar PV, outside of their Net Zero+ Passive House home.* ♻

Storing Energy in the Earth with 90% Efficiency

George Harvey

Energy storage is getting to be a fascinating subject, partly because there are so many ways to do it. When we drive a conventional car, we are storing electricity in the car's battery to start it next time we go out. When we open a door, we might be storing energy in a spring that closes when we let go. If we stack cord wood, we are storing energy in the form of biofuel. There are so many ways to store energy that we don't often think about.

Pelton wheel display. (Photo by Kabelleger. Public domain. bit.ly/PDPeltonWheel)

We have many ways to store energy created by renewable generators. We can store heat in bricks or water. Flywheels can be used to store energy. And in some parts of this country, special trains store energy by hauling carloads of stones to a high point on a rail system and release it by generating electricity as they coast downhill. Pumped storage works by pumping water to a high reservoir so it can be used to generate electricity as it flows back down to a lower reservoir. And, of course, we have big batteries. The ways to store energy seem endless.

Many people have been looking into using abandoned underground sites. Disused mines can be used as reservoirs for pumped storage. And what about the caverns that have been created by removing salt from salt domes? They can be huge, and putting air into them under pressure can be a way to store energy – when the air is released, it can drive a turbine.

Now I can tell readers about a way to store energy I have never seen before. It is to use an abandoned gas well to store water under immense pressure. The water goes into the cracks in the earth that were created by fracking, and it actually pushes up on the geological formations above it. The pressure comes from the weight of the Earth, so the force can be maintained for a very long time. When valves are opened allowing the water to come back to the surface, it comes out in a jet powerful enough to drive Pelton turbines.

Pelton turbines have been around for a very long time. They are very small, relative to their power output, and they are typically over 90% efficient. They do not use much water, but they do need very high pressure. Because of these attributes, a very small turbine can use very little water to produce a lot of electricity, provided it is sited properly. The typical setup is a small turbine at the foot of a mountain, on which there is a lake hundreds or thousands of feet higher.

Sage Geosystems (Sage), a company based in Houston, Texas, has engineered a way to put all this together in a nice little package called EarthStore™ (ES) to store energy. Sage has tested the system and has some data on it.

The original turbine for the test was a Pelton turbine designed to be turned by water at 3,000 pounds per square inch (psi). Sage redesigned it to take 3,500 psi. We are talking about a lot of pressure.

As a small test, the test site produced one megawatt (MW) of electricity for half an hour. It also showed that it could produce 200 kilowatts for 18 hours. Sage pointed out that the test showed the promise for larger systems of 2 MW or 3 MW, and possibly much larger.

The round-trip efficiency of the system was 70% to 75%. And the levelized cost of storage shows that it is competitive with lithium-ion batteries or pumped storage.

All things considered, Sage's ES system has advantages that the other storage systems do not have. Lithium-ion batteries and pumped storage take a fair amount of land. The former is used in what looks like self-storage sites. The later uses reservoirs that are rather large. Lithium uses scarce materials. By contrast, the ES site would only use a single reservoir, or possibly none, and the housing for the system might actually be completely out of sight, because the turbine is so small.

Some people might be worried that the Sage ES system could cause earthquakes because they can be used at old fracking sites. That is not of great concern, because the sites used for the ES would be carefully chosen, avoiding the fracking sites associated with earthquakes.

One other thing we might mention is that the Sage ES system is not geothermal storage, but mechanical. That is something the other articles I have seen on the system get wrong.

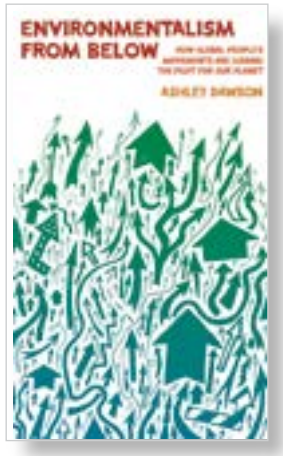
We are excited to see where this technology is going.

Sage Geosystems' website is https://www.sagegeosystems.com. ♻

Book Review:
Environmentalism from Below

by Ashley Dawson
Haymarket Books, Chicago, Illinois to be published on Jan 16, 2024

Review by Roger Lohr



Environmentalism from Below by Ashley Dawson outlines struggles in the Global South that are impacted by the climate crisis with a focus on food, urban sustainability, energy transition, and conservation. The Global South is a code name for poorer countries from South America, Africa, and southern Asia such as India and Indonesia. Grassroots groups are up against powerful nations and corporations, which rely on border control and military power. Solutions such as carbon trading, offsetting, and even the Green New Deal are depicted as ineffectual in the book.

Environmentalism from Below makes its case sprinkled with Karl Marx, and crammed with organizational acronyms in almost every paragraph. It consists of alarming statistics regarding our world and its population directly blaming capitalism, as a system that requires ceaseless growth on a finite planet by maintaining control of natural resources.

Among the views are that the Green New Deal (GND) falls far short of transformational change and international climate change "agreements" (i.e., Paris, Kyoto) that were made had signatory countries forwarding loans instead of reparations to the Global South countries so that financiers gained a stranglehold. The GND is depicted as a fragmented, contradictory set of policies to employ government spending to offset cyclical downturns of capitalism by increasing demand and employment within a green overhaul of infrastructure of fossil capitalism - colloquially, "everything must change so that things can remain pretty much the same."

The book outlines the more recent Inflation Reduction Act of 2022 as $369 billion for clean energy or tax breaks for pollution reduction, environmental cleanups, domestic manufacture of batteries and solar panels -- at the same time giving ConocoPhillips drilling rights over 30 years in the Alaskan tundra for an estimated 600 million barrels of oil and signing 7,000 drilling leases approved by President Biden in 25 months (outpacing Trump!). Some may view this legislation as a compromise while others see a sellout.

"The carbon footprint of the world's top 1% is more than 75 times higher than the bottom 50% and capitalism is characterized by a relentless drive to acquire surplus value that is ecologically inherently destructive. Production and consumption are without limits separating humans from nature and transforming everything into commodities. Laws are written to justify enclosure and exploitation of the environmental commons around the world."

"Agribusiness grows 30% of the world's food with 90% of global grain trade controlled by four companies that dominate vertically and horizontally including seeds, fertilizer, processing, packing, distribution and retail." This has occurred prior to the more recent changes involving artificial intelligence and the undeniable climate change effects on small farmers such as unpredictable weather patterns, shorter growing seasons, extreme temperatures, droughts, pests, crop diseases.

The book cites a number of organizational efforts on urban issues with regard to those living on the lower fringes of society in India and South Africa for example. Most of the urban experiment explanations in the book feature the word "BUT"

Cont'd on p.38

Wind In the News

Revolution Wind Receives Project Construction Approval

Kimberly Warner-Cohen

Revolution Wind has received approval for its construction and operations plan from the U.S. Department of the Interior's Bureau of Ocean Energy Management, moving the project toward construction. The first utility-scale offshore wind farm serving Rhode Island and Connecticut, Revolution Wind will deliver 400-MW of power to Rhode Island and 304-MW to Connecticut, powering more than 350,000 homes across both states. It will be sited about 15 miles south of the Rhode Island coast, 32 miles southeast of the Connecticut coast, and 12 miles southwest of Martha's Vineyard.

Source links: 1.* North American Windpower, *Nov 21, 2023, "Revolution Wind Receives Project Construction Approval"*

2. Clean Technica, *Nov 20, 2023, "Revolution Wind Begins Construction Of Offshore Wind Farm In Rhode Island Sound"*

3. Electrek, *Nov 21, 2023, "Connecticut & Rhode Island's offshore wind farm just got the construction go-ahead"*

Vestas Bags 239-MW U.S. Wind Turbine Order

ReNews.Biz, November 21, 2023

Danish wind turbine maker Vestas has secured a 270-MW wind turbine contract for an undisclosed wind project in the U.S. The manufacturer will supply 53 V163-4.5MW machines. The project is owned by a subsidiary of Engie North America. Turbine delivery will begin in the fourth quarter of 2024 with commissioning scheduled for 2025. The orders include supply, delivery, and commissioning of the turbines, as well as a multi-year service agreement.

Source links: 1. reNews, *November 21, 2023, "Vestas bags 239MW US wind order"*

2. Windpower Monthly, *November 24, 2023, "Vestas secures 500MW orders for two US projects"*

3. Power Technology, *November 24, 2023, "Vestas secures 270MW wind turbine order in US".*

** Source links in the online edition of G.E.T.:* ♻

As EV Adoption Grows, Energy-Efficiency Can Help Ensure the Grid Is Ready

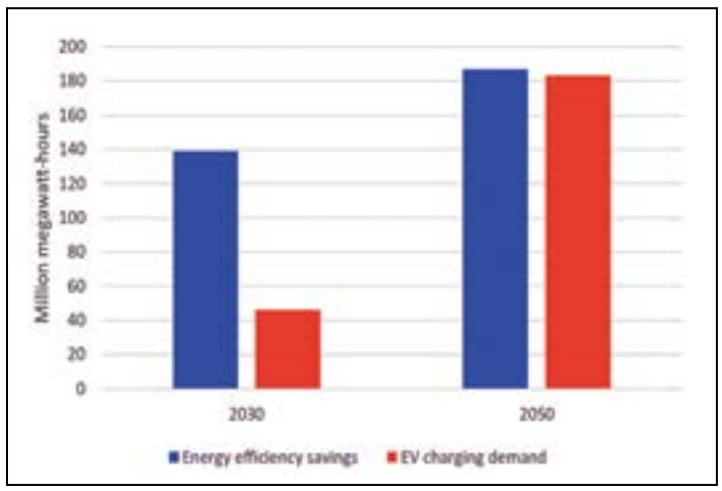
With millions of EVs likely to hit the road in coming years, improving efficiency in residential and commercial buildings can help ensure the grid can handle the increased electric load.

Peter Huether

The transition to electric vehicles (EVs) is completely changing the way we fuel our cars, with drivers ditching the gas station for the wall outlet. The Department of Energy's multiyear Electrification Futures Study estimates that widespread electrification could *increase electricity consumption by up to 38%*, which could require expensive upgrades to electricity transmission and distribution systems over the coming decades. However, we can avoid many of these grid expenses if we make smart investments in energy efficiency instead.

Cars and trucks are responsible for over 23% of all *U.S. greenhouse gas emissions*. Since EVs can run on a renewable electricity grid and be zero-emission, electrifying all the vehicles on the road will be vital to reducing carbon emissions. The Department of Energy study projects that increased electricity demand by 2050 will be driven mainly by EVs. In California, the state with the *largest EV market share* today and a *state with ambitious EV adoption goals*, if all vehicles are electric in 2050, it would increase electric demand by 183 million megawatt-hours, according to Energy Innovation's *Energy Policy Simulator*. That's a significant increase, but not insurmountable if overall electricity demand is reduced through energy efficiency.

The United States has made great strides in reducing energy consumption, *halving energy use* relative to the size of the economy since 1980, but bigger opportunities are still ahead. Energy efficiency investments will benefit households' bottom lines and reduce our dependence on fossil fuels. It can also mean an easier and faster transition to EVs because energy efficiency reduces the grid upgrades needed to bring the electricity to serve EVs.



Energy efficiency savings potential versus projected EV charging demand in California. (Courtesy image)

California could reduce its electricity usage with investments in commercial and residential building energy efficiency, including better building insulation, more efficient appliances and lighting, and smart thermostats. By *one estimate,* the state could save 187 million megawatt-hours annually by 2050 with ambitious energy efficiency improvements in these areas. As shown in the chart below, California's potential energy savings from efficiency is slightly greater than the expected electricity consumption of fully electrified vehicles in the state, with the avoided grid enhancements saving utilities and consumers money. The impact is even more pronounced in the short term: the potential for energy efficiency to reduce electricity consumption is about three times greater than the expected electricity demand from EVs in 2030 in California, at 139 million megawatt-hours in savings compared to 46 million megawatt-hours in EV charging.

In addition to savings in the buildings sector, efficiency savings can be achieved in other sectors of our economy, including industry and transportation. For example, industrial firms can adopt *strategic energy management*, an approach that commits to continuous efficiency improvement. High-efficiency EVs can be an essential part of these efforts, lowering the electricity needed for charging and making the transition easier while *limiting grid strain*. The efficiency of today's EVs varies widely, and there is plenty of room for improvement to reduce the millions of megawatt-hours *EVs will need* over the coming decades. *Greater EV efficiency* will also save drivers money, allowing them to go farther with the same amount of electricity, and it can increase an EV's range and reduce mineral demand for EV batteries.

Utility planning will be necessary to ensure that the grid can deliver the needed electricity and do so when and where it's needed. The timing of electricity savings and demand will help determine the level of investment required to ensure grid stability. Policies like electricity *time of use rates and demand management* can help match the supply and demand of electricity as we electrify transportation and other sectors.

The amount of electric power use that can be reduced through efficiency measures is massive. It can significantly reduce the grid upgrades needed to handle full electrification of all the vehicles on the road. Energy efficiency makes transitioning to EVs easier, meaning less climate pollution, cleaner air, and lower utility bills for households and businesses.

Peter Huether is the Senior Research Associate for Transportation for ACEEE.

Links to source materials will be available in the article as it appears online. ♻

ACEEE
American Council for an Energy-Efficient Economy

Electric Grid Transition

Cont'd from p.1

annual fuel utilization efficiency (AFUE) rating was considered good at one time. That meant that only 20% of the heat went up the chimney. Some newer furnaces have AFUEs of 95%. We could exclaim about that second figure because it is so close to 100%. And nothing is ever all the way to 100%, right?

An electric resistance heater is usually close to 100% efficient. That means that the heat energy created by a resistance heater is equal to the electric energy making it go. So, we can have something that could theoretically be 100% efficient. But clearly, nothing could be better than 100%, right?

Well, no. Efficiency and percent both must be considered carefully. In both cases, we really don't know the meaning of the word, unless we know the meaning *for this application, in this context*. That means that in either case some explanation should be given.

An article in a recent edition of *MIT Technology Review* says, "Heat pumps' real climate superpower is their efficiency. Heat pumps today can reach 300% to 400% efficiency or even higher, meaning they're putting out three to four times as much energy in the form of heat as they're using in electricity. For a space heater, the theoretical maximum would be 100% efficiency, and the best models today reach around 95% efficiency." (https://bit.ly/MITheatpumps)

We should recognize that the word "efficient" is being used very unconventionally here, and the idea could possibly have been said better another way. It is really more accurate to say that a heat pump has a coefficient of performance (COP) that is 300% to 400%. That means the amount of heat energy delivered by a heat pump is three to four times as great as the electric energy used to power it.

Towers seen from Rt. 20, east of Duanesburg, NY, waiting to be erected as the state continues to improve the grid efficiency in the capital region. (N. R. Mallery)

We might do well to consider that. We can get three or four times as much energy from a heat pump as the amount of energy that goes in. That seems to violate the laws of physics about the conservation of energy and mass. But a close inspection of what is going on shows that the magic can be explained.

The magic arises because a heat pump does not normally *create* heat, which is what burning fuel or heating with a resistance heater does. Instead, it *moves* heat.

It is not really all that hard to envision this. Nearly all refrigerators have heat pumps in them. The heat pump in a refrigerator removes heat from the cold inside of the refrigerator, making it colder, and discharges it into living space, making the kitchen warmer. So, a heat pump appears to be far more efficient than oil furnace or resistance heaters because the heat pump moves heat instead of *creating* it.

That lengthy explanation illustrates (we hope) the fact that when we electrify things, we can be much more effective in doing the same work with less energy. That *appears* to be an increase in efficiency.

Putting electric vehicles on the road will mean that we use more electricity, certainly, than if we power them with combustion. But they will also change the demands for electricity at different times of day. This is because the EV will be charged at night, when demand for power is low, and will often be used as a battery resource when demand is high, in the afternoon or evening. So having more EVs could increase the amount of electricity used during a 24-hour period, but also reduce the peak demand. An article on the grid and EVs appears on page 8 of this issue of Green Energy Times.

As we move to electrifying things, we should do the overall work of becoming more efficient. When we install a heat pump, we should do the work of testing weatherization and insulation. If there is a need for improvement, as there often would be, the whole house becomes more efficient. In theory, we could find that a house is so efficient passively that heating it at all is not normally necessary.

In the course of the transition to zero emissions, we are likely to see sharp increases in the amount of consumer-produced electricity. Rooftop solar systems and passive houses could make local grids less dependent on imported energy. This would mean electrification could even reduce the overall use of energy. In theory, we could even come to use only electric energy, but use it so efficiently that the demand would decrease. ♻

Eleven Ways to Approach Money for Green Energy Equipment at Your Home

Janis Petzel

Converting your home from oil or gas to cleaner energy is a worthwhile investment in your family's future. But it can take a pile of greenbacks to go green. The following ideas on money management came from our family's experiences remodeling old Maine houses and from information about the Inflation Reduction Act (IRA).

1. Put a priority on clean energy in your budget and personal savings: Our family's goal is to avoid buying fossil fuels. We want to reduce the risk of climate change for our children and grandchildren, and to protect ourselves from corporate greed. We make clean energy a priority in how we spend our money. It's so satisfying to achieve steps along the way.

2. Educating yourself is worth money. Read up on clean energy options so you are prepared if something breaks, a rebate is available, or you are ready to do a remodel.

3. Do traditional and ordinary energy conservation measures, like window coverings, insulation, programmable thermostats. The electricity you don't use is the cheapest and cleanest, plus, when you do get solar or heat pumps, you will pay for smaller equipment.

4. Purposeful savings: Even if it is the five-cent deposits from cans and bottles, put something aside so when the time comes, and the furnace fails or you're ready to go solar, you have some cash available.

5. DIY, but avoid paying tuition at the College of Hard Knocks: Sweat equity is great but take the time to know what you're doing. Doing things twice because you created a moisture problem in your house (or some other screw up) is not cost-effective.

Publicdomainpictures.net

6. Windfalls: A larger-than-expected tax refund, an inheritance, the sale of a boat or car, or even a rebate from another energy product can be put to use for life-changing investments in green energy. This is how we got started with our solar panels. Then, the money we saved on electricity helped finance the next green energy thing we bought (a used Nissan Leaf), which charges from the solar, so we don't buy gas. Windfalls beget other windfalls.

7. Rebates or assistance from your state. Thanks to the IRA, the rebates on heat pumps have gone from a few hundred dollars to potentially thousands of dollars, and lower income people get more money (at least in Maine through Efficiency Maine). The program is more complicated than it was last year, but the money is real money and a big help, worth the trouble to get through the paperwork. Many states have programs to help low-income people pay for electric bills, weatherization, or new HVAC equipment like heat pumps.

8. Federal tax credits— https://www.irs.gov/pub/taxpros/fs-2022-40.pdf. The tax credits are so much better this year thanks to the Inflation Reduction Act. It's worthwhile spending time familiarizing yourself with these credits, so you can use your larger than expected refund to fund your next clean energy project (and make use of the tax credits again). Unfortunately, these tax credits are not much help to low-income people.

9. Borrow the money through a home equity line of credit, bank loan, or financing through the company where you buy the equipment. Even if you pay interest over time, you will still come out ahead in the long run. States may also offer green energy loans. Avoid using credit cards with predatory interest rates.

10. Synergy: Solar was our gateway to clean energy, but it doesn't matter where you start. The savings on one project allow other good things to happen. Not only do we save on electricity, but we also save on the heating oil and gasoline we no longer need to buy (plus there is less maintenance expense with the electric car). Our solar panels protect us from utility rate hikes, increase our property's value (on average 4.1% per Zillow) but did not increase our insurance rates.

11. Pay it Forward: If you can, give solar, heat pumps, etc. to a young adult in your life. It is hard for young people to get started in this expensive world. You can help them get a jump on savings, as well as make the world a better place.

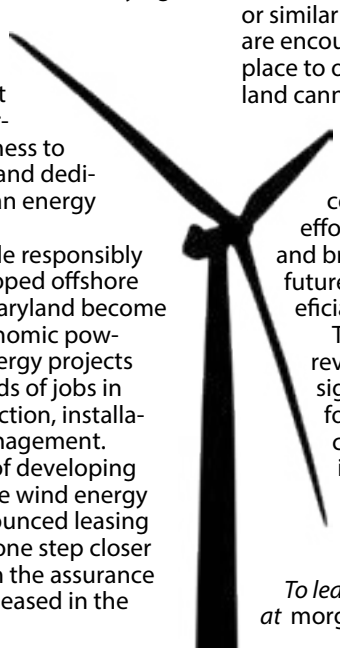
Janis Petzel, MD is a physician, grandmother and climate activist whose writing focuses on resilience, climate, and health. She lives in Islesboro, Maine where she advocates and acts for a fossil-fuel free future. She serves on the Islesboro Energy Team and is a Climate Ambassador for Physicians for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

Editors' note: In relation to 7 and 8 above, the federal assistance for heat pumps (as home heating and cooling equipment) and their installation may change in the near future. ♻

Federal Initiative Accelerates Offshore Wind Development in the Central Atlantic

On Tuesday, December 11th, the Biden Administration urged by U.S. Senators Chris Van Hollen and Ben Cardin (both D-Md) announced an exciting proposal for the offshore wind lease sale in the Central Atlantic Ocean.

The proposed lease sale of two previously designated parcels in the Central Atlantic Ocean, which is scheduled for 2024, represents a significant stride towards bringing online renewable energy sources. The commitment to identifying additional acreage off Maryland's shores as Wind Energy Areas (WEAs) for a subsequent lease sale in 2025 underscores their responsiveness to state and local leaders, and dedication to long-term clean energy strategies.



Investing in large-scale responsibly sited & equitably developed offshore wind power will help Maryland become a clean energy and economic powerhouse. Renewable energy projects would provide thousands of jobs in manufacturing, construction, installation, and operation management.

Maryland has a goal of developing 8.5 gigawatts of offshore wind energy by 2035 and these announced leasing areas will put the state one step closer to reaching its goal with the assurance that more areas will be leased in the near future.

Offshore wind energy stands as a source of encouragement in the fight against climate change and the transition towards clean energy alternatives," said Josh Tulkin, Director of the Maryland Sierra Club. "We commend Senators Van Hollen and Cardin, and the Biden Administration, for their commitment to expanding renewable energy resources and accelerating the transition to a more resilient and just energy landscape. While we are disappointed that leasing area B-1, or similar areas, were not released, we are encouraged that there is a process in place to open additional areas. Maryland cannot reach its clean energy goals without additional space being made available.

"We look forward to greater collaboration on decarbonization efforts across the Central Atlantic, and bringing about a clean energy future that is fair, equitable, and beneficial for all communities."

The proposed lease sales and review of additional areas not only signify an economic opportunity for Maryland, but also signal a collective step forward in reducing carbon emissions, promoting job growth, and securing a cleaner, more sustainable future for generations to come.

To learn more, contact Morgan Caplan at morgan.caplan@sierraclub.org. ♻

Inflation Reduction Act (IRA) RESOURCES

The Inflation Reduction Act (IRA) has billions of dollars in rebates and incentives for home energy efficiency and electrification. Building Performance Association (BPA) created a hub for business owners to get all of the information they need to successfully apply for home energy and rebate programs. Resources include requirement guides, eligibility checklists, fact sheets and more.

Recent IRA Resource Links (interactive links in our website edition at *greenenergytimes.org*):

- **DOE: Home Efficiency Rebates Retroactivity Fact Sheet and Eligibility Checklists** *(https://bit.ly/building-performance_HomeEfficiencyRebates)*
- **The White House: IRA Guidebook** *(https://bit.ly/building-performance_IRAGuidebook)*
- **The Residential Capital Stack: Maximize the impacts of HOMES, HEEHR, 25C Tax Credit, WAP, and Utility Programs** *(https://bit.ly/building-performance_ResidentialCapitalStack)*
- **More info about IRA Resources at:** *(https://bit.ly/building-performance_NavigatingIRA)*

Learn more about BPA at https://building-performance.org. ♻

NH Saves Is Back Before the PUC

Sam Evans-Brown

Imagine you could go to the store and purchase a coupon for one dollar, and that coupon provides you with two dollars and twenty-seven cents. It's likely the stores offering these coupons wouldn't be able to keep them in stock. Savvy shoppers would scoop them up by the armload and the staff at the store may have to limit customers from taking too many.

This imaginary scenario is of course absurd, but in broad strokes it also describes New Hampshire's energy efficiency policies, which operate under the brand name "NHSaves." The next iteration of the state's three-year energy efficiency plan was just approved by state regulators on November 30th, and the programs as a whole are forecast to generate $2.27 in benefits for Granite Staters for every dollar invested.

Considering the cost-effectiveness of these programs, perhaps it's no surprise that New Hampshire's lawmakers have now twice voted unanimously that they want to make these coupons available to the state's savvy shoppers. The last time the Public Utilities Commission (PUC) was given the opportunity to weigh in on the state's efficiency programs, back in 2021, the politically appointed commissioners used their order to attempt to dismantle NHSaves. As a result, in 2022 and 2023, the legislature voted to pass two bills which have sent a crystal clear message to the state's regulators that New Hampshire wants to keep the shelves stocked with money-saving energy-efficiency offerings. Thanks to this bipartisan support, state regulators were more or less obligated to approve this latest three-year plan, as they acknowledged in their order.

The program offerings represent stability and continuity. Over the course of 2024-2026, the three-year plan will offer financial assistance to encourage nearly 5,000 new homes to be built above code, including many being built as close to net-zero-ready standards as possible, and will assist more than 11,000 homeowners to add insulation to their existing homes, of which nearly one third will be low-income households. These programs will also help cut the costs of more nearly 40,000 businesses and municipal energy consumers.

The plan includes important innovations too. If the plan is approved, New Hampshire residents and businesses will be paid to use various technologies, including back-up batteries that they've purchased to weather New Hampshire's frequent storm-induced outages on sunny days, too. Batteries that are enrolled in the program will be discharged into the grid during times when more energy is needed, avoiding having to buy electricity when it's most expensive. Over the course of three years, more than 13,500 residents and 419 businesses are expected to enroll in these "Active Demand Response" programs. And this program is particularly cost-effective. Each dollar invested in incentives encouraging business to participate creates up to four dollars of benefit.

If the past two years have taught us anything, it's that New England's energy prices are increasingly exposed to global energy markets. Our electricity prices are driven almost entirely by natural gas prices, we're located at the very end of the existing gas infrastructure, and American natural gas is *increasingly exported overseas to Europe*. As a result, New England has found itself in the unenviable position of having our economy yoked to the swings of geopolitics, and the whims of strong-man dictators in petrostates all over the world. The most meaningful immediate term action any of us can do to reduce our exposure to these forces is to simply use less fossil fuels. Energy efficiency is our first, best option in that regard.

This need is particularly pressing when you look at how much new electricity demand is expected in the years to come. Currently, there are around 10,000 electric vehicles registered in New Hampshire, but that number is set to increase to more than 165,000 ten years from now. Over that same time frame, the increasing electrification of heating load is expected to add as much as 271 MW of winter heating demand to the electric grid, equivalent to the capacity of brand-new, medium-sized power plant. If we're going to meet this growing demand as affordably as we can, we'll need to invest as many of those money-saving efficiency coupons as we can get our hands on.

While the drama-free approval of this latest plan is a welcome development, PUC Commissioner Carleton Simpson wrote the following regarding his decision to approve the plan, "While I support the Plan as filed, our work is not complete. In future triennial plans or program updates, I hope to see more analysis and development around the integration of renewable and distributed energy resources, energy storage, managed electric vehicle charging, and smart controls to optimize efficiencies and coordination between the electric and natural gas networks."

Indeed, these need to be the marching orders for NH utilities, policymakers, clean energy advocates, and anyone who is serious about wanting to decrease our emissions and the amount we spend on energy in the Granite State.

Sam Evans-Brown is the executive director of Clean Energy NH. ♻

Green Energy Charges Ahead
– Surpasses Two Important Milestones

Despite all the talk of increased opposition, alternative electricity generation continues to overtake some of the nation's most used traditional energy sources, including fossil fuels. Why? Because its long-term advantages are undeniable, both in terms of lower environmental impact and now lower cost-per-watt.

Clean Energy Funding Now Surpasses Fossil Fuels'

According to Bloomberg, for a second straight year banks are making more money providing loans and underwriting bond sales for green-related projects than they're earning from fossil fuel companies.1

Together, banks have generated about $2.5 billion of revenue from climate-focused financing so far this year, compared with $2.2 billion from their work with oil, gas and coal companies, according to data compiled by Bloomberg.

It's a big change from as recently as 2020, when lenders pocketed almost double the fees from Big Oil than they did from backing green initiatives.

Banks have faced considerable criticism in recent years for their support of the fossil fuel industry, the primary source of planet-warming pollution. Financiers have sought to defend themselves by claiming they want to assist in the transition to a low-carbon economy by staying engaged with the industries most responsible for the accelerating climate crisis.

At the same time, growing numbers of banks have acknowledged the risks of the crisis by increasing their ambitions around green financing. For example, JPMorgan Chase & Co. announced emissions-reduction targets late last year

(Wikimedia)

for airlines, cement manufacturers and iron-ore and steel companies. That added to the bank's first set of goals, which focused on the oil and gas, electric-power and auto-manufacturing sectors.

Most climate change trackers agree, however, that as encouraging as this new milestone in green energy generation is, the green-to-fossil fuel ratio is still far from where it needs to be, and will require an extraordinary ramp-up in green investment to reach 1.5C goals in time.

SOLAR AND WIND GENERATE MORE POWER THAN COAL IN U.S.

Wind and solar power have generated more electricity than coal for the first time ever in the U.S, according to new federal data.

Wind and solar sources produced a combined 252 terawatt-hours in the first five months of 2023, compared with coal's output of 249 TWh, according to data from the U.S. Energy Information Administration (EIA) as reported by Scientific American2. This marks the first time renewable energy has outperformed coal without including hydroelectric power in the count.

As recently as 2008, nearly half of the country's electricity was generated by coal, but it has been declining steadily ever since, replaced by renewables and natural gas.

At the same time, an additional 22.5 gigawatts (GW) of solar and wind capacity were added in the past year ending in May, according to an earlier EIA report.

Ending coal generation once and for all can only do good things for the climate. Though it comprises around one-fifth of the energy grid, coal use makes up more than half of the greenhouse gas emissions from the power sector, according to data from the U.S. Environmental Protection Agency.

The expansion of renewables has been given a boost by the Inflation Reduction Act, but getting green power sources hooked up to the U.S. electrical grid has now become the roadblock. In fact, 1,350 GW of capacity from more than 10,000 projects are now waiting to be connected to the grid, most of them renewables -- giving new meaning and urgency to the term "gridlocked".

While not as glamorous as gleaming solar arrays or majestic wind turbines, grid connectivity and updated software are now actually two of the most pressing needs for climate reversal.

Sources: 1. Bloomberg Green ESG Investing, "Green Fees Overtake Fossil Fuels for Second Straight Year," October 18, 2023; 2. Scientific American ClimateWire, June 12, 2023. ♻

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 for:

Advanced Wood Heating

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

• Coal Change-out adder. An additional $3,000 additional incentive for a pellet heating system if replacing a coal heating system. (www.RERC-VT.org) or call them at (877) 888-7372.

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

• Additional information on wood heating at: www.fpr.vermont.gov/woodenergy/rebates

Bio-diesel

• Eligible customers can receive funds for heating with bio-diesel. (www.rerc-vt.org/heating-with-biodiesel)

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.

• 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

• Combination washer/dryer rebate: $400

• 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.

• On-bill financing: Pay for your weatherization project on your monthly utility bill. Restrictions apply.

• Renters can get free LEDs (including dimmable and wifi-enabled), faucet aerators, and showerheads.

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.

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.

UP-TO-DATE INCENTIVE INFORMATION CAN BE FOUND AT:

WWW.DSIREUSA.ORG

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Department of Energy

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 closed

Residential Solar Water Heating Rebate Program is currently closed.

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

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

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 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

ReWire America Calculator. https://www.rewiringamerica.org/app/ira-calculator

Read up on electrification at: https://homes.rewiringamerica.org/

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 Compare 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. Compare 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 or a fasterLevel 2 charger. For public sites like 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

Music for Sustainability - Welcome to the Reusiverse

Jessie Haas

Music: Uplifting. Concert venues after the crowd goes home? Not so much. Concert goers in the U.S. generate 116,834,033 pounds of waste per year, and emit 400,000 pounds of CO2. One major culprit? Single-use plastic plates, cups, and cutlery.

A new organization is trying to change that. Musicians For Sustainability (MFS) was started by Ben Kogan as a project of his organization, Reuseable Solutions, which describes itself as "an outreach organization that focuses on eradicating single-use plastic and climate change through business promotion and influencing environmental policy."

MFS asks musicians to take a pledge to request that their venues agree to three of six climate solutions. These are: 100% renewable energy, through onsite or community solar, wind, or renewable energy credits; reusable cups and other food and drink containers (no compostables); can-carrier reuse or keg-only drinks; composting; electric vehicle charging; and water refill stations.

A solar-powered trailer is used for music concert. (Jordan Heiden)

Why no compostables? To many of us, they seem like part of the solution. But Kogan explains that few venues and events offer composting. If compostable cups and utensils go into the landfill, they don't compost there. They rot and produce methane, and they also leach PFAS chemicals from the cups' waterproof inner lining. (They may also leach PFAs into your beverage.) Paper cups are a huge emitter of greenhouse gases in their production, according to Bold Reuse, which has found that a paper cup is responsible for far more emissions than the typical red Solo cup (the least-harmful of the disposables, according to a recent study).

Reusable food ware, though it may embody more materials, is far better for the climate. Glass mugs come in at the top of the list, but ceramic and stainless-steel containers are close behind. (See the graph on BoldReuse.com) A study by Upstream Solutions has found that reusable food ware breaks through on many environmental measurements after just two uses.

Cont'd on p.21

Hockey Legend Mike Richter – *Cont'd from p.1*

properly. When you start to either diminish the environment or just have larger demands on it, there's probably a market solution for it. There are more people on earth. There is more demand for these resources. So there's an opportunity to maybe be more efficient with them.

And I've always been drawn to the energy space. I'm not an engineer by training, but I have great people around me.

Munsell: And can you tell me a little bit more about Brightcore and its business model?

Richter: In some ways, we are kind of pedestrian. We use proven, off-the-shelf technology; it's not cutting-edge stuff. Our clients are not guinea pigs. These are commercially proven products that we're putting into commercial and industrial buildings.

It can be something as simple as lighting or as complicated as geothermal loops. But we basically have three verticals: lighting and controls, solar that increasingly comes with battery storage as that cost curve comes down, and renewable HVAC in the form of geothermal ground-source heat exchanges.

We also are very interested in the transportation sector, and we're doing a lot with plug-ins for electric vehicles, both for fleets and individuals. We started with lighting simply because every building has lighting, so it's a great way of getting to the building and understanding the energy profile. Then we bolt on things like on-site generation through solar-plus-battery-storage, which then leads to demand response — a possible revenue stream.

But really, what we're finding exciting now, particularly with the Inflation Reduction Act and some of the legislation that's coming out in cities and states in the East, is HVAC and especially geothermal heat pumps, where we have some proprietary technology that we've partnered on with European firms. We're bringing it across the ocean to deploy here, and we now have the ability to apply geothermal technology in very dense urban settings, which opens up the retrofit market.

This stuff is happening right now; these are not just ideas and words and hopes. These technologies exist today, and they're being deployed. And they have to be deployed at scale.

Munsell: I saw on your website that you've done some work on some sports arenas. Is that through connections from your former career?

Richter: We certainly have connections into that world, given my former career in the NHL. When you think about even a localized, municipal hockey rink, it's basically keeping that ice at 27 to 28 degrees Fahrenheit through days that could be 90°F outside with 90% humidity. It's a freezer without a door on it. And these things are not particularly well insulated. So we can come in and actually make them perform a heck of a lot better.

But [at Brightcore], we don't really focus on athletic facilities per se. We're opportunistic across all of the commercial and industrial buildings. If you look at multifamily housing, campuses, office buildings — they have huge energy needs. And the grid is getting strained increasingly. So this is an all-hands-on-deck moment.

Munsell: How can we use the culture of sports to help solve the climate crisis?

Richter: In a lot of ways, sports is a perfect metaphor. It's all about performance. If there's waste in any form, whether it's carbon or just using more electrons than you need, you're probably not performing at your capabilities. That holds true for a 12-year-old goalie, and it holds true for a Goldman Sachs portfolio of buildings. Efficiency rules the day and competition.

Not to stretch that metaphor too much, but in sports, you have everything from food to energy to health all converging on that pitch, or that ice surface, or that football field. And it's an apolitical place, right? You have conservatives who support the Yankees. You have liberals who support the Yankees. This is a lot larger than some of the petty squabbles we get into about climate change and resource efficiency.

The [Natural Resources Defense Council] started the Green Sports Alliance way back when, and that's still going strong. They're just saying, "How can we green our supply chain? How can we get the 25,000 people in the arena to understand that recycling is very important and [get them] to take public transportation?" These are great platforms for people to start thinking about these things on a daily basis.

At a practical level, sports have an enormous carbon footprint, so when you start cleaning it up, it makes a real difference in absolute terms. To help the NHL, we're partnering with them to put LED lights in some of the 5,000 arenas that are municipal or privately held.

Munsell: What message do you have for clean energy professionals and policymakers?

Richter: Well, for the policymakers, [I'd like to see] more of the same, lots more of the same. The IRA has come out, and it has changed the landscape for technologies that have been proven to be the most efficient heating and cooling options out there.

What we've always talked about is that our competition is not another company that does what we do — it's inertia. An internal combustion engine has served us so well for so long. Fossil fuels have too. The density per unit is amazing. And it's created the society we have. But it's no longer perfectly functional for us. We need to evolve to a better transportation system, a better way to heat and cool and light our buildings.

When you think about a place like New York City, 80% of the buildings are still going to be there in 20–30 years. We're not blowing these buildings up and making all LEED-standard buildings out of what once was there. The Empire State Building will stay. But we're going to have to gut that building and put in cutting-edge [efficient] technology so we're not staying on fossil fuels for the next half-century.

Somebody's going to have to do that, and that inertia has to be broken through. The Inflation Reduction Act has been so helpful — for New York state in particular — in getting these nascent technologies to be able to compete financially with the legacy fossil fuels. Right now, there are still tax breaks for the fossil fuel industry. There are still enormous subsidies that thankfully lower the cost of fuel per gallon so it's affordable for everybody. But it also pushes out these new technologies that are trying to come in and compete. So, when we can start to change the tax landscape, it makes a huge difference. So, I just say more of the same. It's going to take government. It's going to take the free markets. And it's going to take everyday people making these changes.

Munsell: What geographic markets are you active in?

Richter: We work primarily on the East Coast, but we will go anywhere to do the projects that are of scale. When you think about the East Coast and the New York tri-state area, there are billions and billions of dollars to put to work right here. We have aging infrastructure. We have high energy costs; we have enormous demand. So, the table's set for upgrading our old system. And if you've been in a passive house, a highly insulated building — it's a healthier place to live. It's more comfortable. It's better lit. And it costs less to run.

These are not sacrifices we're making. They're evolution. And I would really encourage us to think more in those terms. How can we make our buildings better, or our schools? We spend more than half a day inside buildings. If they're not healthy and they're not well lit, we can't expect the people inside to perform to their capabilities.

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Mike Munsell is the director of growth at Canary Media. ♻

Music for Sustainability

Cont'd from p.20

Kogan works with about twenty musicians currently and says that has created the opportunity for hundreds of conversations with music venues. Just raising the issues and being able to say that musicians and the public want solutions, helps get the issues on the minds of the people who manage music events. Kogan, a musician himself, has even held his own music festival, Imagine Zero, as proof of concept. When he works with venues, he helps them identify and contact companies that offer systems that can make the transition to a trash-free event seamless.

One favorite is Cup Zero, a company in New York that offers a turnkey system that includes logistics, delivery of cups, collection points, signage, washing, sanitizing, and storage. They serve stadiums, venues, festivals, offices, cafeterias, and schools. Within metropolitan New York, Cup Zero uses a deposit system for to-go cups with an app for locating collection points.

Kogan points out that it's important to develop systems for venues. They have a system now, they know how it works and what it costs, and though it has significant downsides in terms of waste and greenhouse gas emissions, it's what they know. To help people make the leap, it takes someone like him to guide them through the steps and find the sources. Energy can be simpler. Kogan says he is always looking for solar and electric vehicle charger providers to partner with.

The 39-year-old says he came to this role by looking at a Febreze bottle and wondering if the vaguely eco-friendly leaf symbol on it actually meant anything. It must, because corporations knew that was what people wanted and would do it, right? His wife persuaded him to read Naomi Klein's book, *This Changes Everything*. Then he happened on a talk by Judith Enck of Beyond Plastics. Already an environmentalist, involved with 350.org, the Sierra Club, and the Sunshine Movement, he had some energy to put toward something and was inspired to target single-use plastic.

Another major project of Reusable Solutions is the Vermont Can Carrier Reuse Program, in partnership with Eco Friendly Beer Drinker. Customers bring their can carriers—plastic four-pack and six-pack holders--back to a participating brewery or retailer, which either reuses them or donates them to another brewery to reuse. The pilot program started in November 2021 with ten breweries and rescued over 10,000 carriers in a two- month period. As of January 2023, they had over 60 collection locations throughout Vermont and are collecting over 10,000 cans a month. Only around 1% of the carriers are broken. They are durable enough for many reuses, yet small and thin enough to create big problems at recycling centers, where they are often mistaken for paper and clog equipment. At that point they are usually pulled out of the waste stream and sent to the landfill.

Enter "The Reusiverse," Kogan's name for his reuse/recycle system. The program has been extremely popular with Vermont's craft beer consumers. "It's been great to see these can carriers, which most people thought were easily recyclable (a result of the manufacturer's disingenuous marketing claims) kept out of the waste stream," said Mel Allen, host of The Boozebuddy Update.

The Imagine Zero festival uses Cup Zero to help make this a trash-free event. Cup Zero offers a turnkey system that includes logistics, delivery of cups, collection points, signage, washing, sanitizing, and storage. (Ben Kogan)

Two breweries, Black Flannel Brewing in Essex Junction, and Colchester's Green Empire Brewing, have not needed to purchase new packaging since the program began and have rescued well over 25,000 carriers from the landfill. The distributor Beer Shepherd has been an important partner in helping this initiative take hold, picking up carriers and delivering them to participating breweries. If you are an eco-friendly beer drinker, got to www.ecofriendlybeer.com for can carrier recycling maps for Vermont, Massachusetts, and Rhode Island.

The Reusiverse inspired some other uses as well. Hikers, snow shoers and cross-country skiers can expect to see color-coordinated beer carriers acting as trail markers at golf courses or on trails, replacing the plastic tape that was always fraying and disappearing into the environment. This is a durable reuse of the small number of carriers that can't be used to carry beer anymore.

Behind Kogan's projects are many friendly partners, enjoying beer, listening to music, and taking responsibility. It does take a village to accomplish almost anything important, but there's no reason that village can't have a good time doing it.

Jessie Haas lives in a 450 sq. ft. off-grid cabin with husband Michael J. Daley. She's the author of 41 books, including The Hungry Place.

Sources info availables online. ♻

The Imagine Zero music festival attracted 650 people and resulted in garbage totaling less than half a garbage barrel. (Ben Kogan)

System M Makes Energy-Efficiency Work for Wichita Business

John Vastyan

There's a 68-year-old home in suburban Wichita, KS that's a lot younger than it looks. The mid-60s, mostly-brick ranch home began to be an eyesore in the neighborhood. That is, until one of the city's visionaries had an inspiration.

TRU-Building's new headquarters incorporated energy efficiency through the installation of a Taco System M heat pump system seen below. (Courtesy photo)

Certified Passive House Consultant and builder, Jeff Jones – president and owner TRU-Building, Inc. (TRU), based in Wichita – is one of the Midwest's leading energy efficiency- and sustainability-focused construction experts. The portfolio of energy efficient homes confirms the innovative passion he and his team embrace.

TRU-Building needed a new headquarters for the growing team to call home. Jones had already acquired a property and completed architectural planning to build a facility when the old home and property, just half a mile from their existing building, came to his attention.

Jones learned that the old home down the road had been vacant for almost a decade. Yet, he saw that it was an ideal opportunity to showcase the capabilities of his firm. It offered great potential as the ultimate expression of sustainability.

The six-month renovation began in August 2022, resulting in an all-new appearance and expansion from 2,700 square feet of residential space to 3,200 square feet now repurposed for commercial use.

The biggest surprise of all came a few weeks later when Jones took a call from a friend and business colleague, Jeremy Hobbs, branch manager of the manufacturer's rep firm, J. M. O'Conner, with offices in Wichita and Kansas City. Hobbs and his team were attending a presentation by Taco Comfort Solutions. He spoke about Taco's latest technology, System M, an innovative air-to-water heat pump system that provides comfortable, efficient heating, cooling, and domestic hot water. "It's a fully-packaged system that's super easy to install, and over 400 percent efficient," explained Brice Walsten, O'Connor's outside sales engineer.

Before the call ended, Jones agreed that the appliance would be perfect for the new building as he could see how System M could be a focal point to showcase TRU-Building's emphasis on energy efficiency, sustainability and electrification.

How it Happened

"We gladly walk the walk to demonstrate what we mean by our actions, rather than by what we say," he quipped.

The renovations at 101 N. Ridge Road, Wichita are now complete and Taco's System M has since fulfilled its expectations, too. "We're well into our first year of super-efficient comfort," said Jones. "The staff loves our new home; we couldn't be more pleased with every aspect of the new facility – from its higher-

Cont'd on p.30

Many thanks to our sponsor:

ENERGY CATALYST

America's First 'Enhanced' Geothermal Plant is Operational

Next-generation geothermal could be a huge source of carbon-free power. A first-of-a-kind project from Google and Fervo Energy is a step in that direction.

Maria Gallucci

A next-generation geothermal plant backed by Google has started sending carbon-free electricity to the grid in Nevada, where the tech company operates some of its massive data centers.

On November 28, Google and geothermal developer *Fervo Energy* said that electrons began flowing from the first-of-a-kind facility earlier this month. The 3.5-megawatt project, called Project Red, is now supplying power directly to the Las Vegas–based utility *NV Energy*.

The announcement comes more than two years after Google and Fervo *signed a corporate agreement* to develop the "enhanced geothermal" plant. Unlike conventional geothermal plants, which tap into heat found close to the earth's surface, Houston-based Fervo uses advanced drilling techniques to access resources that are deeper or trickier to reach than hot springs or geysers.

Fervo Energy's 3.5-megawatt enhanced geothermal plant in Nevada. (Google/Fervo)

The pilot project's completion is a meaningful step in the growing global effort to harness the earth's heat.

In the United States, geothermal energy supplies only about 3,700 megawatts (3.7 gigawatts) of electricity, or *0.4%* of total U.S. electricity generation last year. But according to the U.S. Department of Energy, geothermal could provide potentially *90GW* of firm and flexible power to America's grid by 2050 — assuming that enhanced systems like Fervo's catch on as a widespread renewable energy option.

Fervo's project has a relatively small capacity: enough to power roughly 2,600 U.S. homes at once. Still, that's more electricity than any of the world's 40-some enhanced geothermal systems have previously achieved, according to the company.

Google said it *inked the agreement* in May 2021 as part of a larger strategy to reduce its reliance on fossil fuels. The prior year, the search-engine giant set a target of operating all of its power-hungry data centers and office campuses worldwide on "*24/7 carbon-free energy*" by 2030, a *goal* that requires not just purchasing renewable power but also accelerating the development of innovative energy technologies.

"When we began our partnership with Fervo, we knew that a first-of-a-kind project like this would require a wide range of technical and operational innovations," Michael Terrell, Google's senior director of energy and climate, wrote in a *November 28 blog post*.

"The result is a geothermal plant that can produce round-the-clock [carbon-free energy] using less land than other clean energy sources," he said, adding that Google "worked closely with Fervo to overcome obstacles and prove that this technology can work."

Google declined to share financial details about its agreement with Fervo or the cost of the electricity that Project Red is producing.

Drilling deep for clean energy

Geothermal resources are available virtually everywhere underground, representing a potentially vast supply of clean electricity and industrial heat. Yet most of those resources are too deep or technically complicated to reach cost-effectively using traditional methods.

Fervo, which has raised more than $180 million since 2017, is among *dozens of companies* in the U.S. and worldwide that are striving to develop easier and cheaper ways of unleashing this geothermal potential.

The startup uses horizontal drilling techniques and fiber-optic sensing tools gleaned from the oil and gas industry. Technicians create fractures in hard, impermeable rocks found far below the earth's surface, then pump the fractures full of water and working fluids. The super-hot rocks heat those liquids, eventually producing steam that drives electric turbines. The idea is to create geothermal reservoirs in places where naturally occurring resources aren't available.

In recent years, enhanced geothermal projects in a handful of other countries were shut down after triggering earthquakes and rattling surrounding cities. Since then, companies have stepped up efforts to monitor and mitigate induced seismicity. Fervo said it had adopted a protocol developed by DOE to avoid causing seismic events at its project sites.

The startup first began drilling in Humboldt County, Nevada in early 2022. Project Red was initially anticipated to be a 5-megawatt facility that would come online last year.

At the geothermal site, two wells reach 7,700 feet deep and then connect with horizontal conduits stretching some 3,250 feet long. Fervo's team flows fluid into the project's artificial reservoir, where the liquid can reach temperatures of up to 376 degrees Fahrenheit. In July, Fervo *announced that it successfully completed* a full-scale well test in Nevada that confirmed the commercial viability of its next-generation technology.

Roughly four months later, its first power plant is officially up and running.

"We did what we set out to do," Sarah Jewett, Fervo's vice president of strategy, said in an email to Canary Media.

Through the agreement with Google, "We proved our drilling technology, established Project Red as the most produced enhanced geothermal system in history, and delivered carbon-free electrons to the grid at a time when competing clean, firm energy developers have struggled to execute their projects," she said.

To boost America's geothermal capacity, the DOE has set a goal of slashing the cost of power from enhanced

Cont'd on p.31

GEOTHERMAL HVAC: IRA OPPORTUNITIES
AND THE GEO ECONOMICS CALCULATOR TOOL

Joe Parsons

The Inflation Reduction Act (IRA) of 2022 is a monumental step toward a sustainable future in the United States. Emphasizing the adoption of green technologies, particularly geothermal heat pump (GHP) systems, this legislation includes initiatives that will likely mark a pivotal shift in the nation's energy landscape. Joe Parsons, senior marketing sustainability manager at ClimateMaster and a prominent figure in renewable energy, highlights that the IRA goes beyond incentivizing eco-friendly choices; it aims to revolutionize our energy paradigm.

Geothermal Heat Pump Technology: A Nationwide Game Changer

GHP systems tap into the Earth's stable temperatures to provide efficient heating, cooling and hot water. Unlike some renewables limited by geography, GHPs boast a unique advantage—they're implementable across all 50 states. This ubiquity positions them as a universal solution in the pursuit of energy efficiency and sustainability.

Economic Incentives Driving Change

The IRA introduces compelling economic incentives to facilitate the adoption of GHP systems, particularly in commercial projects. Key among these incentives are tax credits covering 30% to 50% of the project's cost basis. This substantial financial support underscores the government's commitment to reducing greenhouse gas emissions and promoting energy-efficient technologies.

Explaining the Tax Incentives and Bonuses

The IRA outlines criteria for maximizing tax credits, establishing a base Investment Tax Credit (ITC) rate of 6% that can be boosted through additional bonuses.

Projects utilizing domestically produced components can secure an extra 2% to 10% in credits. Moreover, areas impacted by the decline of traditional energy industries or with high unemployment rates are eligible for added incentives

These incentives are designed not just to promote GHP adoption but also to support local economies, especially those transitioning from traditional energy industries. By incentivizing projects in these areas, the IRA effectively marries environmental goals with economic revitalization.

Rebates for Non-taxable Entities

An often-overlooked provision in the IRA caters to non-taxable entities like schools, nonprofits and government organizations, offering them rebates equivalent to the tax credits. This inclusivity ensures a broader spectrum of society can participate in and benefit from the transition to greener technologies.

Non-taxable entities can learn more about these rebates and elective pay at bit.ly/NonTaxElective.

The Geo Economics Calculator: Empowering Decision-Making

ClimateMaster's innovative tool, the Geo Economics Calculator, simplifies the transition to geothermal energy. By inputting project specifics, users can estimate costs, savings and return on investment for GHP installations. This platform, factoring in available IRA tax credits and rebates, supports informed decision-making for businesses and organizations exploring geothermal HVAC systems - and proves green energy adoption is more accessible than ever.

This approach by ClimateMaster not only provides valuable insights but also underscores the feasibility and practicality of adopting geothermal solutions in diverse settings.

The Economic Argument: Beyond Environmental Benefits

Comparisons between more conventional HVAC systems and GHPs showcase the long-term financial advantages of geothermal alternatives. While a geothermal system's initial cost might be higher, the IRA's tax rebate significantly offsets this, leading to substantial savings over time. For example, a traditional HVAC system might cost around $510,000, whereas a geothermal alternative would be closer to $740,000. Thanks to current IRA incentives, the incremental cost difference can be offset in the first year.

Realizing Success Stories

Real-world projects across various sectors, from office buildings and schools to community centers and museums, along with small buildings to large industrial applications and everything in between, underscore the versatility and scalability of GHP systems. These success stories affirm the practicality and benefits of geothermal technology in diverse applications.

Conclusion: A Call to Action

The Inflation Reduction Act of 2022 shifts us toward a greener, more sustainable future, and its emphasis on geothermal technology highlights vast potential. With clear economic incentives outlined in the IRA, the time is ripe for businesses, organizations and communities to invest in geothermal HVAC systems.

Standing at this environmental crossroads, we have the tools for change at our disposal. The rewards, both environmental and economic, are within reach. It's time to harness the Earth's power and pave the way for a sustainable tomorrow.

Learn how to make the Inflation Reduction Act work for you at Climatemaster's web page on Commercial Tax Credits and download the Guide to Residential Geothermal Heat Pump Tax Incentives or the Guide to Commercial Geothermal Heat Pump Tax Incentives for more information specific to your needs.

Joe Parsons, a senior marketing sustainability manager at ClimateMaster, with 40 years of experience in the commercial HVAC industry, has a special focus on renewable energy and geothermal heat pumpsand in advancing the geothermal industry, particularly in the context of the IRA. ♻

Geothermal Expands in New York's Capital Region

Albany-Based Company, Energy Catalyst, Awarded $5 Million DOE Grant to Expand Geothermal Heat Pump Manufacturing Facility

Energy Catalyst, a leading innovator in geothermal heat pump technology headquartered in Albany, New York, has been granted a significant boost in its mission to revolutionize clean energy solutions. On November 17, U.S. Secretary of Energy Jennifer Granholm and White House National Climate Advisor Ali Zaidi proudly announced the selection of Energy Catalyst and their co-applicant Hydro-Temp as one of the recipients of the Department of Energy's highly competitive Defense Production Act program aimed at bolstering U.S. Heat Pump manufacturing.

Matt Desmarais of Energy Catalyst Technologies

Energy Catalyst, in collaboration with Hydro-Temp Inc, based in Pocahontas, AR, secured over $10 million in funding, marking a pivotal moment in advancing sustainable energy solutions across North America. Among the eight awardees, this unique partnership stands out for its commitment to innovation and meeting the escalating demand for eco-friendly heating solutions.

At the core of this endeavor lies Energy Catalyst's groundbreaking technology—an Energy Star certified ground source heat pump that uniquely repurposes existing heating infrastructures in homes utilizing baseboard or radiators. With the Department of Energy's investment of over $5 million, Energy Catalyst is poised to construct and expand its manufacturing capabilities within the Capital Region of New York.

Founder and visionary behind Energy Catalyst, Matt Desmarais, expressed his excitement. "Today marks a tremendous milestone for our grassroots company, born from a simple science experiment in my basement. This support propels us towards our goal of reducing geothermal heating costs through pioneering technological advancements, while simultaneously elevating heat pump efficiency to unprecedented levels. Our mission aligns with the nation's clean energy objectives, and this grant fuels our commitment to that cause."

The ambitious expansion plan entails the development of a state-of-the-art facility covering approximately 25,000 square feet. This facility will house cutting-edge automated manufacturing equipment, a high-precision testing laboratory, and an extensive contractor training space. Energy Catalyst is set to establish an IGSHPA-certified training program, aiming to educate and empower disadvantaged youth, MBE/WBE/veteran contractors, and professionals in diverse geothermal topics. This initiative not only addresses the burgeoning demand for clean energy experts in New York State but also champions inclusivity within the industry.

Moreover, Energy Catalyst anticipates the creation of up to 50 employment opportunities over the next five years, fortifying the region's workforce while contributing to the local economy.

Read *G.E.T.'s* past coverage of Energy Catalyst in the December 2022 issue at https://bit.ly/GET-ECT-12-22 and the June 2022 issue at https://bit.ly/GET-ECT-6-22. ♻

Local Bite the Frost Efficient Building Design Business Updates

George Harvey

Bite the Frost (BTF) is a small architectural and mechanical HVAC design firm that specializes in space, energy, and resource-efficient homes. It was the subject of an earlier *Green Energy Times* article, "*Bite the Frost and Go for Net-Zero Energy House Plans*," in August, 2021.

BTF is a small company, but in the world of architectural and mechanical HVAC design, it has a presence. BTF has become known by residential contractors and builders across the country for its ability to combine both architectural and mechanical HVAC designs into one seamless package.

Founder Gwendolen St. Sauveur gave us some thoughts about how the company fared in 2023. This has been a remarkable year for BTF, leaving it with a sense of accomplishment. Working with innovation and sustainability is a delicate balancing act, and this act has required constant attention to trends in today's residential architecture.

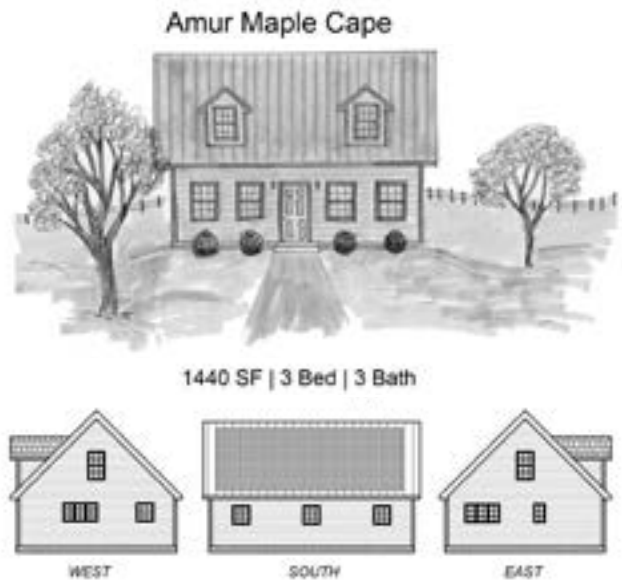
BTF was awarded the Women Owned Sustainability Grant from Womens Net. This was a testament to BTF's dedication to its mission. The grant empowers women entrepreneurs, and it was awarded based on BTF's commitment to sustainability, with efforts to make a positive impact in the industry.

The year, BTF achieved compliance with California Title 24 design standards. This means the company can offer stock plans that are ready for construction in California. This required adaptability to meet the varied needs of clients. One of BTFs many custom designs, currently being built in the high mountains of California, is expected to be added to their Stock Plan collection soon. BTF is also getting set to introduce a carriage house/apartment over a garage plan, further expanding its offerings.

Also in 2023, BTF became a DOE Zero Energy Ready Home partner, a significant milestone. This required the company to surpass industry benchmarks and emphasizes its environmentally conscious building practices. Coupled with the Section 45L Tax Credit for Energy Efficient New Homes, it highlights BTF's work to make sustainable living economically viable.

This custom design is under construction, being built in the high mountains of California. BTF intends to add this design to its stock plan collection in the coming months. (Courtesy of BTF)

BTF's belief in collaborative partnerships led it into working with Habitat for Humanity, showing how working together can create lasting, positive change. Breaking ground on BTF's first Habitat Home illustrates a commitment to fast, easy, and cost-effective net zero designs. This initiative goes beyond building homes; it's about building hope and contributing to our communities.



The modest 1440 SF Amur Maple home design is one of many BTF net-zero stock plans available on their website. (Courtesy of BTF)

Community outreach is part of BTF's ethos, going beyond construction to contribute to the well-being of the communities where operates. BTF presented an educational workshop at Efficiency Vermont's Better Buildings by Design conference, which focused on teaching manual J energy models to builders and architects. BTF plans build on this to extend its educational initiatives with conference trainings across New England in 2024.

BTF now offers on-site septic wastewater design services for Vermont. Also, it offers RESNET HERS rating services, including EnergyStar single-family and multifamily certifications, as well as blower door tests. These expansions allow BTF to provide a broad suite of services for its clients in Vermont and the rest of New England.

The world is increasingly adopting net-zero construction, and BTF hopes to lead that movement. It may be the first firm in the U.S. to offer true stock net zero home designs. This Integrated Stock Net Zero approach sets BTF apart. Each plan has a pre-determined North and includes HVAC systems, PV solar arrays, and net-zero elements in its architectural drawings. BTF can design for fossil fuel-free HVAC systems, ensuring carbon-free living.

Echoing the charm of historical classics like capes and colonials, most BTF plans adapt traditional aesthetics for sustainability. This is shown in its Net Zero Plan Book. Designed for flexibility and ease of construction, BTF plans cater to a wide range of sites across 35 states, from North Carolina to Alaska. The plans use common building materials and construction methods, allowing contractors the flexibility to work with preferred materials while meeting design R-values. BTF homes under construction nationwide are a mix of our designed stock homes with client-specific alterations.

BTF is proud to play any role in families' transitions to more sustainable and cost-effective lifestyles. Sustainable homes are not just structures; they are the foundations for sustainable living. Homes are where we grow, love, relax, and make the decisions that shape our lives. BTF believes they are our greatest assets.

The BTF Net Zero Designs website is www.netzerohomeplans.com. ♻

Health, Wellness, and High-Performance Building

Karla Butterfield

MAKING A BUSINESS CASE

Today's homeowner knows more about carbon reduction, energy efficiency, and good indoor air quality than ever before. The New Home Trends Institute by John Burns Real Estate Consulting, LLC surveyed 1,263 homeowners and single-family renters age 18+ with household income of $50,000+ and published some interesting findings. The general lesson is a trend where health and well-being is valued and an acknowledgement that the home building industry has a responsibility to its customers and the environment.

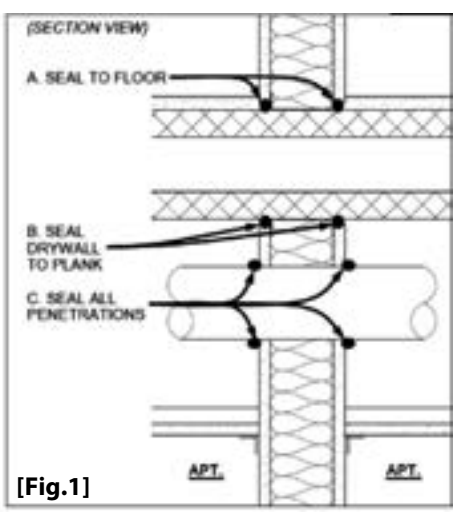
Half of those surveyed believe the industry has a somewhat, or very negative impact on the environment. Changing that perception will take creating high-performing, healthy buildings, while lowering carbon emissions.

HOW TO MAKE IT HAPPEN

In most cases, the building code sets the bar for builders. And while we may think advancements have been slow, the 2021 International Energy Conservation Code (IECC) made significant progress with reducing carbon emissions. A Pacific Northwest Laboratory (PNNL) study determined that the 2021 IECC represents 9.4% site energy savings improvement and 8.7% carbon emission reductions for residential buildings relative to the 2018 IECC. The problem is that states can be slow to adopt progressive codes. Or, like the 2022 Connecticut State Building Code, the 2021 IECC was adopted but then amended to be less rigorous. However, all that may be changing due to the State and Community Energy Program (SCEP) funding from the Inflation Reduction Act (IRA) where states will receive grants for implementing the 2021 IECC or other codes with equivalent or greater energy savings. Some states are already there. Massachusetts, for instance, adopted an unamended 2021 IECC as the baseline, and a more rigorous Stretch code is mandatory if designated as a Green Community under the Green Communities Act. Taking an even bigger step, Massachusetts communities opting into the specialized code require Passive House or equivalent for all new construction **[See figure 1].**

Beyond energy savings, what's in the 2021 IECC that addresses health and wellness? For one thing, air infiltration testing is a requirement, regardless of building size or type. Mechanical ventilation is also required. This means fresh air coming into and leaving our buildings is quantified and controlled.

DEMISING/CORRIDOR WALL PENETRATIONS



[Fig.1]

Notes: A,B,C. Intent: reduce leakage between the wall cavities and the apartment
C. Includes ducts, pipes, wires, etc.
Responsibilities: Drywall: A, B
Mech/Elec/Plumb: C

BUILDING BEST PRACTICES

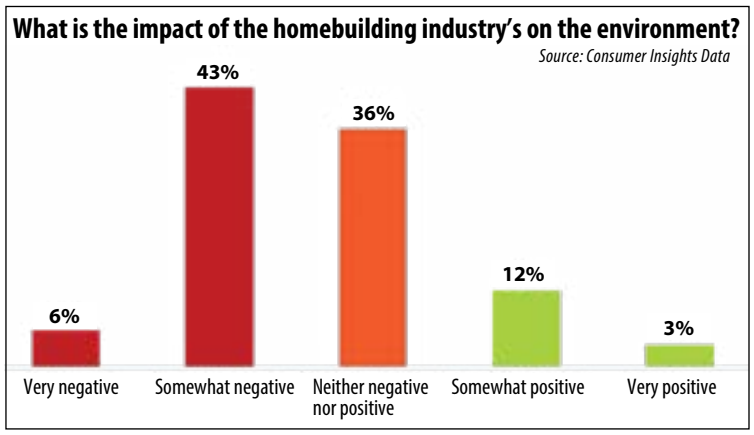
Design and build professionals who previously embraced volunteer programs such as ENERGY STAR, LEED, NGBS, and Passive House find themselves ahead of the code curve. But how does the rest of the industry get there? Step 1: Install a continuous air barrier that aligns with the thermal barrier (insulation). And pay attention to air sealing, including compartmentalization in multifamily buildings (i.e., unit to unit, unit to corridor, etc.). Engage the energy rater early and perform preliminary testing to inform where air sealing needs to improve before things are closed-up. Step 2: After choosing high-efficiency heating and cooling (HAC) equipment, focus on the delivery system. If ducted, keep the runs simple, short, and fully duct the return side to the air hander.

Squeezing a heat pump into a ceiling cavity (top) almost always leads to construction sequencing issues and poor installation. A heat pump without a ducted return allows dust and debris into the system. (Courtesy photo)

Squeezing a heat pump into a ceiling cavity almost always leads to construction sequencing issues and poor installation. For example, the return duct to the heat pump shown in the graphic was designed to be fully ducted. Return air should pass through the return grill and filter then directly to the equipment. Unfortunately, that didn't happen here. Drywall was completed before the mechanical rough-in was done so by the time the installer tried to finish the sheet metal return, the space was too tight. Instead of a nice clean return duct, the air path is through a cavity full of dust and debris. Installing non-ducted HAC systems is one way to avoid these issues. However, some options, such as mini-splits lack good filtration. 10% of consumers from the New Home Trends Institute survey were familiar with the term "MERV" (Minimum Efficiency Reporting Value). As industry professionals, we've been screaming "MERV 13" for years. Which seemed to fall on deaf ears until we found ourselves in a post-COVID world. Now homeowners are savvy enough to ask for efficient, healthful homes with good MERV filters!

SUSTAINABILITY LINKED LOANS

Homeowners and renters aren't the only ones asking for lower carbon buildings. Sustainability-linked loans are the fastest-growing component of Environmental Social Governance (ESG) debt. Bloomberg Financial tracked a five time increase in ESG loans from 2020 to 2021 a steadily increasing pace for 2022. To meet ESG reporting requirements, investors are asking for third-party certified buildings. And it's not just European investors, both Fannie Mae and Freddie Mac have "green" loan programs. Again, the design and build professionals who embraced these volunteer programs early-on, find themselves ahead of the curve. But how can any project team take advantage of these programs and satisfy ESG objectives? Step 1) pursue a third-party certification or labeling program and Step 2) pay attention to both operational and embodied carbon emissions. When a building is in use, it produces Green House Gas (GHG) emissions. The more efficient the building, the less energy it uses, the fewer operational emissions it produces. Embodied carbon emissions come for the stage before and after the building is in use. These emissions are from the extraction, transportation, and manufacturing of the materials that go into the building. As well as the end of its useful life, where demolition and waste are accounted for. While there are many modeling tools that will predict the embodied carbon in our choices, we can also choose to limit or avoid the "heavy hitters" such as, concrete, aluminum and steel, poly-based insulation, glass, and hydrofluoro-based refrigerants.



MARKETING, USE, POST-SALE

The New Home Trends Institute survey also concluded that while most homeowners and renters want more efficient, healthier homes, they want a three-year rate of return! Opportunities to reduce costs can include utility rebates, state incentives, and the IRA 45L tax credits ($5,000 for achieving Zero Energy Ready Homes). Once the home or building is complete, there are a few more steps to help ensure the systems are working as designed and the homeowner (or occupant) is comfortable: 1) register all equipment with the manufacturer to secure and extend manufacturer warranties, 2) provide the homeowner an educational session, 3) provide a "one box" service to annually deliver every filter the home needs and, 4) visit the home twice a year to inspect and service things. As design and build professionals, we know the steps to create the sustainable, efficient, healthful homes the consumer is demanding.

Karla Butterfield is Sustainability Director of Steven Winter Associates, Inc. ♻

Clearing Up the Gray Areas

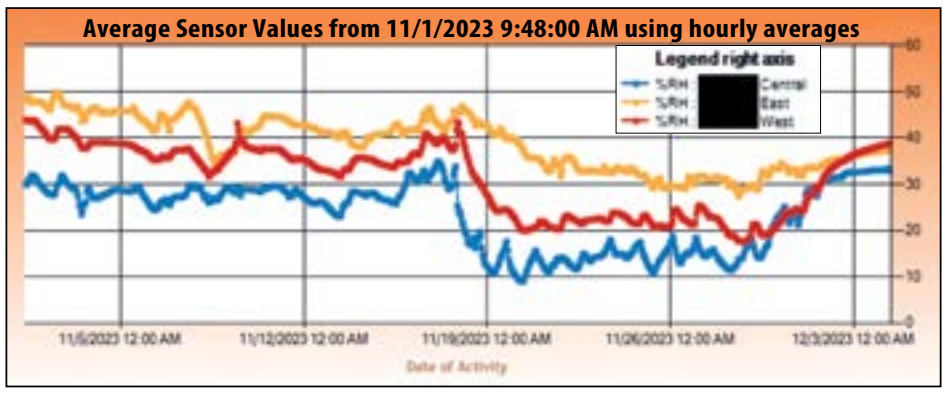
How Envelope Remote Conditions Monitoring (ERCM) can influence modern building practices

Nate Gusakov

A large part of modern high-performance building design and practice is driven by hypothetical scenarios. We design our heating loads based on the assumed 15 or 20 coldest nights of a theoretical year for a given location; we insulate at least four feet below ground level for when the soil freezes that deep, having no idea what percentage of the time it actually does; we run ourselves through all sorts of mental and physical contortions (vapor barrier locations and types, interior-exterior insulation ratios, double stud walls, etc.) to avoid thermal bridging and condensation in the building assembly.

Let's explain that last one a little more: At the highest level of building design we use advanced hygrothermal analysis modeling programs like WUFI or DELPHIN to predict how heat and moisture will flow through and around a certain building assembly or component (for more on these, check out: https://journals.sagepub.com/doi/full/10.1177/1744259120988760). The programs are very specialized, very complex, and take a lot of time and expertise to model even a relatively small detail. As a result, much of modern building practice (and even state codes) uses rules of thumb like 'a 1200 ft2 home needs two tons of heating capacity', or 'you need 60% of your total roof insulation on top of the sheathing plane', or 'wall assemblies must achieve R-20 cavity insulation plus R-11 continuous.' Each of these might be excellent advice or guideline in certain specific situations, but with the huge variation in individual building designs, location microclimates, occupational uses etc., there is bound to be a lot of gray area in the real world.

Especially in renovations (which are SO important – 80% of the building stock that we'll be using in 50 years is already standing, so we had better take care of what we got!), there are often decisions made about building assemblies that fall squarely in a gray area from a building science perspective. With building code also being less clear and stringent about renovation requirements, I have seen budget or sequencing concerns steer decisions away from 'building science best practice' to 'building science bare minimum' many times. Assessing condensation potential and risk is one of the most troublesome parts of defining 'building science bare minimum.' For large commercial projects, advanced modeling may be used at significant expense, and everyone will hope that the models got it right. For small commercial or residential projects, we are usually back to rules of thumb and gray areas. Fortunately, there is technology available that has the capacity to push our understanding forward by leaps and bounds in the next ten years. I will borrow a phrase already used by manufacturing and industry, and call it Envelope Remote Conditions Monitoring, or ERCM.



A sample graph of results from an Envelope Remote Conditions Monitoring system (photo: www.OmniSense.com)

ERCM consists of placing small self-contained sensors in various locations of the building assembly. Each sensor is a little box that screws into any component of the building, usually into wood framing or plywood sheathing. The basic sensors that I am using (made by OmniSense, www.omnisense.com) will measure temperature, relative humidity (RH), absolute humidity, dew point, and wood moisture equivalent (WME, via the installing screws). By way of the magic of Wi-Fi and small battery technology, these little buggers will send data for all of the above parameters for about 15 years to a central hub located somewhere in the building, and that hub will then send it to whoever wants to monitor the data online. 'Alarm' email notification thresholds can be set for each of the parameters, and all of the data is searchable for any given time period. What does all of this mean from a practical perspective? A recent installation offers a good example: A local residential renovation that I am consulting for ran into budget and design constraints. As a result, there are portions of an un-vented roof assembly receiving an over-roof with exterior insulation, but not enough to achieve a 60/40 ratio. This section of roof is squarely in the gray area for possible condensation risk. Will it cause a problem? Probably not, but it is hard to tell. The homeowner is completely aware of all the factors involved, and so to help ease everyone's minds I installed remote sensors at the peak of said roof, above both bathrooms and in the center of the house to capture and relay data. The sensors above the bathrooms represent the likely worst-case scenario locations due to the point source of bathroom moisture. The central sensor will serve as a control as it is above the 'dry' living room. I have alarm thresholds set for RH and WME (I'll be notified via email if RH registers above 70% or WME above 15% in any of the locations), and at any point I can log in and look at the graphed results over time. Not only is it fascinating to see the building envelope conditions react to weather and job site events, I will be able to

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System M's Energy-Efficiency

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visibility location and enlarged space, to the coziness and efficiency of the system that now maintains our comfort."

Hearing this from Jones isn't idle talk. He and his staff are immersed in the business as a long-standing partner with the U.S. Department of Energy on the Zero Energy Ready Home program. Jones is also the only Certified Passive House Consultant (CPHC) in the state of Kansas.

The company also holds a position at the leading edge of a growing trend toward the type of ultra-efficient buildings and homes that Jones long ago predicted to be the next, big construction and renovation wave in the Midwest. It's come to pass.

Though headquartered in Wichita, the company also has an office in Muncie, IN. Professionals at both locations focus on higher-end, innovative commercial and residential construction and renovation.

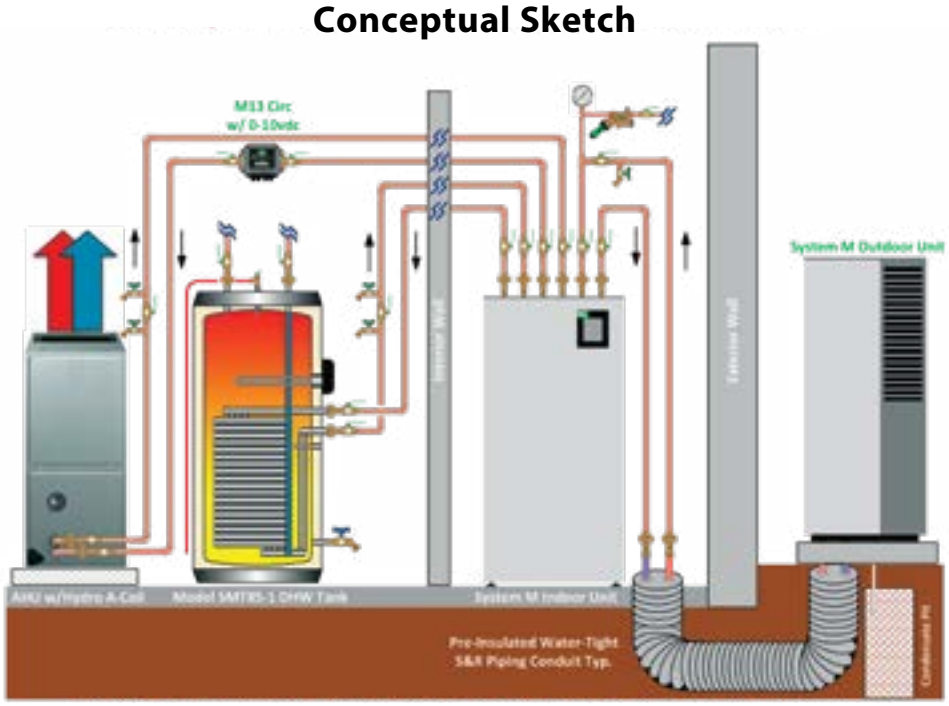
"Our business pros have found that the topic of energy efficiency is a bit like a bell curve," explained TRU-Building Brand Ambassador, Janie Moore. "Initially, people did not have the information to fully understand the additional cost of energy-efficient building. With energy prices continuing to rise, the government and DOE have begun to speak loudly in favor of improving energy efficiency while offering incentives for it.

"Our customers quickly learn the various interconnected facets of every building envelope component – from insulation and windows, to siding and HVAC," she explained.

According to Moore, home and business owners alike are now far more receptive to conversations about energy efficient construction and energy renovations – much like the work TRU-Building did at their own facility.

"Building energy-efficient homes offers a multitude of advantages that extend beyond just lowering energy bills," added Moore. She continued, "Improved insulation, energy-efficient appliances and smart technologies ensure optimal comfort year-round, with stable indoor temperatures and exceptional indoor air quality. Also, energy-efficient homes tend to hold their value better over time while also attracting environmentally-conscious buyers. By embracing these construction practices, homeowners contribute to a more sustainable future while enjoying long-term cost savings and improved living standards."

Conceptual Sketch



** Refer to Taco System M installation and Operating instructions for details, local codes will take precedent*

The crown jewel: System M

Invariably, every tour of TRU-Building's new facility makes a stop in "the cave," the comfortable sitting area located in the lower level. "That's where visitors and prospective customers find a source of real intrigue," explained Dave Trotter, Taco's regional manager of wholesale products.

One of those most intrigued with the System M's capabilities was Chris Highfill, owner of Wichita-based Frederick Plumbing, Heating and Air.

Highfill explained that System M is an ideal solution for home and business owners seeking an exceptionally versatile, high-efficiency hydronic heating and cooling system – with the added benefit of providing domestic water heat.

"Taco's air-to-water heat pump system is a complete, integrated heating, cooling, and domestic hot water solution," agreed J. M. O'Connor's Walsten. "The technology provides up to 44,000 BTUh and 3½ tons of cooling."

"Out of the box, System M is solar PV and smart grid ready," he added. "Water is the most efficient and natural energy transfer medium on the planet. In a nutshell, it's everything most homeowners need for heating and cooling – and it heats domestic water, too."

"There are so many uses for the technology, from radiant heat to low-temp baseboard and panels, to radiant cooling," continued Highfill. "My impression with this first experience with it is that it's built for the long haul, is solid, and has so much going for it in its ability to provide super-high-efficiency comfort."

"System M is an ideal fit for the type of people who're naturally drawn to TRU-Building – and, among them, a high percentage of Net Zero'ers," added Walsten. "They're the early adopters, folks who've devoted their dollars to achieving higher efficiency and sustainability."

"We're very pleased with System M's performance and efficiency," added Jones. "We had a long string of hot days in July, each of them over 100 degrees consecutively. The heat pump's comfort was ideal.

"It helps to protect our bottom line because of its energy efficiency, and we also appreciate that it's a fully-packaged unit – not a bunch of parts and pieces assembled here with the hope of performance," he added.

John Vastyan is CEO of Common Ground, a trade communications firm based in Manheim, PA. ♻

Clearing Up Gray Areas

Cont'd from p.29

alert the homeowner and builder long before any potential issues are present long enough to cause real damage.

For this one project, the information provided by the ERCM system will offer a reduction in worry; peace of mind that possible risks will not create unseen problems in the future. If the data from this one system is added to a growing pool of similar data from other ERCM installations, then we will be talking about real and significant furthering of our building science understanding. Instead of relying on hypothetical modeling to 'see' the behavior of a building assembly over time, we will be able to look at the real thing, clarifying the current gray areas with more and more black-and-white pixels of real-world data.

Nate Gusakov is the founder of Green Mountain Enclosure Consulting, LLC (www.GMECx.com/).♻

VCRD's Climate Catalyst Innovation Fund Supports 25 Local Projects

The Vermont Council on Rural Development (VCRD) announces the awardees for the third competitive round of the Climate Catalyst Innovation Fund. The funding supports projects that make a meaningful, community-scale impact. VCRD received more than $99,000 in requests and was able to fund 25 projects totalling $82,500 to support local climate solutions in Vermont.

In collaboration with generous funders including VLITE, VSECU, the Sunflower Fund, the Vermont Community Foundation Flood Recovery Fund, the Ruth H. Brown Foundation, and the Ben & Jerry's Foundation, VCRD is supporting local innovators in developing solutions that move Vermont closer to its climate and energy goals. Projects are practical and creative efforts that expand community resilience, reduce energy use, and create new approaches to challenging problems. Projects funded this year include a floodplain public food forest, developing frontline emergency preparedness kits, climate economy workforce training, and many more. This year, the Climate Catalyst Innovation Fund grew to $82,500 following the successful first two rounds. An interactive map is available to showcase recipients, location and project descriptions. Project outcomes and photos from the first round are available in the Climate Catalysts Innovation Fund 2021-2022 Report.

"To date, this fund has awarded 68 local innovators with over $200,000 in collective support of community-led climate and energy projects," said Laura Cavin Bailey, the Climate Economy Program Manager of VCRD. "This provides exciting opportunities to launch ideas into action at the community level."

Climate Catalyst Innovation Fund award amounts range from $500 - $4,000, are selected by an outside panel of experts, and are based on demonstrating a mix of innovation, equity, replicability, collaboration, resilience, leverage, and meeting climate and energy goals. VCRD anticipates opening a new round of applications in the fall of 2024.

"ACORN is grateful for the opportunity to continue to develop a Farmer Climate Network in the Champlain Valley," said ACORN's Executive Director Lindsey Berk. "Thanks to VCRD's Climate Catalyst funding, we will be hosting on-farm winter working bees to build a resilient farmer network that is better prepared to mitigate the risks and adapt to the opportunities that a changing climate brings."

2023-2024 Project Recipients & Projects:

- **ACORN** (Addison County Relocalization Network) to create a farmer-led network for climate resilience;
- **Bennington County Window Dressers** to support the county-wide window insert build;
- **Bottomless Well** to build an off-grid retreat center for climate change artists and activists;
- **Catamount Solar** to put a business plan together and secure partners for a Community Solar project;
- **Charlotte Library** to install LED pedestrian crossing signs in the West Village of Charlotte;
- **Community Resilience Organizations** to convene the CROs cohort to debrief the relief phase, build personalized emergency preparedness kits and explore back-up energy solutions;
- **Craftsbury Energy Committee** to support the 2024 WindowDressers Insert Program;
- **Edible Brattleboro** to plant a mini food forest for public access to food and green space in a flood zone;
- **Green Driving America** to provide electric vehicle educational webinars to schools;
- **Northeast Vermont Development Association (NVDA)** to receive free online training in Solar Installation & Design for twenty Northeast Kingdom residents;
- **Old Stone House Museum & Historic Village** in Brownington to plant a publicly accessible 10-stem heritage tree garden featuring fruit, nut and flowering varieties;
- **Orwell Free Library** to replace the fluorescent light fixtures with LED light fixtures;
- **Rich Earth Institute** to develop and build efficiency upgrades to the Rich Earth farm applicato;r
- **Shelburne Climate & Energy Committee** to promote heat pump education and awareness;
- **SolarFest** to build a shed for the new Brandon electric lawn and garden tool lending 'library' with possible solar for charging;
- **St. Albans Free Library** to purchase two E-bikes for the library Loan Program
- **Stone's Throw Farmstead** to build a climate resilient, passive solar greenhouse;
- **Sustainable Woodstock** to promote electric lawn care;
- **The Flower Basket** to educate florists, growers, and foragers to increase the purchase of locally-grown flowers and locally-foraged materials;
- **Town of Stowe Electric Department** to host a design event with high school and college students alongside professional advisors for the restoration of the historic Seaver Sawmill;
- **Vermont Adult Learning (VAL)** to pilot a merged curriculum that will provide linguistically accessible training in weatherization and heat pump installation to English Language Learners;
- **Vermont Community Solar Association** to launch the new Vermont Community Solar Association, a network of supporters and creators with a mission of ensuring that all Vermonters have access to renewable electricity;
- **WheelPad** to partially fund the design of a new product, BathPAD: a small modular accessible bathroom to connect to a home
- **White River Valley Window Dressers** Community Build to support the regional window insert build;
- **Winhall Energy Committee** to install a web-accessible Energy Dashboard which publicly tracks and graphically displays monthly energy use at each of the five municipally owned buildings.

To learn more visit *https://www.vtrural.org/programs/model-communities/innovation* or contact Laura Cavin Bailey at *laura@vtrural.org* or (802) 223-6091 with questions. ♻

'Enhanced' Geothermal

– Cont'd from p.24

geothermal systems to $45 per megawatt-hour by 2035 — a 90 percent drop from today's prices. Fervo currently produces power at a "significantly" higher cost than the DOE's target, Tim Latimer, the company's CEO, told *Utility Dive* in July. Still, he said the startup remains on track to hit $45/MWh in the coming years as it scales its technology.

On that point, Fervo is *already getting started* on a 400-megawatt geothermal power plant in Beaver County, Utah called Cape Station. This summer, Fervo began drilling the first of what will become 100 geothermal wells for the project, which is expected to start delivering 24/7 electricity to the grid in 2026 and reach full-scale production in 2028, Jewett said.

Google, for its part, said it will continue working with Fervo and other companies to accelerate the commercialization of advanced clean energy technologies. In September, the tech giant formed a partnership with *Project InnerSpace*, a nonprofit that aims to expand the use of geothermal energy worldwide. Google said it will lend its data and software capabilities to help develop a tool for mapping and assessing global geothermal resources.

"For geothermal to grow over the coming decades, we need big players with global scale and breakthrough technological solutions focused on this massive clean energy resource beneath us," Jamie Beard, executive director of Project InnerSpace, said in an earlier statement about the Google partnership.

Reprinted with permission from Canary Media's November 28, 2023 blog. The original article can be read at *https://bit.ly/canarymedia_EnhancedGeothermalPlant*.

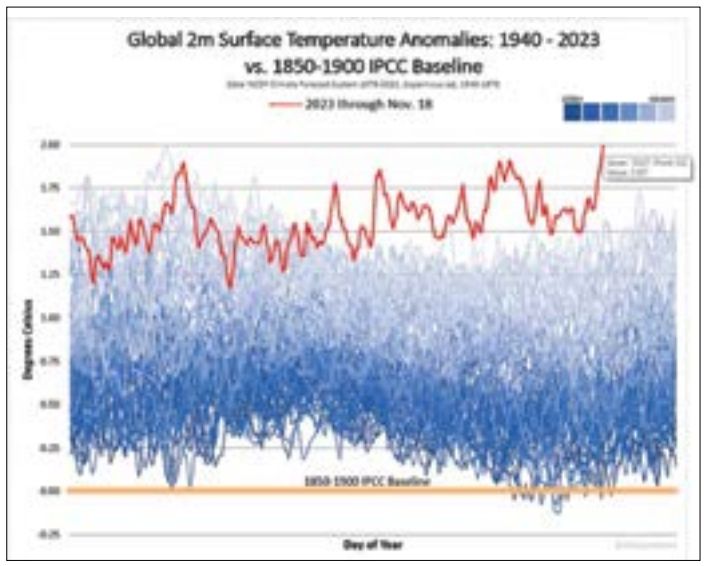
Maria Gallucci is a clean energy reporter at Canary Media*, where she covers hard-to-decarbonize sectors and efforts to make the energy transition more affordable and equitable.*

More images available with the posting of this article on the Green Energy Times *website at www.greenenergytimes.org.* ♻

Take Action to Address the Global Climate Crisis

Peter Dugas

On November 18, 2023, news broke that for the first time in history, the global mean temperature exceeded 2.0 degrees C above baseline levels (UN-IPCC 1850-1990 baseline). Although this peaking temperature was temporary, global average temperatures fell back only to the long-term average increase of about 1.3 C above baseline -- dangerously close to our stated goal to limit warming to 1.5 C globally. That temperature goal seems increasingly unrealistic considering November's other troubling climate news: global greenhouse gas emissions have again reached record levels even as our global leaders convene at this year's UN COP28 in the hope that their action might finally meet the urgent need of our perilous moment.



NOAA Graph: Red line shows earth's rise in temperature in 2023 compared with data since the early 1900's. (NOAA / University of Maine Climate Change Institute).

And yet, one can see reasons for optimism all around us. Readers of *Green Energy Times* are long familiar with efforts to decarbonize our lifestyles, move away from fossil fuels and do what we can to build a sustainable future. As climate advocates, we should be encouraged with each *Green Energy Times* story that would have seemed unrealistic just a few years earlier: electric vehicles, heat pumps, energy efficiency and insulation incentives, sustainable forestry, community composting, generational solar, wind and hydropower booms; we live in a time of unprecedented innovation. How does one reconcile the gulf between these encouraging developments in climate-friendly technologies with the troubling course of global climate indicators?

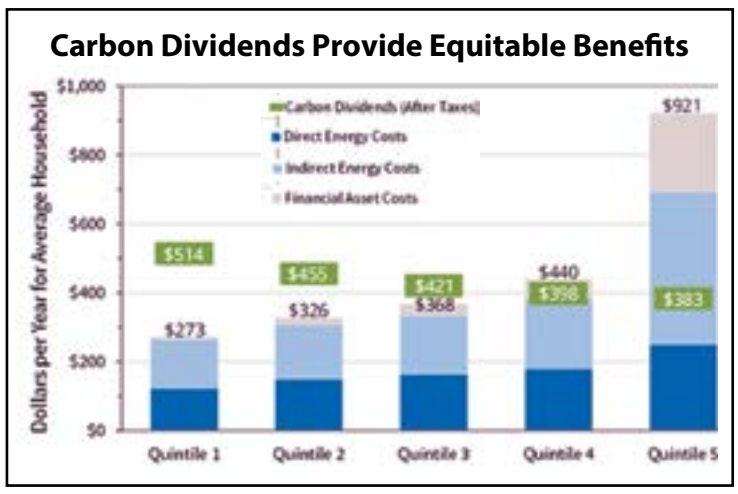
The answer is, with action – action intended to accelerate the transition to clean energy and build a livable world for all.

Yes, the climate crisis requires personal inventory of our energy use and reducing our personal greenhouse gas emissions. But it also requires working to end our complicit reliance an unjust economic system built on fossil fuel energy and the resulting pollution. Ours is an economic system where in the U.S. alone industries are given free rein to pollute our atmosphere with CO2at the rate of one Mount St. Helens' worth of CO2 emissions (520 million pounds), every 18 minutes!

Effective climate action is systemic climate action. We must expand our ambitions to address the systems that perpetuate continued pollution at a time when we need aggressive reductions. Many of us think about our greenhouse gas contribution when we burn fossil fuels directly: gassing up our vehicles, topping off our heating oil or paying our electrical bill. Yet for all of us, greenhouse gas emissions from "embedded" or secondary sources are greater than direct emissions. Embedded emissions are those associated with the countless transactions we all make for the good and services we consume daily with little thought to the long chain linking our transactions with burning fossil fuels: the emissions embedded in the shirt you might buy that was manufactured and shipped from far oversees, the package conveniently delivered to my doorstep, the photo I uploaded to the energy-intensive "cloud" or the mundane cup of coffee. Every transaction will continue to have embedded greenhouse gas emissions – until we "disincentivize" emissions throughout the economy.

In the short term that means renovating our electrical grid for **clean energy transmission** through legislation like the Big Wires Act (S2827/H5551). For the U.S. to achieve the 40% emission reductions promised in last year's Inflation Reduction Act, our electrical grid needs rapid improvements to accommodate the new renewable energy and address the present bottlenecks impeding a transition to renewable energy nationwide. There are great opportunities for bipartisan legislation in this Congress and our national lawmakers can play central roles with enough constituent support. Ask your lawmaker to cosponsor the Big Wires Act today.

But to achieve and exceed the 50% emissions-reduction targets of the UN Climate panel, we must price industrial carbon pollution. In a study of 142 nations over 20 years, in 43 countries *with* carbon pricing, CO2 emissions did not increase *in a single one*, while in the 99 countries *without*, emissions *increased* in more than 80% of them. The UN Climate panel has consistently described carbon pricing as a "necessary condition" for stabilizing the climate.



Comparison of Year 1 household costs from carbon fee with Year 1 carbon dividends. Direct energy is gasoline, electricity, and home heating. Indirect energy is embodied energy in all other purchases. Financial asset costs accrue from carbon costs incurred by businesses and passed back to owners. Carbon dividends are net after personal income tax. (CCL Household Impact Study)

Thankfully, Congress has recently reintroduced the Energy Innovation Carbon Dividend Act (HR5744) which predictably and persistently increases the financial penalty (price) on industrial carbon pollution to force polluters to either decarbonize or lose out to their competition who do. There are now more "carrots" and "sticks" moving the world's largest economy (USA) to price carbon pollution. EU/UK carbon tariffs penalize imports from countries where it is too cheap to pollute (like China with its paltry carbon price of $5/ton) or where free to pollute (like Russia, Saudi Arabia and the only developed nation without a carbon price – the United States). But since the U.S. economy is more carbon efficient than most of our global partners (except the EU and UK where carbon pollution has been subject to pricing for over a decade), U.S. businesses are coming to realize the latent economic benefits to our clean energy economy should the U.S. join the growing majority of nations pricing carbon pollution. The proceeds from industrial carbon pollution pricing, returned monthly to every citizen, financially benefits low- and middle-income earners according to independent economic analysis.

If you want to take effective action to address the global climate crisis, remember that in addition to decarbonizing your personal lifestyle, you have a superpower to effect systemic change. Advocate for effective and equitable climate policy: Contact your lawmakers and ask for cash-back carbon pricing today through cclusa.org/write-cfd. Tell your friends and neighbors to do likewise, because we have both the urgency of a global climate in distress but also the agency to ensure a livable future.

Peter Dugas is the EN-ROADS Climate Ambassador and Citizens' Climate Lobby Maine State Coordinator in Portland, Maine. ♻

Ongoing Flooding of Our Landscape

Dr. Alan K. Betts

My article in the October edition of *Green Energy Times* discussed the takeover of the climate system by Mother Nature to save living species on the planet. I contrasted this with frequent flooding of our landscape to weaken capitalist enterprises that are destroying so much for profit. This is very difficult for us, humanity, to grasp since we are not well-connected to the world of nature. I hope some of you (I will use you to refer to all of us) sat with the natural world till she communicated with you, because then the Creator can help your intuitive understanding and connections. I hope also that some of you studied the four keys for understanding the living Earth in human terms, because we have to face the real world and not remain lost in our destructive past. Transferring this real knowledge to the next generation is critical.

July 2023 flood damage in West Point, NY. (Courtesy image)

The past few months will have shown you all how much our forecasting ability has slipped away into a new world of floods and coastal storms with this different agenda.

Readers in all of New England have had a summer of rainstorms. Parts of northern Vermont had a historic eight to 10 inches of rain on July 9-10 when a large moisture plume came off the warm Atlantic. This caused catastrophic flooding damage as two months' worth of rain fell in two days on already wet ground. Many rivers hit major flood stage, approaching or exceeding the flood level from tropical storm Irene in 2011. This was a helpful reference for Vermonters for both preparation and recovery.

A slow-moving band of thunderstorms on August 3 slowed down over the Middlebury area and dumped more than six inches of rain in three hours, a typical month's worth. This led to flash floods and major road damage to Routes 125 and 116.

A storm stopped over Leominster, MA, northwest of Boston on September 11 for almost five hours, dropping around 10 inches of rain that caused extensive

Cont'd on p. 34

The True Cost of Climate Pollution? 44% of Corporate Profits

Yet governments are still pouring $7 trillion into subsidies for fossil fuels.

Kate Yoder, Grist

What if companies had to pay for the problems their carbon emissions cause? Their profits would plunge, according to new estimates, possibly wiping out trillions in financial gains.

These results, spelled out in a recent study in the journal *Science*, are based on analysis of almost 15,000 publicly-traded companies around the world. To calculate how much each ton of carbon emissions ends up costing society, economists used the Environmental Protection Agency's estimate of $190 per ton.

Air pollution caused by industrial plants in China. (High Contrast - Own work, CC BY 2.0 de, Wikipedia)

For all of those companies combined, the damage would run into the trillions of dollars, Christian Leuz, a coauthor of the study and a business professor at the University of Chicago, told the Associated Press. The researchers only included direct emissions from companies, not "downstream" emissions related to the products they sell. (So emissions from the operations needed to build cars would count; the pollution that comes out of its tailpipe wouldn't.)

They found that the cost of damage surpassed profits for highly polluting industries, including energy, utilities, transportation, and materials manufacturers — a group that accounted for 89 percent of the total. Researchers didn't name any specific companies.

The study arrived during a summer when the costs of climate change are coming clearly into view, as historic flooding, deadly wildfires, and frequent heat waves have rattled the United States. The administrator of the Federal Emergency Management Agency warned last week that the pace of disasters has been so frequent that it's running out of cash. And the economic consequences of climate change go beyond emergency response: Extreme heat is believed to cost the U.S. economy billions in lost productivity every year.

But even as the toll of carbon emissions becomes apparent, governments around the world are pouring more money into support for fossil fuel companies than ever before. Last year, subsidies for oil, coal, and natural gas reached a record high of $7 trillion, according to a report out Thursday from the International Monetary Fund, which works out to $13 million every minute. That's nearly double what the world spends on education and equal to roughly 7 percent of global economic output. Subsidies often come in the form of tax breaks intended to keep people's gas prices and energy bills low, but they come with huge costs, slowing the shift to a cleaner economy.

The economists behind the new study of corporate emissions make the case that forcing companies to disclose their greenhouse gas pollution is a start toward decreasing emissions. Some governments are starting to move toward this approach: The European Union adopted rules earlier this year that will require companies to disclose their emissions, following a similar move by the U.K. government in 2022. It's an approach also being considered by the U.S. Securities and Exchange Commission and California lawmakers.

There's some evidence that such disclosures could prompt companies to reduce emissions. One study found that contamination levels dropped after fracking companies were forced to disclose their pollution, and that these kinds of regulations enabled more public pressure on corporations.

"Put plainly," the study concludes, "it is difficult to imagine a successful approach to the climate challenge that does not have widespread mandatory disclosure as its foundation."

Katie Yoder is a staff writer at Grist.

This story was originally published by Grist *on August 28, 2023 found at* https://bit.ly/pollution_cost. *Sign up for* Grist's *weekly newsletter at* https://bit.ly/grist-weeklysignup. ♻

The Earth Needs a New Operating System

John Bos

Nineteen years ago, Paul Hawken gave an unforgettable commencement address to the University of Portland class of 2009. His opening remarks were, "Hey, Class of 2009: you are going to have to figure out what it means to be a human being on earth at a time when every living system is declining, and the rate of decline is accelerating. Kind of a mind-boggling situation...but not one peer-reviewed paper published in the last thirty years can refute that statement. Basically, the earth needs a new operating system, you are the programmers, and we need it within a few decades."

Hawken is the best-selling author who has written eight books, as well as dozens of articles, op-eds, and other papers about our environment, the ethical responsibility of business, and social justice. His books have been published in 30 languages in more than 50 countries and have sold more than two million copies. His writings have appeared in hundreds of publications worldwide since 1983.

"This planet," Hawken continued, "came with a set of operating instructions, but we seem to have misplaced them. Important rules like don't poison the water, soil, or air, and don't let the earth get overcrowded, and don't touch the thermostat that has been broken. Buckminster Fuller said that spaceship earth was so ingeniously designed that no one has a clue that we are on one, flying through the universe at a million miles per hour, with no need for seatbelts, lots of room in coach, and really good food, but all that is changing."

I don't have the space to give you the rest of his commencement address because I want to fast- forward to a description of how Hawken is providing all of us with a way to create that "new operating system."

Hawken recently noted that we are living in "a watershed moment in history where all of humanity has come together, whether we realize it or not. The heating planet is our commons. It holds us all." Hawken is calling upon us to move out of our comfort zones, our belief that climate warming is no longer possible to stop and "to find a depth of courage we may have never known."

I don't know about you, but when someone makes a clarion call like that to listen up, I listen up.

The Panton, VT system is the first U.S. utility-built community microgrid able to run on renewable energy without a fossil-fuel backup. (GMP)

In 2013, Hawken created Drawdown, a collaborative effort involving 200 researchers and advisors who came together to model the one hundred most substantive solutions to reversing global warming. Now in its 14th printing, Drawdown is published in 14 languages, has been referred to and used by heads of state, is part of the curriculum on every grade level from 4th grade to MIT graduate school, and is placed in a New Zealand hotel chain alongside the Gideon Bible.

Drawdown insists that "In order to reverse global warming, we need to address current human needs, not an imagined future. If we want to get the attention of humanity, humanity needs to feel it is getting attention."

Regeneration takes the next step. It is a visionary new approach to climate change, one that weaves justice, climate, biodiversity, equity, and human dignity into a seamless tapestry of action, policy, and transformation that can end the climate crisis. It is the first book to describe and define the burgeoning regeneration movement spreading rapidly throughout the world. Hawken and the nonprofit Regeneration Organization are launching a series of initiatives to accompany the book, including a streaming video series, curriculum, podcasts, teaching videos, and climate action software (https://regeneration.org/).

My goal is to provide an overview of Hawken's interlocking initiatives that can stem the climate crisis in one generation in several of my upcoming columns. I am starting with several regeneration initiatives that are particularly well-suited to New England. The first defines a smart microgrid as a mini version of the main power grid, with two key differences.

Microgrids are independent from the central grid, which means they can provide backup power during an outage (or serve remote communities that aren't able to connect to the main grid). I toured the MacNeil Generating Plant in Burlington, VT in the mid-2,000's and learned that the lights stayed on in MacNeil's service area when the Green Mountain Power (GMP) grid went down. I later learned that in 2021, GMP activated a "microgrid" attached to a solar power plant in rural Panton, VT as part of its effort to reengineer their electric system. It's now possible to distribute electricity to parts of the nearby community in case they get cut off from the main energy network due to falling trees or heavy snows, not uncommon in Vermont. The Panton system is the first U.S. utility-built community microgrid able to run on renewable energy without a fossil-fuel backup.

A benefit that the GMP microgrid demonstrates is that they can be "intelligent" - integrating machine learning and increasingly affordable renewable energy sources to maximize efficient power use.

Microgrids generate power close to the people they serve, unlike less efficient central grids that push power over long distances (with some loss of electricity that dissipates in transit). Local power is more efficient and accessible. Efficiency goes up and energy costs go down - especially when the microgrid uses renewables. In New Orleans, one apartment building's rooftop solar microgrid kept ACs running when massive power outages and a deadly heat wave coincided during Hurricane Ida in 2021. Critical infrastructure like water supplies and sewer systems rely upon electric powered pumps to keep them running. With no power, fuel pumps at petrol stations stop working, road signs, traffic lights and train systems go dead and transport networks grind to a halt.

Expanding local clean power generation and microgrid distribution in New England is doable and one viable way to tackle our climate crises.

John Bos has been a contributing writer for Green Energy Times *since 2017. Comments and questions may be sent to* john01370@gmail.com. ♻

Mission Possible?

Janis Petzel, MD

If the climate crisis were a movie, we'd have reached a plot point known as The Dark Night of the Soul, where all seems lost. To avert annihilation, the hero or heroine has to dig deep to find the strength of character to save the day. The tension of the story revolves around the question: does the hero have it in him/her/them to prevail?

Maybe the tension around climate change is getting to you, too, but you're not quite sure what to do. We know from surveys like Yale Climate Communications that at least 70% of Americans are worried about the impact of climate change. The greenwashing noise online can make it seem pointless or too confusing to try to avoid fossil fuels. What can one person do anyway?

A lot, actually. Here is one story: In tiny Harrison, a town of about 3000 people in western Maine, Andrea AskenDunn decided to do something to assist her neighbors in fighting climate change. She started Resilient Harrison Maine. EcoHeat Maine had installed heat pumps in her home, so she got them to do a community bulk buy. The story of the success of the program made it into the *Bangor Daily News* on June 21, 2023, where I read it.

I'm part of the Islesboro Energy Team (IET), a volunteer group in our island community (Toby Martin, who distributes *G.E.T.* is the head of IET). We invited Andrea to speak at our October Energy Conference. Her story was so inspiring, we decided to do a similar program on our island. Dave's Heat Pumps in Winthrop, Maine had installed equipment in my house. They were more than happy to do a group buy for us. We are in the middle of it now. Thirty-plus households are getting quotes for heat pumps to be installed in December, and another dozen families want us to do it again in the spring--this in a community of 600 year-round residents.

The story gets better: when we put the news of the bulk buy on our town's Facebook page, a reader from a nearby town commented that she would love to have such a program where she lives. We've encouraged her to start her own bulk buy. When Andrea put her ideas into action for her community, she unleashed actions in other places. I hope that when you read this, you'll consider doing this in your community, too.

It doesn't have to be heat pumps. It could be energy audits, insulation, weatherization, window inserts. If you have an idea, why not go for it?

The gloriously good news is we have tools to meet the challenge of climate change. Build Back Better and the Inflation Reduction Act make it possible for people from all walks of life to get rid of their fossil fuel burning equipment for cleaner energy sources. These bills are making a dent in higher level actions that need to happen, like grid modernization, that individuals can't do on their own.

Individuals still have the power of the vote. We need to carefully choose who we elect to make sure that cheap tricks and subversion don't derail climate response as we approach the Dark Night of the Soul of our next presidential election. The same people who want to take away women's bodily autonomy and kill civil rights don't give two hoots about the environment unless they can use it for a toilet. Please vote mindfully.

Irredeemable climate disaster is getting a little too close to the wire for anyone's comfort. Things are not hopeless, but they are hopeless adjacent. It's time to kick our climate responses into high gear.

Community is the key. We can get through the Dark Night of the Soul if we work together. There are climate heroes and heroines all over this country and the world. You could be one of them.

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. ♻

A heat pump installed at the author's house is part of a bulk purchase agreement program. This program is lead by community members to help in reducing their carbon footprint. (Courtesy photo)

Ongoing Flooding of Our Landscape

Cont'd from p. 32

flooding damage. Storms continued in Massachusetts, and then on September 15, Hurricane Lee passed offshore up the northeast coast as a massive weakening storm bringing coastal wind and large waves. Lee then brought major rainfall to eastern Maine on September 16.

Tropical storm Ophelia came ashore in North Carolina on September 23 and moved north up the coast. It dumped a historic eight inches of rain on NYC on September 29, flooding the city including the subway system, causing immense damage.

Hurricane edges towards North Carolina. (ABI imagery from NOAA's GOES-16 Satellite)

Our warm months in Vermont ended with a sharp transition. October 28 was warm and sunny for the Saturday Rutland Halloween Parade; but October 29 and 30 were 25 degrees colder with rainy weather, followed by a week with several morning frosts.

On a planetary scale severe storms give a quite stunning global picture. We are moving into a new world.

Mexico was struck by the worst storm ever from the Pacific Ocean, when Hurricane Otis spun up very rapidly in just 12 hours, stunning both modelers and forecasters. It made landfall early on October 25 near Acapulco as a Category 5 hurricane with 165 mph winds and higher gusts. The hurricane left catastrophic devastation, flooding streets, wiping out power and communications, and destroying or damaging as many as a 200,000 buildings and 60,000 businesses. Acapulco's oceanfront high-rises were built to withstand the region's powerful earthquakes, but weren't designed to handle anything close to Otis's 165 mph winds. Rescue efforts are struggling to help and resupply the community more than a week later, and total casualties onshore and at sea are still hard to assess.

On October 26, Cyclone Lola struck the islands of Vanuatu in the southwest Pacific Ocean as a category 4 storm, which was the strongest October cyclone on record in that basin. The islands were cut off with severe damage.

Far away in the Arabian Sea, Cyclone Tej built up to a strong Category 3 storm, one of the strongest on record there. While Tej weakened, it still made landfall as a strong tropical storm, a rarity in recent historical records for eastern Yemen. Seventeen inches of rain was recorded in the city of Al Ghaydah, which is over eight times its average annual rainfall of only two inches. This led to massive flooding in eastern Yemen and far southwestern Oman on October 24-25.

The other side of India, 275,000 people were forced to flee as Cyclone Hamoon, a category 2 storm struck south-eastern Bangladesh on October 24.

The Atlantic was by contrast relatively quiet. Hurricane Tammy was a category 2 storm, heading for Bermuda, but then it weakened, stopped moving and faded away.

The UK found itself besieged by a mid-latitude storm Babet. Rivers overflowed their banks in North Yorkshire, the Midlands, and in the southwest, causing major flooding. Residents returned home to scenes of devastation, with their homes damaged by the destructive power of the floods. I am watching because we are planning to visit my 86-yr-old step-mother, but the hotel we had booked was so badly flooded that it will be closed for six months. After Babet came a second storm named Ciarán bringing even stronger winds, heavy rain and flooding to both southern England and north-western France, cutting off power to more than a million people. This storm moved on into Italy bringing eight inches of rain in three hours to a region just east of Florence and went on to flood much of Italy. In Mother Nature's world this may be because the Pope was unable last week to face the power evils of the Catholic Church that are still destroying life on Earth, seventeen hundred years after they were imposed by the Roman Emperor Constantine.

When asked what to expect for the coming winter, I just smile. A few years ago, we have had some warm temperatures and my grandchildren were able to dig under my rye grass cover crop in January, and even February one year. I am planting my rye cover crop as usual, but the rapid shift of extremes as the global jet stream shifts into new high-amplitude four-wave modes around the Earth, at a time of El Nino in the ocean and near solar maximum, limits our forecasting ability. A large amplitude powerful wave this Halloween spanning the whole US brought freezing temperatures and some snow to many of the central states. Downstream across the Atlantic this strong wave helped drive storm Ciarán.

So much is going on globally on Mother Nature's agenda, like the fast melting of Antarctica, where the ocean circulation is shifting in ways we do not understand or measure. We are also oblivious as a society to the reality that on larger scales, solar flares are under her control and our satellite and communication infrastructure is vulnerable.

The central issue is whether humanity is willing to join the rest of the species on Earth and communicate directly with the Creation, so that she can help us. Or whether our society will remain locked in the criminal destruction of most of life on Earth to maximize profits for a few thousand individuals and businesses. Given the corrupt disintegration of the U.S. political system, it may be quite a while before Mother Nature's flooding wakes us up.

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

Elmore Roots' Permaculture Know-How

Being In Harmony

David Fried

Plants can teach people a lot about living together in harmony. Step outside for a minute and look at our natural world. The clouds float gently overhead. The trees bend this way and that in the breeze. The brook flows by singing: "Something in the way she moves, attracts me like no other lover." (Even George Harrison of the Beatles was writing songs for the plants and animals to sing as they stroll by.)

Pastel drawing by Joyce Dutka

On a warm day in winter, the moths are out for one big day. Blue angels fly up into the light and when the cold evening comes, they lay down to sleep until their chance to live comes again. Outside my window the winter rain drips off the white cedar trees. Blue jays land in the middle of the trees and look around. They live in our world now and we live in theirs. Inside the dense green tree canopy there is a whole existence going on.

Trees grow up into the light. If a tree has another tree too close for it to grow straight up, it grows to the side a bit, always reaching for the light and warmth of the sun.

I have a book called The Adaptive Geometry of Trees. It talks about how trees live with all different kinds of trees growing closely together. They adapt to what they are given. They make do with what they have. They do not move around much except by their long-term seedlings moving slightly north or south as the climate will let them and their seeds are successful growing there.

I chose the middle name Willow for my daughter. I wanted to give her the ability to bend and lean and stretch and go with the energy around her as she makes her way in the world. To be flexible and not rigid. To take the water flowing beneath the earth and use it to be nourished deeply. You can tell where a willow tree is growing that there is enough water in that area to support a garden or other plants, too. Willows are one of the trees that grow along streams and rivers and help to hold the banks of the river together so they don't wash out. They have a relationship with the river as the trees get the water they need, and the river gets to keep its channel for flowing towards the sea.

All life is humming. Life may seem hard sometimes but remember: Every 365 days we get a complimentary trip around the sun. The plants know this. The flowers celebrate by giving everything they have, sometimes opening just for one day, where we all get to bask in their glory together.

We can sit on the riverbank and see how all of life keeps flowing. The blue jays stand out now with the snow all around. I stand out with my yellow-orange coat. We are all part of this amazing trip together on the planet.

The rivers keep on turning. The mountains keep on melting their snow on warm days. The moose are hoping to make a comeback around here and the deer are so grateful to have a place to sleep in the grasses.

"You're asking me, will my love grow? I don't know, I don't know. You stick around and it may show." Are we taking care of our beautiful world and each other? "And all I have to do is think of her. Something in the things she shows me." (George Harrison) Let's keep checking in with the plants and streams around us to see how we are doing.

One of my great teachers, and as the Beatles sang, "If you say no and I say yes," it is an argument. But if you SING "yes" and I SING "no" it can be a beautiful harmony." Let the trees teach us how to be in sync with everything and everyone around us. "There is something in the way she moves" (The Beatles).

David Fried of Elmore Roots Northern Fruits and Elmore Roots Fruit Tree and Natives nursery with a few samples of lyrics by George Harrison to help illustrate the harmony we all are seeking. ♻

Report from Ghana, West Africa

Larry Plesent

I walk slowly down the sand and dirt road mindful of where I step. Hello, hello. Good morning, Madam. Hello sir. I give a closed fist power salute to the workers building a concrete block wall around a commercial lot and nod to the motorcycle riders passing by every few minutes. An older woman, her face ritually scarred, dumps mixed garbage outside the walls of a large hotel. Pick up services exist, but why pay for them? Plastic bottles and bags blow about randomly as dogs, goats, sheep and cattle pick through the remains in vain hope for a solid meal. When the flies or aromas get too annoying, the whole mess is burned. My asthma is not happy with this, and I tell the man burning one pile that the smoke will give the children cancer. He looks at me, confusion playing across his eyes. He tells me that the children are at school now and turns back to his work. To him, I am just another crazy white man out too long in the hot African sun.

Recycling does not seem to exist here and probably will not for many more years. Africa has other priorities. I lament the waste of raw materials inherent in the single-use plastic system we all take part in.

Ghana is the Switzerland and the banking center of West Africa. Even fundamentalists need a place to put their money. People are generally good natured here and ever hopeful for a prosperous future. Like other modern countries, Ghana has printed way too much money completing several large infrastructure projects. I appreciate driving the newly paved highways and admire the new giant football stadium --while I am well aware of the financial hardship this year's 50% inflation rate brings to working families. Two economies exist in Ghana. One economy is prosperous and growing fat fueled by foreign money. The other local economy runs on Dash.

Dash is local slang for gratuity or tip money, and I know of its importance in the lives of those who live between the traditional and the modern worlds. I tip 10% or more in restaurant, and attempt to learn people's names, much to the surprise and delight of those I do business with.

"With little we do much," one young mother tells me.

Recycling does not seem to exist in Ghana and probably will not for many more years. Africa has other priorities. (Courtesy photo)

It has been eighteen years since my last visit to Ghana. I compare notes with snapshot memories of past visits when I was a volunteer trainer with Winrock International. Awareness of solar power was just beginning to grow back then. People remain fascinated with solar panels and the idea of making electricity from sunlight. The early lead acid batteries did not last long in this hot region where maintenance schedules do not exist. If it's broke don't bother fixing it. Unfortunately, the early solar experiments with car batteries diminished the general opinions of local people towards the usefulness of solar power. Their complaints sound remarkably like electric-car denying Americans. Nice idea but not practical for most people right now, so they say.

Huawei, the Chinese electronics giant has a solar store nearby. 576-watt black panels are on special. Piles of three and six kwh lithium-ion battery walls. I walk by the display of DC bore hole (shallow drilled well) pumps. They come with their own power pack unit. Plug and play. I appreciate the simplicity of the system. I walk around the small store. The only other customer is a Jamaican, Ghanaian, American from Colorado. We connect immediately. He works with an organization that runs concerts around the world using solar power. I tell him about solar rollers; portable trailers outfitted with panels, batteries, and inverters. His eyes light up with understanding. I am happy to be some small help to solar power.

The sub-continent Indian population has grown in Ghana since I was here last. They come with India built appropriate technology. Motorcycles are everywhere. Tricycles or Motor Kings, a motorcycle attached to a small two wheeled truck bed, have revolutionized life for those working hard to pull themselves up from poverty. The proliferation of small, practical, energy efficient Indian built trucks, motorcycles and Motor Kings have helped to raise the population up while keeping the air from fouling as quickly. The quality of the local fuel has improved over the years as well. I remember the spewing streams of exhaust from previous trips that kept my hand firmly welded to the inhaler. Thankfully, there is much less of that this time around.

There is much to be hopeful for regarding nonpetroleum energy generation. Plans are being laid in the Volta region to build the largest solar field in Africa and tie it into existing infrastructure associated with the reservoir dam there. Decentralized solar power options for far flung areas have been recognized as being more practical than gigantic systems and poles. Since appropriately sized decentralized power structures fit in well with my way of looking at the world and our place in it, I continue to be a cheerleader for more projects like these.

The modern world consumes astonishing amounts of power, a testimony as much to our energy- profligate lifestyle as to the inefficiency of the devices and systems we continue to use. Giant expensive energy projects have their place in the world, of course. If we built a thousand small to mid-sized systems for every gigantic one brought into eventual service, we can transition to renewables faster and with more redundancy and resilience. It is not an either-or decision.

My friend tells me that he saw his first electric motor bike last week. At long last, change is in the air. Tomorrow, I leave for the villages of the north and east to teach people whose ancestors invented soap and lost the knowledge of how to make it from the plants around them.

Larry Plesent is the retired founder of Vermont Soap. He has returned to West Africa after nearly twenty years to teach practical low-tech skills to African entrepreneurs and especially to teach all things soap- related. Learn more at www.vermontsoap.com. ♻

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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USDA Rural Development Invests $2,247,000 in Vermont and New Hampshire Clean Energy and Food Production

Funding Supports New White House Council on Supply Chain Resilience

The U.S. Department of Agriculture (USDA) Secretary Tom Vilsack announced on Nov. 27, 2023 that the agency is making investments in 185 projects with a total value of nearly $196 million to create new and better market opportunities for producers and entrepreneurs across the country. The funding includes $2,247,000 for Vermont and New Hampshire businesses through Value Added Producer Grants, a Rural Business Development Grant and Business & Industry Loan Guarantee.

"The Biden-Harris Administration is championing America's farmers and ranchers by helping to expand businesses, support more robust American supply chains and save jobs," Vilsack said. "Today's investments in agricultural producers and rural entrepreneurs will create better economic opportunities that spur competition and bolster food supply chains across the country. This will result in more affordable prices and choices for consumers, as well as more opportunities and revenue for farmers."

"Vermont and New Hampshire are states with strong agricultural backbones," said Sarah Waring, State Director for USDA Rural Development in Vermont and New Hampshire. "With today's announcement of more than $2.2 million invested, we celebrate the innovation and hard work of farmers, food producers, and our local supply chain. Rural Development's business programs support this supply chain to be more efficient and more carbon neutral, while reducing costs to rebuild our local economies. Because of the Biden-Harris Administration's demonstrated commitment to agricultural producers and entrepreneurs, our rural communities are becoming healthier and more resilient by the day."

Brookford Farm in Canterbury, NH. (Flickr/Lisa Bruce)

Local projects in include:

- $250,000 Value Added Producer Grants for three farms in Vermont and one in New Hampshire;
- A $1,200,000 Business & Industry Loan Guarantee to finance a 788kW solar array farm in Georgia, Vermont, expected to power the equivalent of 88 homes annually; and
- A $47,000 Rural Business Development Grant for Merrimack County Conservation District, to help Brookford Farms in Canterbury, NH, improve its product marketing and create three new jobs.

The announcement was made as part of the inaugural meeting of the new White House Council on Supply Chain Resilience which is part of President Biden's agenda to bring down costs for American families and increase investment in America's supply chains critical to economic and national security. Today's funding builds on prior investments made by USDA under President Biden's Investing in America agenda to increase competition, enhance independent meat and poultry and other diversified food processing capacity, strengthen local and regional food systems and expand domestic, innovative fertilizer production.

USDA is transforming America's food system with an increased focus on more resilient local and regional food production, fairer markets for all producers, ensuring access to safe, healthy and nutritious food in all communities, building new markets and streams of income for farmers and producers using climate-smart food and forestry practices, making historic investments in infrastructure and clean energy capabilities in rural America, and committing to equity across the Department by removing systemic barriers and building a workforce more representative of America. To learn more, visit www.usda.gov. ♻

Winter Composting

Briana Morin

Winter may not be here yet, but snow has begun to fall, which means it's time to start thinking about managing your food scraps for the winter!

Many backyard composters stop composting during the winter and opt to drop off food scraps instead - but did you know you don't have to? The composting process may halt when the land freezes over for the winter, but you can still continue to add food scraps to the pile by following these simple tips!

Composting pauses for the winter. Adding food scraps to your compost bin in the winter is storing them for processing in the spring. (AdobeStock/331598611)

The first step to winter composting is to harvest any finished compost at the bottom of the pile - this will help save some space as ingredients continue to pile up.

As previously mentioned, compost freezes during the winter - adding food scraps to your compost bin during winter is basically storing them until the process continues in the spring. Start the winter with an extra bin to help accommodate the volume.

Even though the composting process pauses for the winter, it's important to continue to add "browns," like dried leaves or wood shavings, so that the food scraps will continue to break down correctly when they thaw. As a reminder, you want to use about three times as many browns as greens in your compost.

Finally, although your compost bin will pile high as winter progresses, it will reduce to less than half of its original volume as soon as it thaws in the spring. Once this happens, you'll want to add more browns, turn the pile, and add more browns on top - this will get the actual composting process started.

If you'd rather forgo composting for the winter, you can always collect your food scraps in a pail or bucket and drop them off at a composting facility or food scrap drop off site.

For more tips and information on backyard composting year-round, visit the Central Vermont Solid Waste Management District's Home Composting page at https://www.cvswmd.org/home-composting.html.

Briana Morin is the public relations and outreach coordinator for the Central Vermont Solid Waste Management District. ♻

Environmentalism from Below

Cont'd from p.14

outlining how their efforts were crushed by the powers that be in each vicinity.

With regard to the energy transition that is often touted as a way for us to survive, the book states that "the growth of renewable energy 1990-2015 has been matched and in many places outstripped by the growth of fossil fuel extraction and consumption. It reported that coal contributed more than double as much to the global primary energy supply as all of the renewable sources combined. Much of the coal issue is exemplified by activity in India trying to become more energy self-sufficient which auctioned the rights to develop 41 new coal mines many in bio-diversity-rich areas. The cost of renewable energy has been decreasing but fossil fuels are expanding in tandem with renewable energy and market-driven energy transition is not coming to fruition."

Greed for land control or development can involve pollution which often impacts farming, livestock, air, water, and soil. Activists who try to combat the onslaught against environmentalism are often faced with brutal tactics including threats, harassment, and assassination in a litany of retaliatory violence and property damage. Protesters are violently dispersed and arrested arbitrarily. The lawsuit strategy is used "to censor, intimidate, and muzzle activism."

"Fortress conservation" refers to protected areas or enclosed territories such as national parks, wilderness areas, and nature reserves. "There are now about 108,000 protected areas on Earth. This land was taken from Indigenous people who were forcibly dispossessed of the land in the name of conservation. In short, colonial powers have seized, militarized, criminalized, and destroyed a way of life."

"The 30 X 30 concept (30% of the planet should be protected by 2030) organized by a consortium of organizations such as National Wildlife Federation, WWF, Nature Conservancy, Environmental Defense Fund, and hundreds of similar environmental, scientific, government orgs, and businesses joined with the World Bank and International Monetary Fund incorporated rhetorical gestures for inclusion, democracy, and empowerment of Indigenous cultures in the manifesto without acknowledging one billion people that live in these areas. These people will need to be dispossessed and displaced and they will not be involved with the control of protected areas, or the decisions of whether a location is protected and what that means for the local people."

One specific carbon offset practice is outlined whereby "polluters pay for governments in the Global South to plant fast-growing eucalyptus trees to offset carbon emissions – trees designed to be cut down in only a few years for industrial use." According to the author's information, "carbon trading and offsetting will render it empirically infeasible to achieve reductions in carbon emissions in aggregate on the global scale with continued use of resources so savings would not occur rapidly enough to stay within the prescribed two degrees carbon budget."

An analogy for the NET ZERO concept as described in *Environmentalism from Below* is "claiming that you are not gaining weight because you are paying someone else to go on a crash diet, even while you continue to gorge yourself."

The People's Manifesto document calls for "restitution of protected areas with plans for reparations tying together labor, climate justice, migration, and land restitution as an effort designed to reverse the unsustainable global structures built on colonialism and racial injustice." This is tantamount to "returning the 85 million acres of American National Parks to a consortium of recognized native American tribes who would be entrusted with stewardship of the lands."

System Change, not Climate Change Demonstration in Vienna during COP21 in 2015. Activists forming the words 'system change'. (Wikimedia, Manuelgre, CC-BY-SA-4.0)

Climate migration is a real thing and currently there is no international recognition for asylum eligibility for refugee people displaced by environmental disasters or the slower onset of impacts of climate change. "In 2022, 32.6 million people were displaced from their homes by natural disasters. "

"The world's 10 largest greenhouse gas emitters historically produced 72% of total GHG dating back to 1850 (48% from the US, UK, Japan, Canada, France, Germany, Australia). The poorest 50% of the world population are responsible for 7% of global carbon emissions. It is projected that 2-3.5 billion people will find themselves living in climates that will become uninhabitable (India, Nigeria, Pakistan, Indonesia, Sudan) and 30% of the world population will have to move to save their lives within 50 years."

"Rich countries spent more on immigration enforcement (policing, walls, detention, etc.) than on the climate funding suggested in 2009 Copenhagen Conference. The US spent $19.6 billion in 2020 on enforcement compared to $1.8 billion on climate financing (this is 11 times the amount, and Canada is similarly 15 times the amount). Interestingly, there are some interlocking board members on fossil fuel companies and border security/detention companies."

The industrialized countries (the Global North) are often ready to provide funding for bank bail-outs or military endeavors in times of emergencies. The climate emergency could be far deeper on the global scale. Environmental From Below suggests that the way to achieve a zero-carbon world is to enact a profound socio-economic transformation including a socially-owned renewable energy section that is under public ownership and democratic control. This is a romanticized fantasy that the Earth is populated by "an indivisible living community of interrelated and interdependent beings with inherent rights and our responsibility in relation to other beings and the community as a whole should be with respect and in defense of rights and harmonious co-existence of all beings."

Most of us are very alarmed by the statistical trends of climate change and concerned with the serious impact on our way of life. But it is unlikely that the pie-in-the-sky recommendations for reparations and transformation that will turn the world helter-skelter would ever happen. The powers that be control resources and military might. They greenwash the climate crisis and do little to phase us out of an economy that is based on fossil fuels. The solution? The concepts of Utopia, Nirvana, and Shangri-la come to mind.

Roger Lohr of Lebanon, NH, who owns and edits XCSkiResorts.com, has published articles in regional and national media. ♻

Sister Act at Maple Ski Ridge Invests in Efficient Snowmaking

Roger Lohr

Maple Ski Ridge (https://www.mapleskiridge.com) in Rotterdam, NY (seven miles from Schenectady) is a 138-acre ski area, which draws roughly 20,000 skiers every year and has been a passion project for the Mulyca family since it opened 60 years ago. Now the Mulyca sisters' act at Maple Ski Ridge is owned and operated by Marilyn Peterson, general manager and Carolyn LaHart, the mountain manager, a groomer, snowmaker, engine fixer, and even cooks sometimes.

An aerial view of Maple Ski Ridge located in Rotterdam, NY. (Courtesy photo)

Maple Ski Ridge was first opened in 1963 by George Mulyca when there was a truck running the rope-tow and a person sitting in the truck driver seat pushing the gas pedal. This woman-owned ski area has eight trails with four lifts (triple, double lift and two rope tows). The low price for skiing at the area is prominent as it is $37 on weekdays ($45 weekends and holidays), $20 for night skiing under the lights 6-8 PM ($25 on weekends or holidays) and $10 for Nordic Lite nights when lifts are not open used by cross country skiers, backcountry skiers, snowshoers and split-boarders.

Mulyca Sisters standing in the trench for the new snow making system pipes. General Manager, Marilyn Peterson, is on the left and Carolyn LaHart, Mountain Manager, is on the right.

In recent years, the ski area replaced the lighting on the trails with LED lights to save on electricity costs and now it has commenced a three-phase, three-year, three-million-dollar snowmaking infrastructure improvement project. They set aside funds for this much-needed initiative (no loans) and have also received a grant worth $100,000 from the Schenectady Industrial Development Agency (IDA). A significant portion of the project has been completed over the summer replacing the old diesel pumps with new electric pumps and building a new pump house. The upgrade also includes enhancing the electrical system that powers the snowmaking system.

Two 5-year old girls are having fun learning to ski at Maple Ski Ridge in Rotterdam, New York. (J. WInter)

The procurement of new snowmaking machines will be the final phase with new, state-of-the-art, Techno Alpin snow-making machines which will be acquired in stages over the next couple of years.

The snowmaking system saves more than 40% in the time making snow to cover the trails while it reduces the amount of water compared to the old leaky system, saves energy for pumping and running computers, and has fewer emissions and pollution because of the elimination of diesel for powering the snowmaking operations.

Besides low-priced skiing and an authentic local ski experience, Maple Ski Ridge is participating in the national Indy Pass program (about $400), which provides privileges for two free lift tickets for Indy Pass holders at more than 180 independent alpine and Nordic ski areas.

"There's been a movement in the skiing industry where the larger places are pricing people out of skiing, which is not a good or healthy thing," said Kirsten Ford, the director of marketing and communications, and a ski instructor at Maple Ski Ridge. "We are a feeder mountain where we teach the next generation to ski and snowboard. Then they go off and ski wherever, but they need to have a good foundation. We're not intimidating. We're here to provide that base to the industry. And if we're not here, then the whole industry will start to crumble."

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. ♻

Snowmaking with a view at Maple Ski Ridge. (Courtesy photo)

"Greening" the Water Cooler

Jessie Haas

We all know (I think) that single-use plastic water bottles are bad for the planet and possibly bad for our health. That said, if that's the way water is provided in the workplace or in public venues, we're going to grab one. So, it's good to know that there are companies dedicated to keeping people hydrated in a clean, healthful way that's good for our only planet.

Crystal Rock was founded in Stamford, CT in 1914 as a water delivery company. Now a brand of Primo Water North America, Crystal Rock provides businesses in New England and New York with water in large bottles which are delivered to the customer's door every two weeks. On delivery day, customers leave empty bottles outside the door for pickup. Orders can be updated via an online account or app. Primo, the parent company, provides multi-gallon water machines to over 41,000 locations in the U.S. and Canada. It also provides dispensers for hot or cold-water, high-quality coffee delivery, breakroom supplies, and water filtration.

Crystal Rock is actively engaged with improving its environmental profile. Recently it upgraded much of the delivery fleet to run on propane rather than diesel, which promises a 40% increase in fuel productivity. On-site refueling of the fleet reduces air pollution and the environmental impacts of the vehicles. To reduce mileage, drivers use smartphones to optimize their routes. When Crystal Rock and Primo considers new water sources, location near existing bottling plants is prioritized, reducing fuel use and transport distance.

Packaging can have a big impact on transportation costs and emissions. Lighter containers can deliver the same amount of water using less fuel. Primo's efforts are focused on reducing, reusing, and recycling. They have reduced the amount of plastic in U.S.- and Canada-branded 0.5-liter polyethylene terephthalate (PET) bottles by more than 50%, and caps by 25%, over the past ten years. Converting one-gallon bottles to a lightweight model reduced plastic use by 2.8 million pounds. Plastic cups are lighter weight these days too, and an 100% biodegradable and compostable cup was introduced last year. (Reusables are still much better for the environment, so bring your own mug!) The company is continually working with suppliers to source environmentally friendly and reduced-plastic packaging. The three-gallon and five-gallon polycarbonate water bottles are reused up to 50 times. At the end of their usable life, the bottles are recycled. All Crystal Rock's packaging is 100% recyclable, including bottles, caps, outer-wrap, and corrugated boxes.

Another ongoing effort is to reduce energy use in bottling plants, by transitioning to energy efficient lighting. When implemented, the savings in CO2, sulfur dioxide, nitrogen oxide and mercury emissions will provide the equivalent of planting 452 acres of trees annually, according to the company's estimate. It will reduce lighting-related energy costs by 64% in these plants.

Primo joined the Alliance for Water (AWS) in 2019, and is the first company in the world to have a spring water source certified under AWS's program, which sets a global benchmark for responsible water stewardship. Certificants must address aspects of responsible water stewardship including governance, sustainability, quality, and safety.

Primo Water North America became carbon neutral across its U.S. operations in October 2020 and is now certified as a carbon neutral company under the Carbon Neutral Protocol, administered by Natural Capita Partners. Primo reduced greenhouse emissions by 168, 375 metric tons in 2020 through the purchase of renewable energy and carbon offsets.

With pure, certified spring water available hot or cold from a dispenser, there's no reason at all to resort to single-use plastic bottles. Local employers and public venues have an environmentally responsible, convenient option close to hand.

Jessie Haas lives in a 450 square foot off-grid cabin with husband Michael J. Daley. She's the author of 41 books, including The Hungry Place. ♻