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Earth Closes In On 1.5°C Increase

Roy Morrison

Historic flooding in Ludlow, Vermont again devasted the state in July 2023. Photo shows the intersection of the access road to Okemo ski resort. (Courtesy image)

Three all time global records in 2023. In June, global oil consumption reached an all time high of 103 million barrels a day according to the International energy Agency (IEA). In July we had the hottest month ever in in recorded history. In July we also reached the 1.5°C global temperature increase in a summer of murderous heat, epic floods and huge wild fires.

We are in a fundamental ecological crisis threatening the future of the ecosphere and human civilization. What can we do about it? There is much that we can and must do individually and collectively. It's time for action, not despair. Labor organizer Joe Hill facing execution wrote, "Don't waste any time mourning," and encourates us to "Organize!"

The recent Earth Commission Report on Global Health from 40 scientists quantify five key biophysical processes that regulate the health of the Earth system globally and regionally.

These are: tackling the global climate emergency; stemming effects of aerosols to ensure human and planetary health; protecting a thriving

Cont'd on p.33

No, This is Not the New Normal

George Harvey

Flooding in Montpelier, Vermont, on July 11, 2023. (Sr. Master Sgt. Michael Davis, U.S. Air National Guard, via Wikimedia Commons.

The idea that the weather extremes we are seeing could be the "new normal" struck me as bizarre when I heard it. The word "normal" implies stability, but the essential nature of climate change is change. There is nothing normal about it, and there will not be until the climate stabilizes. And that might be many decades away.

We are not in an era of hot summers, droughts, wild fires and floods like those that we have seen. The constant of the era we are in is that weather extremes are likely to be worse than we have seen, unless we learn to do long-term prevention unlike anything we have ever done.

At one point in a July full of rainfall, Vermont was drenched by two months' worth of rain in two days. In some places, flooding was worse than it was when Tropical Storm Irene did its worst in 2011. The state governor, Phil Scott, sent out a tweet, saying that he had to hike to get where he was going. "The roads around my house were completely impassable this morning. Grateful for the @VTVast snowmobile trail network, which I was able to hike through to get to an open road and on to our emergency response center" (https://bit.ly/PS_flood_tweet).

Of course, Vermont was not the only state to be hit by all the rain that fell in the Northeast.

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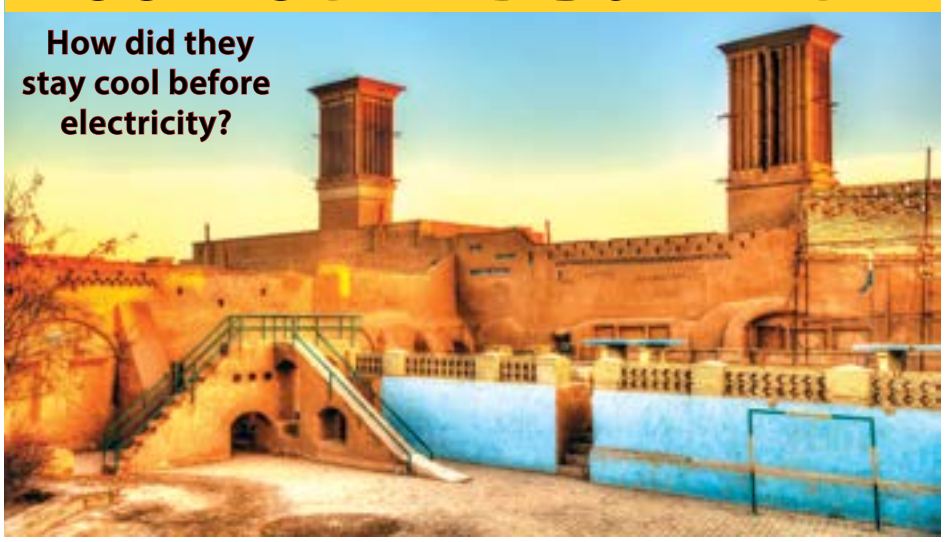
Too Hot This Summer?



Traditional houses in Yazd with windcatcher ventilation towers. The spanish city of Sevilla is experimenting with this ancient cooling technology as heatwaves continue. (AdobeStock_103929310)

Jessie Haas

Between the towns of Putney and Westminster West in the Connecticut River valley in Vermont there is a sloping stretch of road, wooded on both sides and with a small brook trickling through it. As you drive up from the river valley, the temperature always drops two, three, even four degrees along this one half-mile, and on a hot day you feel like stopping and staying awhile. By no means is this phenomenon unique to Vermont.

For thousands of years in Egypt and Iran,the combination of shade, moving air, and moving water has been harnessed in the form of windcatchers. Draft is created by a tower, a chimney which creates a draft, pulling in air from a colder place. Usually this is an underground tunnel with a distant opening. The air is cooled by the earth as it is drawn through the tunnel. Some windcatcher systems use an underground canal which provides water to the home as well. In this climate the air being drawn in is extremely dry, which creates a lot of evaporative cooling in the tunnel. Both air and water are cooled. In extremely well-designed systems, the water temperature may approach freezing. The windcatchers provide air conditioning, cold water, and refrigeration—all without burning a drop of fossil fuels, and all in a very hot environment.

The southern Spanish city of Seville is experimenting with this technology. The CartujaQanat is a site about the size of two soccer fields, featuring green spaces, two auditoriums, a promenade, and a shaded area with benches, all cooled by the qanat, an underground system of pipes and tubes inspired by the Persian windcatchers.

The aqueducts can lower surrounding temperatures by as much as 10°C (50°F) which would have turned a recent 108°F day into sweatshirt weather, using only solar power. The new system is not as passive as the old windcatchers. It uses water pumps, two of which have not yet been installed. A second qanat intended to cool a bus station received no bids when contracts were issued

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Concentration of CO2 in the Atmosphere

422.14
parts per million (ppm)
August 5, 2023

Learn more at www.CO2.earth.

IN THIS ISSUE

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

Proudly Bringing *G.E.T.* to Maine since June 2021

LETTER FROM THE EDITOR

I think the big message in this edition is that climate change is here, now! And it is not pretty. But we hope you can find useful information and solutions by reading the information in this and every edition I Solutions are at our fingertips. The technologies to change things are available now. We just need to do them. No excuse is acceptable today. Where there is a will, there is a way. The IRA and state incentives can help fund some of the big items. But a huge part is up to you and me.

In case you did not notice and ask why, as Senator Bernie Sanders said (see p.3), "Just look around." It has been a crazy two months since our June edition came out. The disastrous fires in Canada and our unhealthful air situation were a big story back in June. Then came one disaster after another. Floods in VT and NY followed. How about the heat — oh the heat?! July was the hottest year ever recorded, by far. Phoenix, Texas, Spain, Italy and many other places are struggling to deal with the crazy high temperatures. Tornadoes have ravaged many communities. It seems we hear about a disaster every day or two. There was an E-5 tornado that did damages in Massachusetts the first week of August. And among it all, hurricane season is starting. Maui, Hawaii experienced the worst fires they have ever endured. Speaking at a news conference on August 11, Hawaii Governor Josh Green (D) stated: "Climate change is here, and it's affecting the islands." Clearly disasters have increased incredibly. It seems that the climate is certainly now out of control and so very unpredictable. We have not even mentioned the slowing of the ocean currents and what that means.

Please read Bernie's message in our climate news section on p.3. I am concerned that part of his message might not make enough of an impact. Bernie said, "At every level, in every country, we must work aggressively to save the planet for our kids and future generations."

As the I write this, most parents are getting ready to send the kids back to school. Thinking long beyond this school year is what we should all be taking as serious as this climate emergency is – for them! We need to make important choices right away that will result in the best chance possible that our children will be prepared to live through the disasters they will face.

For a very long time now, scientists have warned us about what is ahead and how to keep the CO2 levels below 1.5ºC to leave a livable planet for our children and grandchildren. Together we each have to take the situation as serious as it is — right now. We each need to do more. It is the choices we each make every day that will make it or break it.

The pages of *G.E.T.* are intended to help you along a path leading to a livable future. Please try to incorporate more what you learn in *G.E.T.* into your own life. You can set the example that will hopefully encourage others to follow.

At this point, the "WHY" should be obvious. The next disaster may be in your own back yard. We hope that each section in this edition will help you learn something you can improve in your own life regarding transportation, renewable energy, heating, building and energy efficiency, agriculture, and everyday living choices. In the end, as we end each edition of *G.E.T.*, we earnestly hope we will find that it is *a Green Life After All.*

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

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THE IMPACTS OF CLIMATE CHANGE

Bernie Asks You to "Look Around"

A Letter from Bernie Sanders

> *"If the entire planet does not get its act together, the world that we will be leaving our children and future generations will be increasingly unhealthy and uninhabitable." -- Bernie Sanders*

LOOK AROUND:

Over the last few days, nearly two-thirds of the population of the United States of America was living under either a flood warning, watch, or a heat advisory. Temperatures in the Atlantic Ocean are the highest ever recorded. Wildfires are ravaging parts of Greece. A typhoon has forced tens of thousands of people from their homes in Beijing. And July is on track to be the hottest month in recorded history.

Meanwhile, the latest report from the United Nations' Intergovernmental Panel on Climate Change (IPCC) is very clear and it is very foreboding. If the United States, China and the rest of the world do not act extremely aggressively in cutting carbon emissions, our planet will face enormous and irreversible damage.

Let me be clear about that last part: If the entire planet, led by the largest economies in the world, the United States of America and China, does not get its act together, the world that we will be leaving our children and future generations will be increasingly unhealthy and uninhabitable.

What makes this issue so difficult and so complicated is that it is a crisis that **no** individual nation can solve alone for its own people. It is a global crisis. It is an issue that requires the cooperation of every nation on earth. Whether we like it or not, we are all in this together.

Just one example. Despite the frightening impact of climate change on the United States, highly populated Asian countries are facing even worse challenges. Sea levels on China's coastline are rising more quickly than the global average. Major cities like Shanghai, Tianjin and Shenzhen are all located along the Chinese coast and could face catastrophic flooding in years to come – creating havoc with the entire Chinese economy. There are projections that Shanghai, a city of 24 million, could be underwater by the end of the century.

Now, the bad news is that developing a mutually beneficial relationship with China to save the future of this planet will not be easy. Sadly, there are "hawks" in both countries who are working hard to create a new cold war.

The good news is that we still have time — the United States, China and other countries around the world — to make the decision to act aggressively in combating climate change and prevent irreparable damage to our country and the planet.

While we must work diligently to foster international cooperation on climate change, we must also do something else. In the United States, and around the world, we must ask a very simple question.

How did we get here? How did we get to a place in time where the health and well-being of the entire planet, and the lives of billions of people, is under enormous threat?

Top: Historic flooding in Ludlow, Vermont again devasted the state in July 2023. Image on left shows the raging expanse of water. To the right, vehicles are covered with the flooding waters over their rooftops. (Images courtesy of Keith Dewey); Left: Hawaii experienced historic wild fires that took at least 80 lives and destroyed much of Lahaina. Hawaii Gov. Josh Green (D) blamed the disaster to global warming: "Climate change is here, and it's affecting the islands". (U.S. Coast Guard photo, via Wikimedia Commons); Bottom: Lahaina after the fire. The roof of the old courthouse and interior structure is burned off. Behind it is the largest banyan tree in the United States, also scorched by flames. (U.S. Civil Air Patrol)

And the answer is not complicated.

The truth is that the scientific community, for many decades, has made it crystal clear that climate change — and all the dangers it poses in terms of drought, floods, extreme weather disturbances, and disease — is the result of carbon emissions from the fossil fuel industry.

As far back as the late 1950s, over 60 years ago, physicist Edward Teller and other scientists were warning executives in the fossil fuel industry that carbon emissions were "contaminating the atmosphere" and causing a "greenhouse effect" that could eventually lead to temperature increases "sufficient to melt the icecap and submerge New York." That's what they were saying 60 years ago!

In 1975, Shell-backed research concluded that increasing atmospheric carbon concentrations could cause global temperature increases that would drive "major climatic climactic changes" and compared the dangers of burning fossil fuels to nuclear waste.

Beginning in the late 1970s, Exxon — now ExxonMobil — conducted extensive research on climate change that predicted current rising temperatures "correctly and skillfully."

The fossil fuel companies knew.

They knew they were causing global warming and therefore threatening the very existence of the planet.

Yet, in pursuit of profit, fossil fuel executives not only refused to publicly acknowledge what they had learned but, year after year, lied about the existential threat that climate change posed for our planet.

So what happened to the CEOs who betrayed the American people and the global community? Were they fired from their jobs? Were they condemned by pundits on cable television and the editorial boards of major newspapers? Were they prosecuted? Did they go to jail for their crimes?

Nope. Not at all. Not a one of them. These CEOs got rich.

It's obscene.

When a criminal walks into a store and shoots the clerk behind the counter, we make the moral judgment that this behavior is socially unacceptable, and that the gunman should be punished.

When a public official misuses and steals taxpayer money, we make the moral judgment that the embezzler should lose his job and, perhaps, be incarcerated.

Yet, when fossil fuel executives make calculated decisions that are life-threatening to millions of people — or to the planet — we are told that "it's just business."

No. That's just not acceptable.

That is why, earlier this week, I sent a letter to Attorney General Merrick Garland urging him to bring lawsuits against the fossil fuel industry for its long-standing and carefully coordinated campaign to mislead consumers and discredit climate science in pursuit of massive profits. The letter was co-signed by Senators Merkley, Warren, and Markey.

Like the tobacco industry before them, the actions of ExxonMobil, Shell, and potentially other fossil fuel companies represent a clear violation of federal racketeering laws, truth in advertising laws, consumer protection laws, and potentially other laws - and the Department of Justice must act swiftly to hold them accountable for their unlawful actions.

More than 40 states and municipalities have filed lawsuits that seek to hold the fossil fuel industry accountable for their illegal campaign of misinformation around the global crisis of climate change.

The Department of Justice must join the fight and work with partners at the Federal Trade Commission and other law enforcement agencies to file suits against all those who participated in the fossil fuel industry's illegal conspiracy of lies and deception. The fossil fuel industry must begin to pay for the extraordinary damage they are causing.

Climate change is an existential threat to every person on earth. At every level, in every country, we must work aggressively to save the planet for our kids and future generations.

Let's go forward together.

In solidarity,

Bernie Sanders

Read the letter at https://bit.ly/Sanders_letter. ♻

Bernie Sanders. (sourcewatch.org)

EV Sales Continue to Soar, but a Surge in Production Could Lead to a Glut

Waiting lists may be a thing of the past for many EV models as automakers try to balance supply and demand. One outcome: lower sticker prices.

Dan Gearino

For years, many people who wanted electric vehicles had to get on a list and wait for months to take delivery—the result of demand that exceeded supply.

This equation is now changing. Automakers have increased EV production, and dealer lots have gone from a scarcity of options to, in some cases, a glut.

The shift to EVs needs to happen quickly if the United States and the world are going to make rapid progress in cutting carbon emissions. But we don't yet know how large the public's appetite is for electric vehicles, or whether auto dealers are ready to sell them in large numbers.

The stakes and the uncertainty can be overwhelming, but there are some encouraging signs.

In the first half of 2023, U.S. customers bought 556,707 electric vehicles, which was up 47 percent from the first half of last year, according to Kelley Blue Book.

EV market share was 7.2 percent of the U.S. market for cars and light trucks, which was up from 5.7 percent in 2022 and 3.1 percent in 2021.

Some indicators are less encouraging. One of them is how demand for some EV models is not keeping up with the growth in supply.

"While demand is increasing, production is increasing faster," said Michelle Krebs, an analyst for Cox Automotive.

This month, U.S. dealers have an average of 103 days of supply of EVs, which is roughly double the average of 53 days of supply of all models on the market, according to Cox Automotive.

This is a metric that considers how long it would take to run out of a model if the sales rate remains the same and no new inventory arrives. A good rule of thumb is that 60 days of supply is optimal. Note that the figures don't include Tesla or Rivian, since those companies' direct-to-consumer approach to sales limits the ability to collect data.

The Kia EV6, Nissan Leaf and Volkswagen ID.4 are among the EV models that have at least 120 days of supply.

One way dealers can stimulate sales is to cut prices, and that's happening for some EVs. Tesla and Ford are among the automakers that have reduced prices.

Ford said its price cut for the Ford F-150 Lightning is a response to gaining efficiencies from an increase in production and because of a drop in costs for battery materials. Pricing for the Lightning now starts at $49,995, down about $10,000 from before this month's price reduction. This number doesn't include a federal tax credit of up to $7,500, which is also true of the other vehicle prices we are listing today.

Tesla CEO Elon Musk said the price cuts were a response, in part, to rising interest rates. His company has had several rounds of price changes, most of them cuts. The Model Y, the country's top-selling EV, now has a base price of $47,490.

"As interest rates rise, the affordability of anything bought with that decreases, so effectively increasing the price of the car," Musk said last week in a conference call with analysts. "So, when interest rates rise dramatically, we actually have to reduce the price of the car."

His company has one of the most highly anticipated new models, the Cybertruck, which began production this week, but is not yet widely available.

Musk had this to say in the call about his expectations for Cybertruck sales: "Demand is so far off the hook; you can't even see the hook."

The Tesla Model Y and Model 3 have the top two spots on the U.S. sales chart for the first half of the year, far ahead of their closest competitors.

But as more companies introduce EVs and put marketing muscle behind them, Tesla is becoming less dominant than before. In the first half of last year, the company had about 70 percent of the U.S. electric vehicle market based on unit sales, according to Kelley Blue Book. This year, its share is down to about 60 percent, even though its sales have risen.

One of the models that's got our attention is the Chevrolet Bolt, which is in the middle of a comeback story. The model had a major battery recall in 2021 and a long pause in production, contributing to stretches of poor sales.

General Motors' Chevrolet brand, said in April that it was planning to discontinue the model, citing the need to retool the Bolt's factory in Michigan to build other EVs like the Silverado EV pickup.

Meanwhile, the Bolt was turning into a strong seller. The model more than tripled its sales in the first half of this year compared to the same period in the prior year, and it is now the country's third-highest selling EV.

This week, GM CEO Mary Barra said the company has changed its mind about discontinuing the Bolt. Instead of going away, the model will get a redesign that will include technology upgrades.

"Our customers love today's Bolt," she said. "It has been delivering record sales and some of the highest customer satisfaction and loyalty scores in the industry."

The company didn't say when the new Bolt would go on sale. The current versions are likely to stop production late this year, followed by a hiatus until the new design or designs become available.

The Bolt is an important vehicle in the EV market because of its relatively low price, with the subcompact hatchback version starting at $26,500 and the subcompact SUV version, called the "Bolt EUV," starting at $27,800. The model also has long range relative to the price, with a battery capable of going more than 250 miles on a charge.

And the Bolt is an example of an EV that is selling about as fast as dealers are getting them, with 30 days of supply for the hatchback and 23 days for the SUV, two of the lowest numbers in the market.

Krebs of Cox Automotive said to expect ups and downs as automakers feel their way through the shift to EVs.

"We have to understand this is the biggest transition in the history of the auto industry since Henry Ford made the moving assembly line," she said. "It is not going to be linear. There are going to be big bumps in the road."

Dan Gearino covers the midwestern United States, part of Inside Climate New's *National Environment Reporting Network.*

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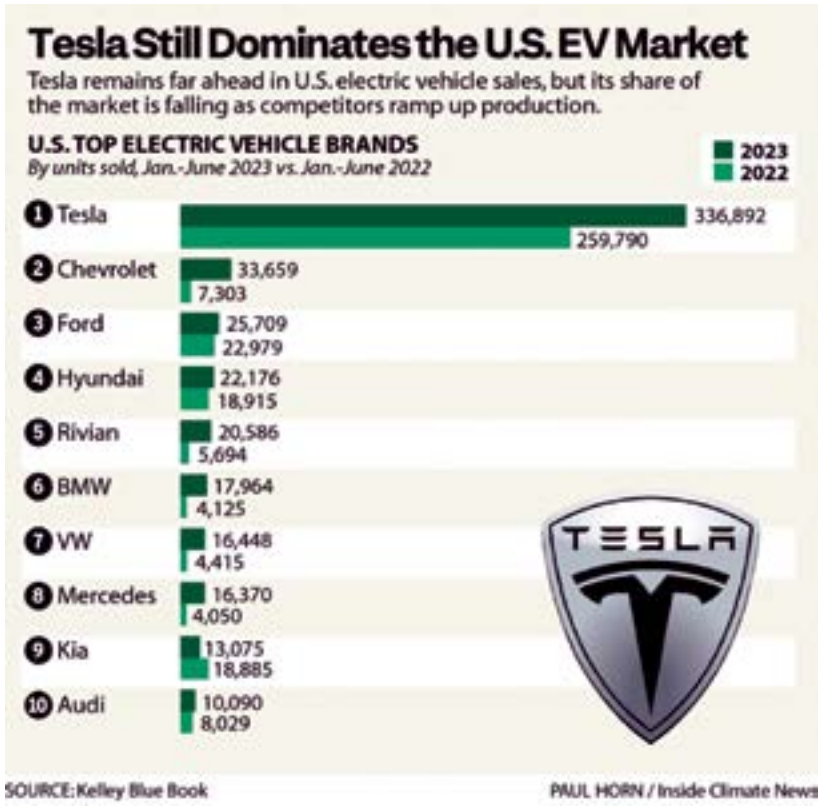


This is a celebration to bring awareness to the benefits of all-electric and plug-in hybrid vehicles. Events held around the country allow you to view and test-drive electric vehicles (EVs). You can view events at https://drive-electricweek.org/attend. Events in our region are noted below.

NEW HAMPSHIRE:

Exeter, Sat., Sept 23 at 10:00 am - 2:00 pm, Unitil offices.

Concord, Sat., Sept 23 at 9:00 am - 1:00 pm, City Plaza NH State House.

Drive Electric Expo at **Monadnock** Clean Energy Fair, Sat., Sept 30 at 11:00 am - 2:00 pm, Community Center, Peterborough.

Upper Valley EV Expo, Sat., Sept 30 at 10:00 am - 3:00 pm, behind Lebanon City Hall, off Flynn St.

MAINE

South Paris, Sat., Sept 30 at 12:00 - 4:00 pm, Oxford Hills Comprehensive High School.

Wells, Sun., Sept 10 at 1:00 - 4:00 pm, Wells Public Library

VERMONT

Bethel Community Forward Festival, Sat., Sept 23 at 10:00 am - 3:00 pm, Main Street parking lot.

Bennington, Sat., Sept 30 at 10:00 am - 1:00 pm, Hilltop Farm Store, Pownal.

Johnson, Thurs., Sept 28, VEC Headquarters.

South Burlington, Sat., Sept 30 at 10:00 am - 2:00 pm, City Hall.

NEW YORK

Schenectady Sun., Oct 1 at 10:00 am - 2:00 pm, Greenmarket. ♻

The Standardization of Tesla's Supercharger Technology

HOW TO MAKE EV CHARGING MORE EFFICIENT

Beatriz Olivieri

When most people think about electric vehicles (EVs), Tesla immediately come to mind, which makes sense given that Elon Musk's company has the largest EV charging network in North America, with 2,050 stations and over 22,000 plugs, 12,000 of those in the United States. To help paint the picture, according to the U.S. Department of Energy, there are 36,000 EV charging plugs in the United States. Even though most EV owners charge their cars at home, one of the main concerns regarding EVs is the charging speed, especially when discussing long-distance traveling. This scenario is where Level 3 charging, DC fast charging, becomes ideal as it draws direct current (DC) off the grid and allows you to get from 20% to 80% (charge level) in about half an hour, depending on your vehicle. As of July 2023, there are 32,000 publicly available DC fast charging stations, a ratio of 72 cars per charger (Kessler, 2023). Most EVs except Tesla are manufactured with the Common Charging Standard (CCS), the shape of the charging connector used for DC fast charging.

Supercharger: Image: (http://blogg.sundhult.com/)

Tesla has developed what they call "Supercharger," a 480-volt direct-current fast-charging technology, which allows you to charge your car for a range up to 200 miles as quickly as fifteen minutes. Currently, the American EV giant owns and operates more than 45,000 Superchargers globally that are available to customers 24/7 through major routes near convenient amenities. Nevertheless, Superchargers use proprietary charging plugs meaning that non-Tesla EVs cannot access such technology. As mentioned, Tesla has its own ports, the North American Charging Standard-NACS. Ultimately, getting connected is a crucial point of the universalization of EV charging and the further adoption of EVs. Tesla has announced the development of "Magic Docks" to democratize access to Supercharger technology. What is there to know about Tesla's Magic Docks? Retrofitting the existing charging location with a new adapter makes it possible for a non-Tesla EV to plug in. In such a manner, Magic Dock stations can serve both Tesla owners and other EVs through the Tesla app, which opens up a CCS adapter. We are looking at 7,500 Supercharger Magic Docks stations to be open for more EVs by the end of 2024 (Motavalli, 2023).

Simultaneously, multiple manufacturers such as General Motors, Ford, Polestar (Volvo's EV exclusive brand), Rivian, and Volvo are set to adopt NACS by 2025. What is being called "the great NACS migration" reinforces the commitment to an all-electric future. As General Motors CEO Mary Barra announced, "the better experience people have, the faster EV adoption will grow" (Kessler, 2023). Moreover, the venture of the seven of the world's leading automakers to accelerate EV adoption is also related to enhancing the customer experience with comfort and well-being features such as "restrooms, food service and retail operations either nearby or within the same complex" (Kessler, 2023). Looking ahead, making this manufacturing switch will allow customers to access the Tesla Supercharges that are Magic Docks. While Magic Docks seems like a promising idea, the current EV owner from the famous "Plug and Play EV" YouTube channel highlights how not one of the eight Tesla stalls worked for me, claiming it was the least successful charge session in seven years of EV driving. Alan Lau and Amir Saidi from MotorTrend had similar issues with a low success rate. Also, they brought to attention that there are challenges related to EVs having different charging ports' positions from Tesla models, which leads to how-to- park problems.

As the United States aims to reach net-zero emissions no later than 2050, the electrification of our fleet will be a crucial step toward this achievement. To pursue this goal the Bipartisan Infrastructure Law (BIL) was enacted as the Infrastructure Investment and Jobs Act (IIJA) on November 15, 2021, and established the National Electric Vehicle Infrastructure Formula Program and the Charging and Fueling Infrastructure Discretionary Grant Program. The US government is looking to have by 2030 more than 500,000 EV chargers available to the public ensuring a more reliable, affordable, and equitable experience for all EV users. With the right incentives and policies in place, US industries can become a global reference in transportation electrification efforts creating new business opportunities in the country. Regionally, in New Hampshire, there appears to be little guidance about EV targets needed to meet decarbonization goals as of now. In conclusion, as demand and public attention gravitate towards this topic, we expect a lot of innovation and improvement in the constant-growing field of electric vehicles.

Notes and source links available with the posting of this article on our website at www.greenenergytimes.org.

Beatriz Olivieri, a native of Rio de Janeiro, Brazil, is deeply passionate about the intersection of climate and energy. With an MS degree in Sustainability Science, she is currently serving as a Sustainability Fellow at Green Wave Electric Vehicles this summer, Beatriz is actively reshaping the organization's internal practices with the goal of ingraining sustainability into its very DNA. ♻

Trucking's Solution to Climate Change

Roddy Scheer and Doug Moss

While no one likes to see companies fail and people lose their livelihoods, some environmental advocates do see the recent collapse of Yellow Trucking as a way to force the industry down a greener path. After all, the transportation sector is the largest U.S. carbon dioxide (CO_2) polluter, generating 20 percent of all domestic emissions. The freight trucking sector alone is responsible for roughly half of that. Given the slowness of trucking to adopt greener fuels, drivetrains and operations, environmental advocates see a lot of low-hanging fruit for reducing transportation's carbon footprint.

What can trucking do to start becoming part of the solution to climate change? The obvious place to start is the adoption of electric vehicles (EVs). There is no reason the same technologies now so widespread for passenger cars can't be implemented at a scale for trucks, too. Indeed, Tesla is showing the way with the recent roll-out of its all-electric "Semi," currently in use by a handful of major corporations and soon to be more common on U.S. highways. To that end, Tesla recently applied for $100 million in grant funding to develop a recharging infrastructure for EV trucks traveling between Texas and California. Tesla isn't alone in trying to electrify trucking: At least 17 other manufacturers (e.g., BYD, Mercedes-Benz, Freightliner, Volvo, Tata) are competing for pieces of the EV truck pie.

Environmentalists are hopeful that the Tesla Semi is the first of many different types of electric trucks plying America's highways and byways in the near future. (Steve Jurvetson, FlickrCC)

Besides a wholesale move to EVs, there's a lot we can do to "green" truck operations. Encouraging the use of alternative fuels such as natural gas and biodiesel where applicable is a no-brainer. Meanwhile, enhancing the aerodynamics of trucks and trailers can reduce fuel consumption and emissions. Installing technologies like side skirts, boat tails and better tires can make a big difference in fuel efficiency.

Another way to green trucking is to implement so-called "smart logistics"—using advanced technology for route planning and load optimization to reduce fuel consumption and emissions. Likewise, providing training to truck drivers on fuel-efficient driving practices and rewarding drivers for fuel-efficient behaviors can lead to significant fuel and emission savings. Employing real-time monitoring and data analytics to track fuel consumption, emissions and operational efficiency can help identify areas for improvement and further optimize trucking operations. And promoting freight consolidation and intermodal transportation—combining multiple modes such as rail and truck—can reduce emissions by shifting some of the freight transport load to greener modes like rail, thus reducing the trucks on the road.

In 2022, the Biden administration unveiled strict standards on emissions from trucks, vans and buses starting in the 2027 model year, the first update to clean air standards for heavy-duty vehicles in more than 20 years. Environmental advocates see this as a long time coming and still not enough—and the trucking industry is challenging the new regulations, claiming they are too onerous. We'll see how things shake out for the trucks of the near future when the dust settles in this fight over regulations.

Roddy Scheer and Doug Moss produce EarthTalk®. Read more articles online at https://emagazine.com. ♻

Renewed E-Bike Subsidies for Vermont Residents

The State of Vermont is offering a limited-time incentive program to consumers for the purchase of eligible electric bicycles. The incentives are available to eligible Vermont residents on a first-come, first-served basis contingent upon funding availability. Consumers will apply to receive a prepaid debit card with the incentive amount to be processed by a participating e-bike retailer. This program was reauthorized with $150,000 through the 2023 Budget Adjustment Act and FY2024 transportation bill (H. 479). Learn more at https://bit.ly/ebike_incentives. ♻

Upper Valley Transportation Center Receives Two Energy Efficiency Awards

V-shaped roof design allows for rainwater collection and maximizes solar collection. The building is oriented to take advantage of the site's southern exposure. (Black River Design Architects)

Tri-Valley Transit is proud to announce that the Upper Valley Community Transportation Center (UVCTC) in Bradford, VT designed by Black River Design, Architects has recently been awarded an Efficiency Vermont Small New Construction Best of the Best award and a Net-Zero Award and Vermont Green Building Award from the Vermont Green Building Network in the non-residential/commercial/multi-family category.

The UVCTC is the newest net-zero-electric and fossil-fuel-free home for Tri-Valley Transit and is located adjacent to the Bradford Park and Ride, just off Interstate 91. The project includes drive-through bus storage bays, a bus wash with rainwater collection system, and administrative offices including a conference room and driver break room.

"Improving environmental health is at the core of TVT's mission," said Jim Moulton, Executive Director, Tri-Valley Transit. "We know public transit is better for the environment than driving alone, and by investing in features to make the Upper Valley Community Transportation Center more efficient we have been able to further our commitment to reducing our environmental impact."

Those features include a tight building envelope and a wood-pellet-heated radiant floor slab in the bus storage bays to keep buses above freezing between routes. Rainwater collected from the roof is stored in an underground tank and is used to wash buses. Clerestory windows provide natural daylight and rooftop and ground-mounted solar arrays produce approximately twice the electricity the facility currently uses. The surplus electricity is currently helping to power other TVT locations, and in the near future, it will be used for charging new electric buses.

In the administrative wing, windows provide natural daylight which is supplemented by energy efficient LED light fixtures. Air source heat pumps warm or cool the space and low embodied carbon materials were selected wherever possible, within the limitations of the budget. Some choices that were made include wood framing in the office wing, instead of steel, and polished

Cont'd on p15

MEET YOUR SOLAR INSTALLER

SOUTH PACK SOLAR

PETERBOROUGH, NEW HAMPSHIRE

George Harvey

South Pack Solar (SPS) is a solar installer in Peterborough, New Hampshire. There are several things about the company that set it apart, and for some people it will be very worthwhile to take a look at what they are.

The company is one of the older solar businesses in New Hampshire. It was founded as Gregory Blake Consulting in April 1998, but in time the business came to focus on solar photovoltaics (PVs). In 2011 its name was changed to reflect this, and it became South Pack Solar (SPS).

Much of the work SPS does is in the Monadnock region of New Hampshire, where it has installed over 300 systems. Together, those systems represent 1.5 megawatts of solar PVs. It has also taken on more than 300 installations in other regions of the country. Typically, the company works on thirty to forty systems per year.

Thirty to forty installations per year does not make SPS a big business. Blake explains this by saying, "This relatively small scale allows us to take the necessary time to design and construct the best built and best value system for our customers using the appropriate technology for the particular site." He calls the business model used by large competitors as a "cookie-cutter approach" and makes it clear the distinction between that and his strategy of careful design and construction.

Blake's business model is unusual in other ways, as well. The people he works with are not an ordinary set of employees. To start with, Blake is a Solar Energy International Solar Professional, which certifies the highest level of competence. Beyond that, it seems that several of the people who work at SPS are masters in their own right. Importantly, Bob Gesick is a Master Electrician, certified in New Hampshire. Others who can be called in to add their own skills on a project include Tim and Andrew Rousseau, of Rousseau's Custom Carpentry; Sean Macy, owner of Frost Pond Carpentry; Josh Kennedy, owner of Josh Kennedy Custom Builder, LLC, Seth Kallman (Kallman Creek), Andy Jenks (Wind Blown tree & Tractor); and Rick and Bodie Swain, Tim Hopkins and Joe Bernstein. Altogether, about thirteen local craftsmen could be called in for any given installation, though not usually more than four at any one time.

It is evident that Blake wants his designs for solar systems to be executed to the highest standards. Also clearly, to achieve that level, the standards must apply not only to craftsmen, but also to the materials used. "We use only the best components including Enphase Energy, Fronius, Schneider and modules listed on *Bloomberg Business*' Tier 1 list. Exclusively Ecofasten rail-less roof mounting and ground mounts supplied by MT Solar and Preformed. Ground mounts offerings include pole mount, ballasted, pounded I-beam configurations."

Of special interest, SPC is not a growing business, and there is a good reason for that. Blake said it is "intentionally compact in order to remain nimble and efficient and best serve its local customers." Because of this, he depends largely on word-of-mouth referrals, and very limited, local advertising. (We at *Green Energy Times* are proud to have his advertising in our publication – the ad in this issue can be seen at page 8.)

Blake has said, "It is our firm belief that concentration on solar has allowed us to become very proficient at what we do. We are not distracted by the need to become acquainted with solar hot water, energy audits, insulation technology, heat pumps and all the other services that our competitors offer. Our position is that trying to be everything to everybody accomplishes only mediocrity." Inevitably, there will be some customers who want more, and when that happens, SPS refers them to other local contractors who specialize in those areas.

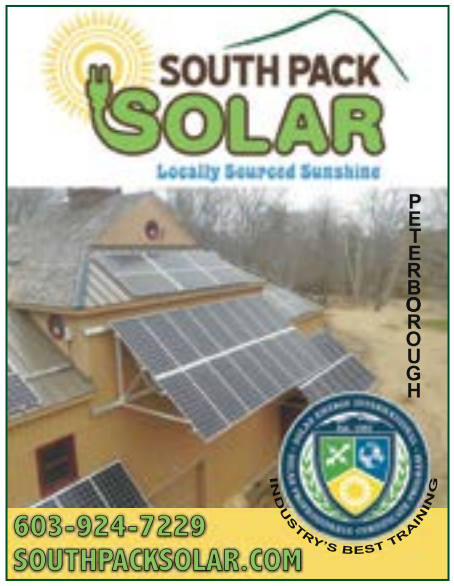
We should mention that though SPS restricts itself to installing solar systems, its abilities in that area are broad enough that it can include just about anything relevant to solar PVs. So, for example, SPS installs batteries, both for backup and in fully independent off-grid systems.

Also, the company encourages customers who want to take on some of the construction work themselves. Blake has noted that such work not only can reduce the customers' costs, it can "provide them with the sense of accomplishment and pride that only comes with having helped build their own array!"

Perhaps, considering how different the South Pack Solar business model is, we should not be surprised that it does not have a "brick and mortar storefront." It has a Peterborough warehouse of 4,500 square feet, which it uses to receive, store, and distribute all sorts of components. Gregory Blake can be contacted at (603) 491-5158 or emailed at greg@southpacksolar.com.

Learn more at the South Pack Solar website at www.southpacksolar.com/. ♻

Clockwise: Top left: A 9.6kW DC roof mount in Hancock, NH with a Ecofasten rail-less mounting and Fronius Primo string inverter; Rooftop solar with custom awning system in New Ipswich, NH. South Pack Solar installed 54 nodules on the barn with three Fronius inverters; Cranberry Meadow Pond Inn's 52kW DC ground-mount solar arrays in Peterborough, NH. Array consists of MT Solar multi-pole mounting; (1) 50 module and (2) 40 module mounts with (4) Fronius Symo (3 phase) string inverters. The point of connection is 850 feet away from the array with a power house in between housing the inverters. (Courtesy photos).



REV's Renewable Energy Myth-Busting Series:

Solar Module Materials and Disposal

Jonathan Dowds, Deputy Director, Renewable Energy Vermont

As Renewable Energy Vermont (REV) continues its public education and outreach on the need to move Vermont off of fossil fuels and onto renewables, we are frequently confronted with misinformation about the impact of moving to a fossil-fuel-free energy future.

This article will address one of the leading bad facts topics REV is currently hearing and its rebuttal.

What about the toxic runoff from solar panels both when in operation and after they are no longer in use? REV rebuttal: solar module materials and disposal

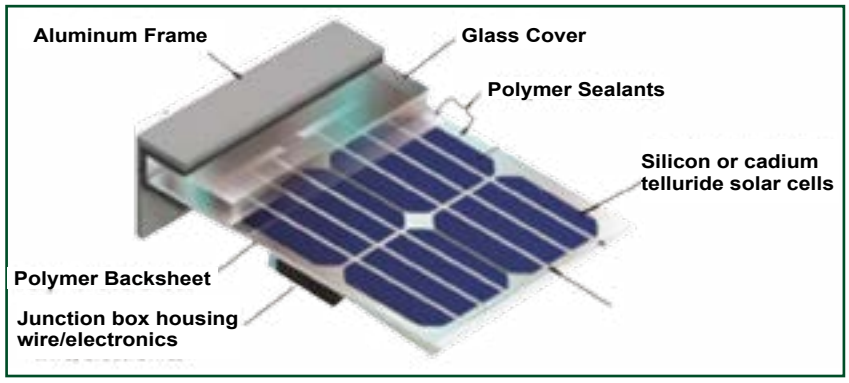
Summary:

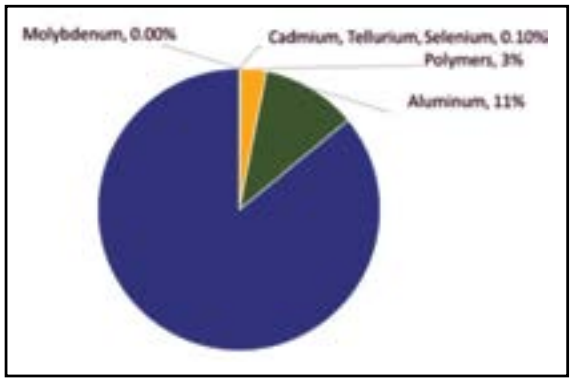
Solar modules consist primarily of glass and aluminum and are tightly sealed to protect the solar cells from dust and moisture. Modules can contain environmentally sensitive materials such as lead, cadmium, selenium, and silver in semiconductors and electrical contacts. Analysis conducted by the International Energy Agency found that even in a worst-case disposal scenario – with broken panels exposed to acidic conditions in an unlined landfill – levels of lead, cadmium, and selenium were at least an order of magnitude below the EPA's health screening values in the soil, air, and water. Federal agencies, industry groups, and Vermont stakeholders, led by REV and the Agency of Natural Resources, are all working to expand reuse and recycling opportunities for solar modules.

What's in a Solar Module?

Glass and aluminum constitute the vast majority of the material in a solar modular – 97% of the module's total mass. Most solar cells are made of silicon but some are made with cadmium and other materials. Lead, cadmium, selenium, and silver can all be found in solar modules and can present health and environmental hazards.

Do Solar Modules Pose Risks to Human Health?





Solar module structure and composition. Adapted from the Solar Energy Technologies Office Photovoltaics End-of-Life Action Plan.

The International Energy Agency has examined the potential human health impacts of solar modules that break while installed and after modules have been disposed of in a landfill.1,2 Both of the assessments looked at worst-case scenarios – rainwater leaching through broken panels at a solar facility and broken panels exposed to acidic conditions in an unlined landfill (which are illegal in the United States) – and reported that levels of lead, cadmium, and selenium released under these conditions where below the EPA's safety thresholds. While this analysis is not a comprehensive study of all of the materials used in solar modules, based on these reports, the National Renewable Energy Labs concluded that panel breakage and disposal did not motivate concerns from a toxicity/hazardous materials perspective.3

What is a Solar Module's Life Expectancy (and what happens when they cease to operate)?

Solar panels are typically warranted for 20 to 25 years. Many solar panels continue to operate well beyond this warranty period. Nonetheless, as the rate of solar installation grows, there is increasing interest in how to manage solar panels after they are decommissioned to ensure that valuable materials are reused and landfilling is minimized. The current waste streams from solar are very small, but they are projected to grow significantly. Even as far out as 2050, solar modules will constitute a small fraction of the electronic waste that we will need to manage.

Federal and Industry Recycling Initiatives

The federal government has invested heavily in bringing down the cost of solar module recycling and removing other barriers to recycling. In 2022, the Department of Energy released an "end-of-life action plan" that includes additional data collection on module components and research into solar recycling technologies with a goal of reducing recycling costs by more the 50% by 2030. The National Renewable Energy Laboratory has also been studying barriers to solar module recycling and identified regulatory uncertainty and variability from jurisdiction to jurisdiction as a challenge for recycling. REV supports a federal policy approach, such as extended producer responsibility law, to encourage module recycling.

Other barriers to recycling are the cost of transporting panels and low prices for recycled glass. The Solar Energy Industry Association is working to develop networks for aggregating panels from multiple sites and to grow downstream markets for recycled materials to address these barriers.

REV and VT ANR Recycling Initiatives

Renewable Energy Vermont (REV) and the Vermont Agency of Natural Resources (ANR) are collaborating to host a discussion series among stakeholders in the renewable sector, waste management, and state government to explore end-of-life disposal for solar power and battery storage equipment in Vermont with the goal of developing best management practices for solar modules in Vermont.

[1] P. Sinha, G. Heath, A. Wade, K. Komoto. (2019) Human health risk assessment methods for PV, Part 2: Breakage risks, International Energy Agency (IEA) PVPS Task 12, Report T12-15:2019. ISBN 978-3-906042-87-9.

[2] P. Sinha, G. Heath, A. Wade, K. Komoto. (2019) Human health risk assessment methods for PV, Part 3: Module disposal risks, International Energy Agency (IEA) PVPS Task 12, Report T12-16:2020. ISBN 978-3-906042-96-1.

[3] Curtis, Taylor, Garvin Heath, Andy Walker, Jal Desai, Edward Settle, and Cesasr Barbosa. (2021) Best Practices at the End of the Photovoltaic System Performance Period. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5D00-78678.

This blog was originally posted on April 7, 2023 at https://bit.ly/GET_myths_debunked. ♻

Low-to-moderate-income Solar Projects Awarded Funding

Hadley Barndollar

This June, the NH Executive Council approved funding for four solar projects that will benefit low- to-moderate-income residents in Laconia, Newmarket, Weare, and the Center Harbor area.

Councilors approved close to $1 million from the Department of Energy's (DOE) Renewable Energy Fund, which supports thermal and electrical renewable energy initiatives. State statute requires that the department provide no less than 15% of REF funds annually to benefit low- to moderate-income residential customers.

The following four projects, benefiting a total of 61 households, were awarded funding:

1. Laconia Area Community Land Trust Inc., doing business as Lakes Region Community Developers, received $124,748 to work with a developer to install and operate solar photovoltaic systems interconnected to eight nonprofit-owned affordable housing units in Laconia. The systems will provide electricity to the tenants of the buildings, and each household will save an estimated $776 a year as a result.

2. The Newmarket Housing Authority received $370,188 to install 22 separate rooftop solar arrays. The project will benefit 21 residential units and an office building. Households will receive on-bill credits on residential electric bills as a result of the solar arrays, and save an estimated $916 per year.

In 2020, Lake Region Community Developers installed solar panels on some of its Pine Hill duplexes in Laconia, NH. (Courtesy of LRCD)

3. The Plymouth Area Renewable Energy Initiative received $109,000 to install a ground-mount solar array to benefit low- to moderate-income residential electric customers in Center Harbor, Moultonborough, Holderness, and Sandwich. Part of a program called "NH Solar Shares," households will receive a "solar share" credit on their electric bill, which is expected to reduce monthly bills by $31 to $34. The project is being done in collaboration with the New Hampshire Electric Cooperative, which will provide the direct on-bill credits. A community solar "garden" will be developed at the Lakes Region Conservation Trust, and an educational solar trail around the array will link to a walking trail on conservation property.

4. The Regenerative Roots Association, a Nashua-based organization focused on resilient local food systems, received $375,000 to work with a developer to design and build a community solar project on land it owns in Weare, to ultimately benefit low- to moderate-income residential electric customers. Under the state's Group Net Metering Program, the Regenerative Roots Association will serve as the host and 15 households will be members receiving on-bill credits. RRA will retain 15 percent, and 75 percent of the 85%generation revenue will go directly to participants' residential electric bills. Households are expected to save an average of $1,388 annually.

With new funding from the DOE, the entity will be installing more at other affordable housing sites.

Reprinted with permission from New Hampshire Bulletin. *Originally posted on June 15, 2023 at* https://nhbulletin.com/solar-projects--funding/

Hadley Barndollar covers climate, energy, environment, and the opioid crisis for the New Hampshire Bulletin. *Previously, she was the New England regional reporter for the* USA TODAY *Network and was named Reporter of the Year by the New England Newspaper and Press Association. Email:* hbarndollar@newhampshirebulletin.com. ♻

Portable Power When and Where You Want It

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

We never know when power is going to go out, but rest assured, it will. Planning for that time is probably a good idea.

Just this summer alone there have been many emergencies from storms, hurricanes, tornadoes, and flooding, and in other places, volcanoes, typhoons in the news almost daily. "This is the new norm" as New York Governor Kathy Hochul said, when addressing the flooding and devastation in the Hudson River valley. "Climate change is here and things are only going to get worse." We need to build resilience and be ready for the worst events.

It's important to take precautions so that you and your household can remain safe when the power does go out.

I had the opportunity to test an Outlaw 1072s 1000W Lithium Power Station (LiFePo4) made by RELiON Battery this spring and summer. The batteries from this company are one of the most long-lasting and reliable energy sources on the market, powering anything including camping, RVs. marine, industrial, commercial equipment and off- or on-grid power storage in your home, or as emergency power – without the unhealthful fumes and noise of a fuel-powered generator.

(1)

However, the Outlaw 1072s is also versatile and can also power the essentials while camping in an RV or tent, tailgating, hunting as well as during emergency outages as a backup power source.

The portable unit supplies 921 watt-hours, equipped with 1,000 watts pure sine wave inverter capable of a 2000W peak surge. It has 3500-plus lifecycles, BMS voltage protections so you can power portable cooktops, mini-refrigerators and lights, recharge laptops and other electronic devices.

(2)

The front panel (1) on the unit features a large LCD screen which displays run time in and out so you always know how much power you are using and how much is remaining.

One of the biggest advantages of the 32# unit is the wide range of power options including three USB Type A ports and two USB Type C Ports for charging smart phones and tablets on the front side.

The back side (2) also has two DC outputs along with a DC power button and two 120V wall outlets. Here you find a 12V car port, a quick charging port which can charge the unit in two to-three hours using the supplied charger capable of 30 amps. It also has AC outlets, input DC charger port and AC power button.

The unit comes with a 10-amp charger, power cord, EC5 Plug, power adapters, power extension cable, and an MC4 Solar to DC Charger adapter for attachment to a solar panel. A hard case keeps them all together.

The solar adapter makes it easy to pair with two solar panels up to 160W, 15-25 volts giving you the option to use the plugs for charging or using solar power. The higher the wattage of the solar panel the faster the charge time. You can also use the charger to fully recharge from empty in six to-eight hours.

I used the unit off the grid to pump water from a pond to my garden beds early in the season and to run equipment such as a shop vac, saws, drills and to re-charge batteries for the electric mowers.

The Outlaw 1072S unit is lightweight and is low maintenance. The portable power station has a sturdy top handle that makes it easy to grab and go making it a convenient backup power option in an emergency and for other situations. Unlike a generator, it is quiet and doesn't release gas or fumes. It can be used to charge a variety of appliances, such as lamps, laptops, phones, small heaters, a radio, or television that you could have in your emergency kit.

The 1000W Lithium Power Station (LiFePo4) sells for $1099.95. Order it online with free shipping at https://www.relionbattery.com/outlaw-1072s.

RELiON also has full home battery options for off and on-grid storage offering total assurance that you will have power when the grid goes down. Learn more at www.relionbattery.com. ♻

Never Change a Remote's Batteries Again!

Martin Wahl

Low-light photovoltaic cells are able to utilize ambient (low lux-level) light to generate electricity. That power can drive devices directly or charge rechargeable batteries in lower-power devices, such as remote controls, sensors, e-readers like Kindle and NOOK, and Internet-of-Things (IoT) including smart home devices.

Mill Valley, California-based Ambient Photonics has received $31million in funding to build a fabrication facility in Scotts Valley, California to manufacture low-light photovoltaic components for device manufacturers to incorporate in their products.

Why is this a breakthrough?

Sunlight covers a broad range of wavelengths on the electromagnetic spectrum; traditional silicon solar cells readily capture shorter wavelength photons that have more energy than those with longer wavelengths.[1] Sunlight is bright enough (between 1,000 and 100,000 lux) that silicon cells can harvest significant energy; ambient (typical indoor room) light is dimmer, however, between 50-100 lux, so photoelectric cells must harvest energy from a broader array of wavelengths to be effective, including LED, fluorescent, incandescent and diffuse natural light.

What does dye have to do with it?

Dye-sensitized solar cells (DSSC) use materials such as titanium dioxide to generate power. Titanium dioxide on its own does not readily absorb light, so it must be coated or "doped" with darker colored dye to capture the photons.[2] The electrons in the dye, excited by the photons, move through the titanium dioxide layer (the photoanode) providing electromotive force. Meanwhile, electrons return to the electrolyte via the counter electrode replacing the electrons that left the dye/titanium dioxide layer, completing the circuit.

The explanation of how and why solar cells work is beyond the scope of this article, involving among other things the movement of electrons and "holes" through transistor and electrolyte materials. DSSCs were first developed in the 1980s but had limited life and power output. Ambient Photonics describes the secret ingredient (their intellectual property) that allows them to solve the dilemma:

"The Ambient team has developed more than 40 novel, organic sensitizer molecules used to create groundbreaking proprietary dyes tuned for low light conditions which absorb light across the entire visible electromagnetic spectrum for the highest possible efficiencies."[3]

Ambient claims that its low-light technology, harvesting energy from across the light spectrum, generates as much as three times more power than previous technologies.

What is the significance from a green energy perspective?

As Ambient Photonics points out in their Technology Overview, German battery manufacturer Varta estimates that a triple-A battery has a lifetime greenhouse gas (GHG) emission equivalent of 61 grams of CO2. Most remotes require two such batteries with approximately a one-year lifetime. If each remote has a lifetime of seven years, and about 225 million TV sets are shipped each year, the annual CO2 equivalent avoidance would be 192,150 metric tons. Statista estimates that there are 1.72 billion TV households worldwide, estimated to exceed 1.8 billion by 2026. Note that in the U.S. it is estimated that there are about 2.9 TV sets per household, so this is a growing issue.

AAA BATTERY CO2 EQUIVALENCE

ghg per AAA battery	61 g CO2
Batteries per remote control	2 batteries
Battery life with average remote control use	1 year
Average remote control lifespan	7 years
Number of lifetime batteries per remote control	14 batteries
Number of televisions shipped in 2020	225 million TVs
Batteries eliminated each year	3.15 billion batteries
Annual CO2 avoidance	192,150 metric tons

(Ambient Photonics)

Another real-world example of the use of low-light PV cells is Ambient's partnership with E Ink to co-develop next-generation electronic shelf labels (ESLs) used in brick-and-mortar stores. Today's ESLs are read-only price tags that help retailers avoid the hassle of managing paper tags, but the small batteries inside these ESLs limit retailers to only a handful of daily pricing updates and constrain ESL functionality. With low-light PV cells, ESLs can become battery-free, connected devices with expanded functionality that eliminate the operational expense and design constraints of batteries with fixed power.

With Ambient's PV cells, ESLs will transform into connected sensors that generate dynamic customer data from the physical retail environment, enabling smarter merchandising decisions that drive sales and improve consumer experiences.

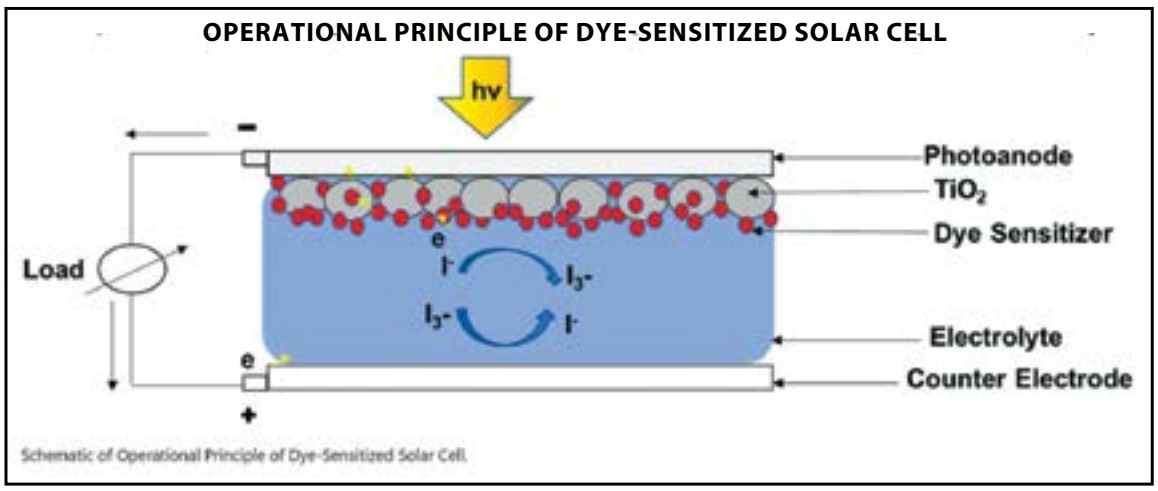
Bates Marshall, CEO and Co-founder of Ambient Photonics said, "… as electronic shelf labels begin to see broader adoption, the impact of millions of discarded batteries is increasing. Our partnership with E Ink will reduce this environmental impact, while enabling a new breed of dynamic retail displays that businesses will utilize to optimize the retail experience without generating toxic battery e-waste."

[1]*Max Plank and Albert Einstein* explained why *shorter wavelength light contains more energy in the early 1900s, as part of the understanding of light's behavior as both a particle and a wave.*

[2]*This is not the first time synthetic dyes have played a role in technology development: Major chemical companies including BASF, Bayer, ICI, Ciba-Geigy and IG Farben ("farben" = "colors" in German) got their starts developing dyes for the textile industry.*

[3]*From Ambient Photonics' Technology Overview*

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. ♻



Schematic from James, S., Contractor, R. Study on Nature-inspired Fractal Design-based Flexible Counter Electrodes for Dye-Sensitized Solar Cells Fabricated using Additive Manufacturing. Sci Rep 8, 17032 (2018). https://doi.org/10.1038/s41598-018-35388-2

THE SUN DAY CAMPAIGN NEWS

Solar and Wind Providing Majority of New Generating Capacity in 2023

Sun Day Campaign, August 8, 2023

Based upon a review by the SUN DAY Campaign of data newly released by the Federal Energy Regulatory Commission (FERC), utility-scale solar and wind provided the majority of new U.S. electricity-generating capacity added in the first half of 2023.

In its latest monthly "Energy Infrastructure Update" report (with data through June 30, 2023) FERC reports that of the 17,017-MW of new generating capacity placed in service during the first half of 2023, 5,867-MW (34.48%) came from solar and another 2,750-MW (16.16%) from wind for a combined total of 50.64%. Including new capacity from hydropower (254-MW), geothermal (44-MW), and biomass (30-MW), the mix of renewables accounted for 52.57% of the new generation added. Most of the balance came from 8,025-MW of natural gas (47.16%). The rest was comprised of 16-MW of new oil capacity and 31-MW of waste heat.

The new solar capacity added between January and June was more than that for the first half of any prior year reported by FERC. Utility-scale solar is now 6.97% of total available installed generating capacity. Wind is another 11.62%. Taken together, the mix of all renewables now accounts for 28.06% of the total. A year earlier, it was 26.74% while five years ago it was 20.67%. Thus, renewables are adding about 1.5% each year to their percentage share of the nation's generating capacity. And that growth may be accelerating.

Over the next three years (i.e., by June 2026), FERC anticipates "high probability additions" of solar to provide another 81,284-MW while wind is expected to expand by 19,734-MW. Assuming that materializes, in three years, solar and wind combined would provide over a quarter (26.01%) of U.S. generating capacity. Wind would account for 12.41% of installed capacity while utility-scale solar would provide another 12.60%. That is, installed solar capacity is poised to overtake that of wind within three years, making it the largest renewable source by capacity. And that does not include generating capacity provided by small-scale, distributed (e.g., rooftop) solar. [1]

In three years, solar and wind will add 101GW of capacity. (www.australiansolarquotes.com.au)

Factoring in FERC's forecasts for hydropower, geothermal, and biomass, renewable energy sources would expand from today's 28.06% of installed generating capacity to 33.99% - i.e., over a third - by June 2026.

For perspective, utility-scale solar's share of U.S. generating capacity by June 2026 could be more than four times that of oil (2.68%), substantially greater than that of nuclear power (7.58%), and nearly equal to that of coal (13.95%). [2]

Solar and wind's share of U.S. generating capacity could actually be substantially higher if new capacity exceeds FERC's forecast of "high probability additions." The agency indicates that the amount of solar and wind in the three-year pipeline could be nearly three times higher than the total of the "high probability additions". Solar could add 214,563-MW while wind could grow by 66,286-MW.

Moreover, recent history suggests that solar and wind growth is outpacing FERC's predictions for "high probability additions." A year ago, FERC forecast "high-probability additions" for wind and solar within three years of 17,225-MW and 66,315-MW respectively. FERC's latest 3-year outlook for those sources is now more than a fifth (20.9%) higher.

Meanwhile, if just FERC's "high probability" forecasts materialize, by June 2026, installed U.S. fossil fuels' share of total capacity will drop significantly: natural gas - 41.65% (from 44.41% in June 2023), coal - 13.95% (from 16.43%), and oil - 2.68% (from 2.87%). Nuclear power will also fall from 8.06% today to 7.58% in June 2026.

"Solar and wind combined continue to add more new capacity to the nation's electrical generating mix than any other energy source," noted the SUN DAY Campaign's executive director Ken Bossong. "Within three years, they will each account for over an eighth of U.S. generating capacity while the combination of all renewable sources will be over a third."

Source links and notes can be found at: https://cms.ferc.gov/media/energy-infrastructure-update-june-2023. For the information cited in this update, see the tables entitled "New Generation In-Service (New Build and Expansion)," "Total Available Installed Generating Capacity," and "Generation Capacity Additions and Retirements."

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

A Tale of an Off the Grid Solar Home

Larry Plesent

Tipi living is not conducive to keeping a straight job. And after four plus years of living in one, even a large well-appointed one sited on a large deck in the woods, we knew it was time to build a more permanent home. We built a small log house, warm and tight. It is heated almost entirely with wood harvested from our property. A Defiant wood stove stands near the center of the house, and a rebuilt 1929 Glenwood cook stove holds court in the kitchen. A rarely used gas heater is there for back up when we go away for a bit.

Author's home is powered by an off-grid solar array which was upgraded in 2023 to more than double its original size. (Larry Plesent)

The house was built with twelve 110W Mitsubishi panels which cost $21,000 in 2009. We upgraded the solar this year, replacing the second round of golf cart batteries with a 5kWh lithium-iron battery from Iron Edison. By adjusting its parameters to not over nor undercharge, we expect this battery to last for over forty years. In 2023, every part of the off-grid solar was replaced making the solar array 250%. The cost was $22,000. This off-grid solar system is 250% MORE for about the same price as the original panels! It helps to be friends with a retired electrical engineer (thanks Neil) to help keep labor cost down, but the math is still real.

The upgraded off-grid solar array has eight 400 watt Q cells. What a difference! The solar controller and inverter both were replaced as part of the upgrade. At a time when inflation is rampant, the cost of residential solar power continues to drop. At least for now, it's still a great time to go solar.

Is it all peachy keen all of the time living in our off-grid world? We all create our own attitudes towards things, don't we? You must enjoy a bit of challenge and want to live and think outside of the comfortable grid-tied life to be unhooked. When something stops working around here, I'm the utility company. I think it's written in the marriage vows.

Utility chores include cleaning off the panels after snow. I use a simple light plastic snow shovel or a broom to remove snow from the easel mounted array. I call them easels because that's what they are. Rather than roof mounting the panels, easels allow you the option of cleaning them off, dramatically increasing your gains. It doesn't take much. Most of the time the snow slides right off. And the reflection from ground snow is a multiplier.

Another winter chore is maintaining the back-up generator. This does not have to be a gigantic machine. You are trickle charging your batteries, which powers your house. I use a suitcase size Honda type generator. The current one happens to come from Harbor Freight at a greatly reduced price. Use synthetic oil. This is not the time to be cheap. You will thank me for it later.

Daily attitude changes from living off grid include becoming more conservative in overall energy use. You have to when living grid unplugged. Teenagers seem to have a particularly hard time with this. Laundry and recharging the electric mower are often done early in the day to allow the panels to top off the battery. Other folks seldom time their household chores, but it becomes routine. Once those things are taken care of the extra sunshine can put its extra electrons into the car.

In general, you develop an awareness of your energy system and household energy use beyond what most of your neighbors consider healthy behavior. And maybe that's a good thing.

I am not an authorized financial advisor. But I have seen the 5%, 20-year return Vermont Soap in Middlebury, VT got on their investment 150kw of solar panels. Another way to look at it is that the 10-year note to purchase the system is paid off by the electricity it produces over 10 to11 years. Everything after that is FREE POWER, BABY. Results will vary.

Green is a process, not a result. Life is a process of resisting entropy. I fully encourage you to follow YOUR dreams and to design and construct your own green home and business, on- or off- grid. Happy building!

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

We Don't Need as Much Energy as We Thought

George Harvey

It turns out that if we switch to renewable energy, we may be able to live pretty much the way we do while using a good deal less energy. This is important, and it implies that the switch to renewable energy could happen much faster than many people realize.

In March, an article by Michael Barnard, "With Heat from Heat Pumps, U.S. Energy Requirements Could Plummet By 50%," appeared at *CleanTechnica* (*https://bit.ly/Heat-pump-reduction*). Barnard is very knowledgeable and thoughtful, but he writes in a style that some people might find hard to get through. What we will do here is review what he said while making it easier to grasp.

We start with an energy flow diagram, "Estimated U.S. Energy Consumption in 2021." This is the most recent such diagram from Lawrence Livermore National Laboratory, and it is the diagram Barnard used. On the left side of the diagram, there are nine primary sources of energy. From the top, they are solar, nuclear, hydro, wind, geothermal, natural gas, coal, biomass, and petroleum.

Solar, wind, and hydro power all originate as electricity directly. There may be energy lost in conversion and transmission, but the amounts are relatively small. By contrast, thermal power sources, including baseload power plants and internal combustion engines, lose a lot of energy. For power plants using coal, natural gas, or atomic fuel, the amount of energy produced ranges from 30% to 46% of the energy in the fuel consumed, according to the article, "Thermal power station" at Wikipedia. That means that between 54% and 70% of all the energy is lost, mostly as heat that goes into rivers and the atmosphere (https://bit.ly/thermal-power-station).

The energy lost in automotive internal combustion engines is worse. The post "Where the Energy Goes: Gasoline Vehicles," at fueleconomy.gov states, "Only about 12% to 30% of the energy from the fuel you put in a conventional vehicle is used to move it down the road," (https://bit.ly/auto-energy).

On the right side of the diagram, there are two gray boxes. The dark gray one is energy services, and the light gray one is rejected energy. Energy services represent the energy we actually use, and rejected energy is the energy that is lost, mostly as heat.

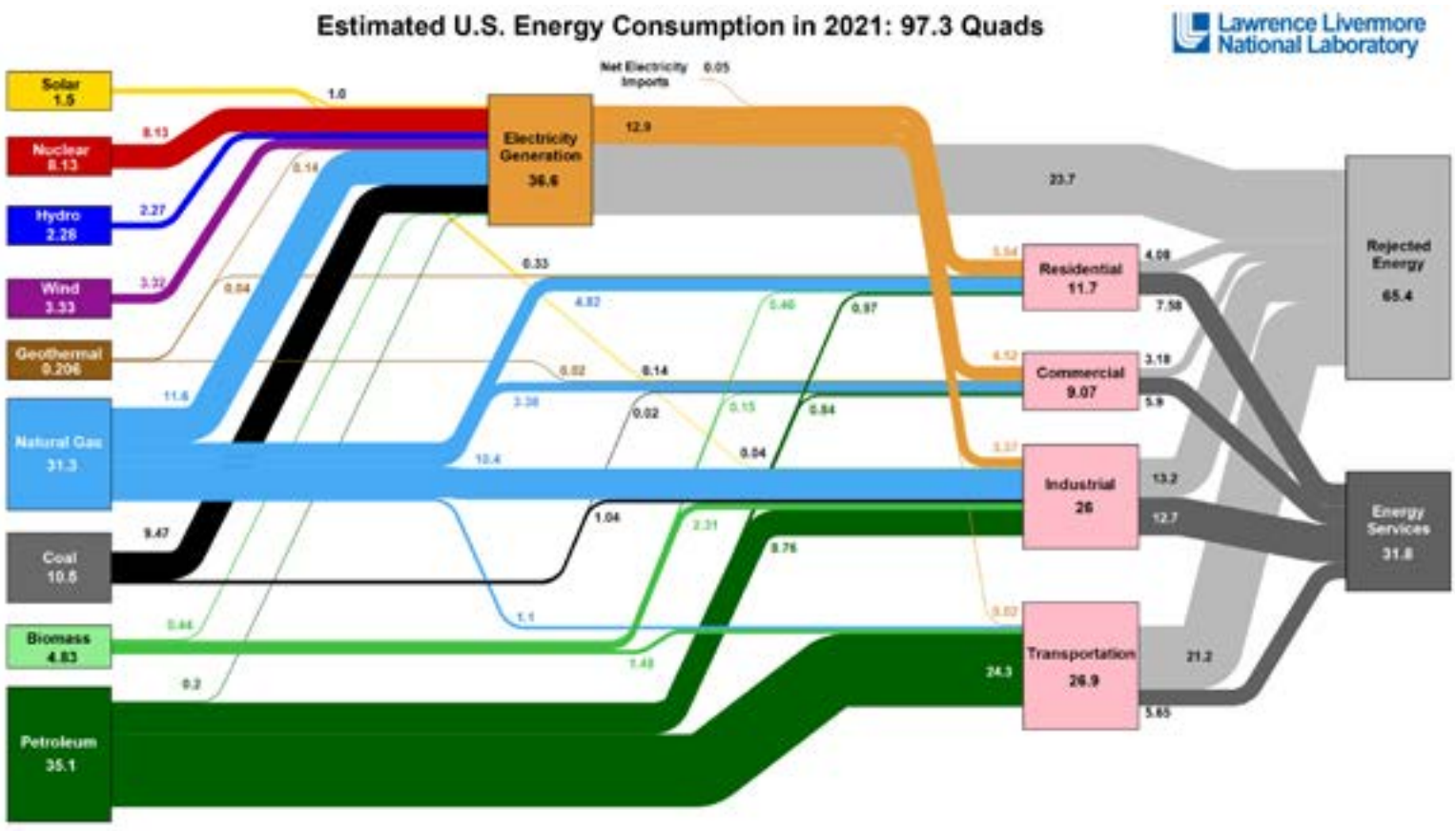
Please note that the amount of rejected energy is waste, and the greatest part of that loss results from using fuel. Regardless of whether it is some fossil fuel or nuclear power, the process is that fuel produces heat, and the heat is used to make energy. The energy conversions associated with fuel use have no equivalent at solar, wind, or hydro plants. Even when renewable energy is stored in batteries, the inefficiencies involved are small by comparison to those of fuel use.

Now we get to what Michael Barnard calls "the primary energy fallacy." The fallacy is the belief that we must replace all the primary sources with equal amounts of renewable energy. We do not have to do that. What we have to do is replace enough of them that we get the same amount of energy services.

Heat pumps offer a really good example. They move energy found in nature into a house. Depending on the nature of the heat pump, it might be that the electrical energy used is only one third or one quarter of the amount of energy in the heat delivered. By contrast, burning gas will deliver less heat than was in the gas, because some of the energy was exhausted up a chimney or vent.

Automobiles are a well-known example. Their internal combustion engines are notoriously inefficient, sometimes delivering as little as 18% of the energy they use to drive the car, as was mentioned above. In an electric vehicle, most of the energy used goes to powering the car and other services we want, and it does this at lower cost.

Because fossil fuels are so inefficient, we could replace them with about half as much renewable energy, hence the title of Barnard's article, which says what it means: The amount of energy we need could drop by 50% when we switch to renewables. ♻



LLNL March 2022. Data is based on DOE/EIA MER (2021). Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal, and solar) for electricity in Btu-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector, and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal the sum of components due to independent rounding. LLNL-MI-410527 (Lawrence Livermore National Laboratory and the Department of Energy)

How much electricity does your home use?

Most people are concerned with the high and ever-rising costs of electricity today. Efficiency Vermont has a helpful online tool that anyone can use to determine one's electric usage. This can be an eye opener to help you understand where the heaviest loads are and what you can do to reduce your usage. You will be able to see how quickly your electricity bill can add up when you use appliances and lighting not manufactured with energy efficiency in mind.

For example, take a look at lighting. If you have ten lamps in your house, each with a 100W incandescent bulb, you can expect to pay about $160 to light your home each year. Energy efficient bulbs will keep those lamps lit for around $47. Plus, they can last six to eight times longer.

The charting tool is a guide and individual household costs may vary. The appliances listed are all electric appliances. Hours in Use is based on a typical four-person household; and your hours may vary. Annual kWh may vary considerably depending upon model, age, and use. Annual Cost is based upon the statewide average of 16¢ per kilowatt hour (kWh). The sum totals provided do not include taxes, connection fees or EEC fees.

Find out how much electricity your home uses at www.efficiencyvermont.com/electricity-use.

The tool is also helpful for reducing the size of an addition of a solar system, which can prove to help you understand how to lower your usage and make the option for solar more affordable — for both on- and off-the-grid systems. ♻

Sodium–Ion and Iron–Air Batteries: A New Era in Battery Technology Is Emerging

Roy Morrison

There are two common objections to a 100% renewable energy transition.

First, that renewable energy is intermittent. The sun does not always shine, and the wind doesn't always blow. The pro-nuclear and anti-renewable crowd claims we are forced to continue to rely on large based load energy plants to supply a large portion of electric supply.

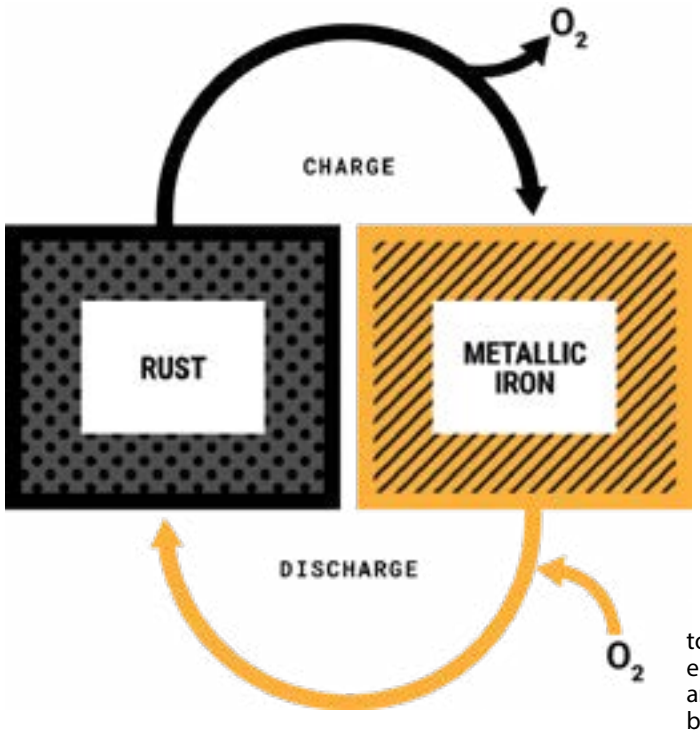
Second, that storage systems to deal with intermittency must rely on lithium batteries whose mining and refining is ecologically damaging sand whose supply is politically insecure. And further lithium batteries require cobalt, a heavy metal often mined under horrendous working conditions in ecologically destructive ways.

What is the true story?

First, forty years of good hourly wind and solar data globally has made clear that over continental scale areas a mixture of renewable sources can supply 100% renewable power with minimal storage. Good online analytic tools from CleanTechnica are available to model the amount of wind, solar, and storage in a given area to provide 100% renewable energy and predict the price (https://bit.ly/cleantechnica-renewable-energy-calculator).

Second, the development of new storage technologies is rapidly being commercialized in large scale and coming to market in 2023 in the case of sodium-ion batteries, and in 2024 for iron-air batteries. The technologies are different.

Sodium-ion is focused on portable batteries typically for electric cars. Sodium-ion batteries have been developed by CATL in China, the world's largest battery company. Sodium-ion is much cheaper than lithium, safer, and longer lasting. It is less energy-dense than lithium and, therefore, heavier which matters if you want elite performance but works fine in your electric vehicle (EV). Sodium-ion batteries are being installed in 2023 EVs. More energy-dense version two will hit the market shortly.



The iron-air battery cycle operation. (Form Energy)

Iron-air batteries using just iron, air and water from Form Energy from Somerville, MA, developed by MIT scientists, are for stationary storage. Weight is of little concern for storage at solar and wind farms. The basic operation is similar to early battery development but re-designed for twenty first century needs. Energy flows from the anode through a conducting water-based fluid to the cathode. The Form Energy innovation is reversible rusting. Discharging the battery takes oxygen from the air and converts iron metal to rust. Charging with an electric current turns rust back to iron and releases oxygen.

Form Energy's design is modular. Each individual battery module is about the size of a washer or dryer and contains fifty-one-meter-tall cells. The cells include iron and air electrodes, that allow the electrochemical reactions to store and discharge electricity. The cells are filled with water-based, non-flammable electrolyte, similar to ordinary AA batteries. The iron-air battery system is highly durable, able to be fully discharged and capable of many more charge - discharge cycles than lithium and the batteries are one tenth the cost of lithium systems. One acre of storage could serve a three-megawatt 12-acre solar array. The battery is also optimized for 100-hour storage. Form Energy is building a $750 million dollar production plant in West Virginia to begin large scale commercialization in 2024.

The development of distributed solar with storage is already leading to the development of Virtual Power Plants (VPPs) where large numbers of rooftop solar systems with battery storage and commercial systems are electronically linked to be dispatched by utilities to help meet peak energy needs. CPower is 2023 national VPP leader with 6.3 gigawatts available from 17,000 sites. The VPPs are becoming the basis for another income stream for rooftop solar with storage and commercial system owners who receive a portion of VPP revenue.

Similarly, the millions of EVs with batteries when designed with two way charging and discharge will prove an enormous potential amount to energy storage. A small percentage of EVs can be an enormous storage resource. California is debating a law that will require automakers to make sure EVs are able to feed battery power into the grid.

New battery systems to come include solid state battery technologies using solid electrodes and solid electrolytes. Volkswagen is working with QuantumScape, a Stanford University spin-off. The goal is a commercial scale solid state battery for Volkswagen in 2025. CATYL is working on a light, very energy-dense battery system design to replace jet fuel to power aircraft.

The combination of zero fuel cost renewables with growing amounts of energy storage means a fundamental transformation in the nature and management of the electric grid. The era of base load power plants is coming to a close. Base load plants using fossil fuel or nuclear energy will be unable to compete with renewables. The renewable energy system will be based on millions of decentralized points of generation and storage. The role of utilities in the twenty-first century will be to optimize this grid and make money doing this effectively. The renewable transformation is accelerating.

Roy Morrison builds solar farms. His latest book is The New Green Republic. ♻

The Small Nukes Scam is Not Happening

Roy Morrison

It's important to understand that the hype about future allegedly small nuclear energy is both nothing of the kind and further reasons why they are almost certainly continuing to be uneconomic and slow to build.

The original designs for various types of next-generation nukes were in the 50-to-70-megawatt (MW) size. The argument that these 50MW more-or-less new nukes compared to 1,000 MW to 1,1,00MW would be able to be inherently safe, about to be installed almost anywhere, factory-mass-produced and standardized and plopped down in big cities and to industrial plants.

That is not happening.

The 60MW NuScale Power Corporation (https://www.nuscalepower.com/en), design now plans its first plant to be 345MW of five or six NuScale reactors at a single site, about 1/3 capacity of 1,000MW nuclear. What this means is connecting and controlling five or six reactors at the same site which adds all sorts of design, piping, and control problems. Quite the opposite of factory built standardized design.

Anyone who has worked around power plants with multiple units (whether nuclear, fossil fuel or renewable) knows that multiple units mean all kinds of site-specific problems. I was a founding member of the University of New Hampshire (UNH) energy office in the 1980's. UNH had a central boiler plant with two venerable boilers burning sludgy bunker oil which by their nature needed careful attention, evidenced by the blast doors on top of the boilers where on occasion control and sensor problems led to a small explosion that would lift the heavy blast doors into the air with little or no damage to the boiler. The university then added a commercial incinerator using the municipal waste stream to generate power in an adjacent building. It never worked well. It frequently did not reach necessary temperature to combust the fuel properly and showered dark crap on the university. It was scrapped after a few years. I suspect that the early generations of multiple reactor units will be expensive to build and operate, and unless endlessly subsidized will be too expensive to run. Security and safety requirements mean that new nukes must be large enough to even dream of being cost-effective. And add nuclear waste to the mixture and costs will continue to skyrocket.

The era of large base load plants is ending.

The future will be millions of points of renewable generation and millions of points of storage. Already there are virtual power plants combining thousands of small rooftop systems with storage able to be dispatched to meet utility needs. The many millions of electric vehicles will also provide enormous storage resources. There is no place for a base load plan that pushes expensive nuclear fuel to operate 24/7. The 100-hour storage from Form Energy's iron-air battery will be a small fraction of the price of lithium batteries and further crush the economics of expensive fossil fuel and nuke power. Flow batteries like the Form Energy iron-air batteries use iron and air and water electrolyte. Solar and wind have zero fuel costs.

Small nuclear power plants are uneconomic and slow to build. (http://www.dianuke.org)

Storage and renewable generation will be dispatched based on price and demand. There will simply not be price takers for high-priced nuke power beyond people who have signed long term fixed-price contracts.

They can plan all they want and talk of new nukes. But the market will have zero taste for that.

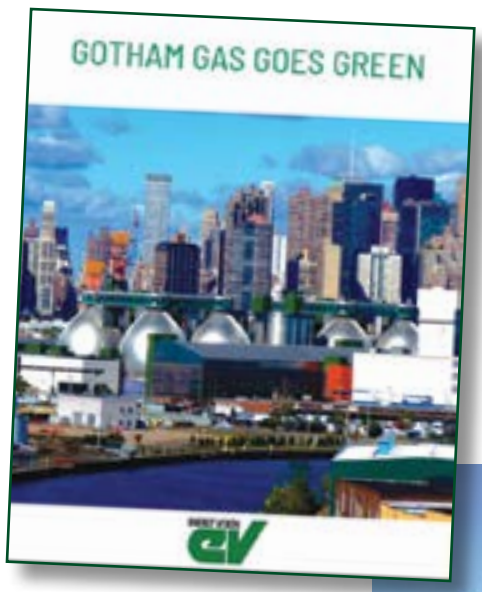
Roy Morrison Builds Solar Farms. His next book is Ecological Economic Growth. ♻

"Holy Microbes, Batman! Gotham Gas is Going Green!"

Michael J. Daley

When this reporter was a kid, a marvelous machine lived under our kitchen sink. It roared and whirled and gobbled food scraps with the added thrill of being just frightening enough to munch your fingers off if given the chance! For a suburban family that had never heard of composting, the garbage disposal was a great way to keep slimy organic scraps out of the wastebasket. Instead, the slurry went to the septic tank to make a gazillion microbes very happy.

In an innovative pilot project, the New York City Department of Environmental Protection (DEP) is using this basic combination of sludge plus food waste on a mega-scale at its Newtown Creek wastewater treatment plant which processes 310 million gallons of sewage every day. The goal is to produce clean energy, slash greenhouse gas emissions, divert food waste from landfills and generate revenues.



The NYC DEP's Newtown Creek waste resource recovery facility (WRRF) processes 310 million gallons of sewage a day. ("Gotham Goes Green" report)

One of the major concerns of wastewater treatment plants using anaerobic digesters is the production of methane gas which has 86 times more global warming potential than carbon dioxide. Newtown Creek and the 75 other wastewater treatment plants in NYC capture about 30% of the methane they generate for internal use, but the rest is simply flared off into the atmosphere – over 2.8 billion cubic feet per year.

Mainly to address this problem, the DEP conceived its "gas-to-grid" project at its Newtown Creek facility. A decade in the planning, the project was undertaken in partnership with the local gas utility National Grid and Waste Management. Food waste collected in NYC by Waste Management is added to the digesters to boost biogas production. Since the raw biogas is a mix of elements, it must be refined to extract the pure methane which can then be used exactly like fossil derived natural gas. It is referred to as Renewable Natural Gas (RNG). National Grid built the refining facility on site at Newtown Creek and pumps the RNG into its pipeline network supplying over 5,000 homes.

Energy Vision is a New York-based national environmental non-profit committed to researching and promoting the clean energy strategies and solutions necessary for a sustainable future. They recognized the enormous potential for this model to help NYC and NY State meet the 2050 climate goals of COP 26 while also furthering Mayor Adams recently announced goal to divert 100% of the City's food and green wastes from landfills. They produced an independent report "Gotham Gas Goes Green" assessing the benefits of applying the Newtown Creek model to all 76 of NYC's treatment plants.

Matt Tomich, Energy Vision President and principal author of the report, said of its origins and purpose, "Central to our mission is to promote strategies that can advance and enable the shift to a sustainable energy future through research, education and outreach. Toward that goal, we've spent a lot of time looking at organic waste streams and opportunities to capture and mitigate methane emissions."

To understand why the Newtown Creek project so seriously captured their attention, it helps to know the different climate impacts of fossil natural gas versus RNG. That is explained in the report as follows:

Fossil natural gas is largely methane produced by anaerobic decomposition of ancient organic material – a remnant of the carbon cycle from millions of years ago. Left in the ground, this methane would do no harm to Earth's climate or ecosystems. But bringing it to the surface and burning it generates CO2 and other GHGs, adding carbon to the atmosphere that was previously sequestered, throwing off the planet's fragile "carbon balance."

The methane biogases from which RNG is derived relate to the atmosphere and Earth's ecosystems in the opposite way. They are captured from above-ground sources of decomposing organic wastes such as food waste, "green" waste, agricultural manures or wastewater. This methane requires no extraction. If these sources of methane are ignored, instead of being trapped and contained, they would escape into the air, warming the climate. And methane is an especially powerful warming agent, with a global warming potential (GWP) over a 20-year timeframe 84-86 times higher than that of CO2.

But if methane biogases are captured, they can be used in ways that not only don't harm the climate, but can actually benefit it. RNG made from wastewater sludge is often classified as "net carbon-negative," because producing the fuel captures more GHG (in this case methane) than using it emits (combusting the methane converts it to CO2 which has a far lower warming effect).

The report evaluates five methane capture and conversion to RNG models of varying complexity using a cost and benefit analysis both economically and environmentally. It is well documented, highly informative, clearly written and intelligently illustrated with comprehensible charts. It makes its case in an admirably concise 26 pages suitable for the average reader, policy wonks, and specialists. Definitely recommended reading.

According to the report, "Under the most ambitious scenario whereby NYC's [waste treatment] infrastructure is fully utilized to process food scraps and other organic waste, the RNG produced would reduce GHG emissions by more than 600,000 tons a year and take NYC almost totally to its short-term climate goal. It would also align with the federal EPA goal of cutting methane emissions 30% by 2030."

In the longer term, it would meet over 15% of NYC's 2050 COP 26 emissions targets. Additionally, this scenario yields each year $80 million in cost savings, processes 30% of NYC's 1.2 million tons of food waste, and if the RNG were used in buses or heavy trucks, could displace 25 million gallons of diesel fuel with its inevitable pollution and health damage.

The report includes a detailed analysis of how expanding the Newtown Creek pilot project to all 76 facilities could tap into the $37 billion allocated for climate-related infrastructure projects in the Inflation Reduction Act. The availability of these funds, said Tomich, is a golden opportunity for NYC at a time when private capital is interested in renewable energy projects.

"Gotham Goes Green" has deservedly gained the attention of city, state, and national policymakers as well as investors. Tomich said, "Due in part to the very positive response we've received, we are now working on a national primer for municipal wastewater plant owners and operators detailing the basic criteria for successful RNG projects. This strategy has now been implemented in almost 30 sites across the country, but there are clearly many [hundreds] more facilities with untapped potential."

Michael J. Daley is a life-long renewable energy educator, advocate and yes, a Batman fan. He lives in an off-grid cabin in Westminster, VT with his wife, Jessie Haas. ♻

TVT Energy Awards

Cont'd from p.6

concrete floors instead of carpet. Native trees and shrubs were chosen for site plantings.

"We're excited to be recognized by Efficiency Vermont and VGBN," said Polly Wheeler, Project Manager and Director of Sustainability for Black River Design, Architects. "Our firm recently launched a sustainability action plan with the goal of doing more projects like this - cost-efficient, energy-efficient, and considering broader sustainability impacts. We are proud to have played a role in its success."

The Efficiency Vermont Small New Construction Best of the Best Award recognizes buildings that have achieved exceptional energy performance through the use of innovative design and construction practices.

The TVT center off I-90 in Bradford, VT, sits behind a park-and-ride lot with chargers. It has solar photovoltaics, rainwater catchment used to wash the buses, a biomass heating system, and many more efficiencies built into it. (Images: Black River Design Architects).

Vermont Green Building Network's VT's Greenest Building Award goes to TVT! This exemplary building excels in green building strategies and meets the highest standards of demonstrated energy performance including: water, health, transportation, affordability as well as many other details built into the design.

- Vermont Green Building Network's Vermont's Greenest Building Awards recognize exemplary residential and commercial buildings that excel in green building strategies - including water, health, transportation, and affordability - and meet the highest standard of demonstrated energy performance.
- Vermont's Green Building Award: Projects demonstrating energy use intensity at least 50% below the regional average energy use for buildings of the same end use and incorporating other sustainability features.
- Net Zero Award: Annual renewable energy production is equal or greater than annual energy consumption.

Green Energy Times previously reported on this exemplary project in the June 2021 issue *(https://bit.ly/GET_new_station).* ♻

The Climate Crisis is Here but Climate Optimism is Important

Jonathan Dowds

Despite the historic flooding that has had a serious impact on so many Vermont families, towns, and businesses this summer, when it comes to climate change, optimism - and action - are the orders of the day. We know that every solar panel that goes up on a roof or field in Vermont reduces the use of fossil fuels. We know that the incremental steps we have already taken are beginning to have big impacts. And we know that the Inflation Reduction Act and continually improving technologies have opened the door for a vastly faster renewable energy transition than seemed possible even a few short years ago. The path to replacing fossil fuels with renewable energy has never been clearer and more achievable.

A road in Vermont was washed away from the enormous amount of rain and flooding the area experienced this summer. (Greg Whitchurch)

One example of the power of renewables to reduce fossil fuel use comes from a source that may seem improbable to many people – solar power's increasing contribution to our grid's winter reliability. In recent years, ISO New England – the organization responsible for ensuring the reliability of the region's grid - has repeatedly warned that a very cold winter could result in "controlled power outages" because the natural gas pipeline that delivers gas to New England is not capable of meeting the region's energy needs when heating demand is at it highest. But the growth of solar is changing that and, even with the planned retirement of one of New England's largest natural gas plants, the forecast for the next two winters is much rosier.

While solar makes most people think of sunny summer days, the reality is that solar can and does continue generating electricity throughout the winter. Even with lower output on shorter, snowier days, winter solar production is now enough to largely alleviate the risk of energy shortfalls from our dependence on an unreliable natural gas system. After years of crossing their fingers that temperatures don't drop too low for too long, this summer ISO New England reported for the very first time that the accelerating growth of solar – along with the continued success of efficiency measures and the first offshore wind facilities coming online – is taking the region out of the danger zone.

But while we should celebrate solar generation reaching levels that solar power can increase winter reliability, we will need dramatically more renewable energy to finally shut down New England's natural gas plants that continue to pollute our climate. There are reasons for optimism here as well.

Over the last ten years, the cost of solar panels and batteries has dropped by 80% while wind costs have dropped by close to 60%. In 2022 alone, close to 75% of the new generating capacity built in the US was wind and solar. So far in 2023, the U.S. has generated more power with wind and solar than it has with coal. With significant new tax incentives in the Inflation Reduction Act, planned renewable projects have skyrocketed. And this isn't just happening in places like California and Texas. Maine added 170 MW of solar in 2022 and Massachusetts added 335 MW of solar and began construction of an 800 MW off-shore wind project slated to come online this year.

Vermont's contributions - even accounting for our small population - were much more modest, a mere 34 MW of solar in all. On a per capita basis, this is less than 45% as much solar as came online in Maine. And wind energy, which is playing a critical role in the climate plans of states like Maine, Massachusetts, and Rhode Island, is nowhere on the horizon in Vermont. This is where our optimism must be merged with action.

The biggest barriers to building more solar,and more wind for that matter,in Vermont are not technical, they are not economic, and they are not environmental. The biggest barriers to building wind and solar are political and regulatory. During the Scott administration's tenure, the process for permitting renewable projects has become increasingly unpredictable and ineffectual and the state's Renewable Energy Standard, which dictates how much renewable energy the state's utilities must purchase, has never been updated. We have gone from being a regional, and even national, leader in renewable energy to a laggard.

Unlike the quest to build a better, cheaper solar panel, which most Vermonters cannot influence, the regulatory and political challenges that are slowing our transition to renewable energy are squarely within Vermonters' control. And this is the biggest reason for optimism of all.

Jonathan Dowds is Deputy Director at Renewable Energy Vermont. ♻

Community Power in New Hampshire–The Savings Are Real

Andrew Provencher

Over the last few years, energy cost has never been more prominent in many New Hampshire household budgets. The price of energy has been high, and the peaks have been extreme. Many communities have been searching for ways to have more control over their options for electricity purchasing but have had few ways to be involved in this process for a long time.

That changed in March with the launch of The Community Power Coalition of New Hampshire (CPCNH). CPCNH is a grassroots non-profit power agency enabled by legislation in 2019 and made possible by a combination of local and state leadership. "We are finally realizing the fruits of the hard work we put in over the last three years," said Clifton Below, one of the originating forces behind the coalition and now its Board chair. "Our goal is to put the power of making energy choices in the communities where it belongs."

The Coalition allows for greater flexibility and control for their member communities, allowing them to be nimble and counter future market volatility while investing in projects that will have a positive impact. At its core, CPCNH is designed to solve problems while bringing innovative solutions, ratepayer savings, and increased community decision making.

CPCNH is led by a Board of Directors that consists of individuals appointed by the member communities, and together they use their collective buying power to lower electricity rates for customers, offer more choices for cleaner energy supply, and provide local decision-makers and communities more control over their energy choices.

The first wave of communities implementing community power included Enfield, Exeter, Hanover, Harrisville, Lebanon, Nashua, Peterborough, Plainfield, Rye, and Walpole. Portsmouth and Canterbury launched soon after the first ten, bringing the number of operational CPCNH community power programs to twelve.

These communities saw immediate rate reductions that represented 22%, 28%, and 39% savings relative to Eversource, Liberty Utilities, and Unitil rates, respectively. Altogether, they experienced $5.8 million in savings for their electric customers, including over $2 million for Nashua customers in the first three months. "Nashua is proud to be among the first ten communities that are charting a new path when it comes to where we get our energy," said Nashua Mayor Jim Donchess. "Community Power Coalition gives Nashua and other communities the ability to control price volatility in the short- and long-term, and the tools to accelerate the transition to a more economically and environmentally sustainable energy system. I'm pleased that this new endeavor will help many Nashuans save money on their energy costs."

CPCNH has just announced that it will continue to provide rate savings to its communities when in August, the base rates for CPCNH communities will fall to 10.9 ¢ per kilowatt-hour, the lowest known available rate in the state. This second consecutive rate reduction will generate an additional $5.5 million in savings for community customers and $1.7 million in community financial reserves. Most exciting, the Coalition can offer their customers more choices, including plans that feature 100%, 50%, and 33% renewable power at rates comparable to the default utility rates.

Under the community power model, community customers still receive their bills directly from utility companies, who will continue to deliver the power, maintain the grid, and handle billing. The Coalition helps control the electrical supply portion, which has saved their customers millions of dollars since their launch earlier this year.

The success of community power has sparked growing interest among communities, and the Coalition membership has now grown from the original fourteen to 35 cities, towns, and counties. The Coalition membership now represents more than 24% of NH's population and will continue to grow as additional communities join.

CPCNH is built for long-term success, with a team of experts and municipal officers working together in order to bring the greatest benefit to their members. In April they hired their first CEO, Brian Callnan, who has over twenty years of experience in the electric utility industry and previously managed the New Hampshire Electric Cooperative's power resource portfolio strategy. "We are looking forward to the opportunity to help deliver ratepayer savings throughout New Hampshire," said Brian Callnan. "CPCNH is providing the tools to help accelerate the transition to a more economic and environmentally sustainable energy system for cities and towns in New Hampshire."

Communities interested in joining the coalition should email info@cpcnh.org or visit cpcnh.org to learn more about the process. All New Hampshire cities, towns, and counties can join the alliance at no cost.

Andrew Provencher is a principal at b-fresh consulting. ♻

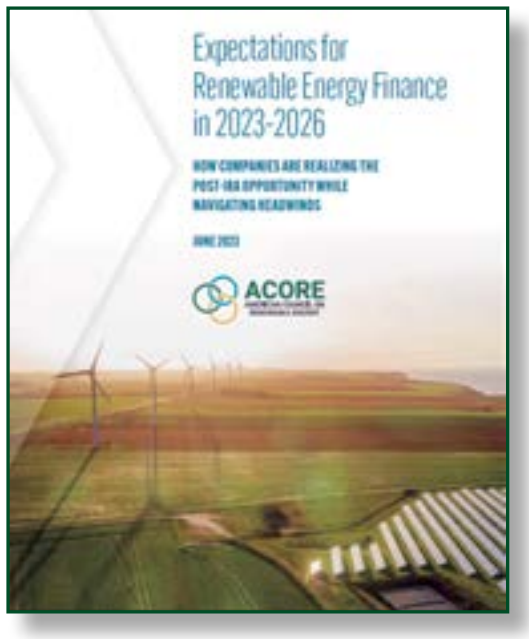
Renewable Investors Perceive U.S. Market Increasing in Attractiveness

ACORE Analysis Tracks Company Expectations for Renewable Finance Through 2026

An analysis released on June 7 by the American Council on Renewable Energy (ACORE) assesses how the Inflation Reduction Act (IRA) is impacting the near- and mid-term outlooks of some of the most prominent investors and developers in the renewable energy sector. The report, "Expectations for Renewable Energy Finance in 2023-2026," also presents survey results addressing the headwinds currently hindering the rate of clean energy development and the potential impacts of new and different financing structures, such as transferable tax credits, on the market over the next three years.

"America has never been a more attractive venue for renewable energy investment than it is today, thanks largely to the policy certainty provided by the IRA," said ACORE President and CEO Gregory Wetstone. "Even as tremendous opportunity awaits, there are still serious market challenges that must be resolved to realize the potential of the IRA and achieve the Biden administration's goal of power sector decarbonization by 2035."

While many of the same headwinds that existed before the IRA's enactment (grid-related issues, supply chain challenges, trade restrictions, tax equity constraints) continue to impact renewable investors and developers, the new analysis finds the IRA has already increased companies' participation in the renewable energy market in 2023. All surveyed developers and most investors said they plan to increase their activity in the U.S. renewable energy sector compared to last year, with 84% of investors planning to increase their U.S. renewable energy investment by 5% or more.



Additional survey findings were as follows.

- For the first time in the six years ACORE has conducted investor surveys, investors unanimously expect the U.S. to increase in attractiveness for renewable energy investment in 2023-2026 compared to other countries.
- Most investors (83%) expect the attractiveness of renewable energy to moderately or significantly increase compared to other asset classes in their portfolios in 2023-2026. None of the investors surveyed expect the attractiveness of renewable energy to decrease.
- Survey respondents commented that headwinds such as supply chain constraints, trade restrictions, interconnection queue delays, and insufficient transmission capacity create significant risk challenges that can lead to delays in deal flow, longer lead times, and increased project costs.
- One-third of developers have reduced their risk profiles in 2023. However, most large developers and many investors are willing to take on increased risks.
- More than one-third of investors and developers expect a decrease in tax equity accessibility this year, but of the surveyed investors who specifically invest in tax equity, 45% expect to see an increase this year compared to 2022.
- Over 80% of surveyed investors plan to utilize tax credit transferability or direct pay.
- Survey participants agree that the tax equity market must nearly triple in size (from $18-20 billion annually to over $50 billion) to meet heightened post-IRA demand.
- Recent attempts to limit ESG investment have affected one-third of investors and developers.
- Over 90% of surveyed investors and developers prioritize low-to-moderate income or energy communities (as defined by the IRA) to some extent in their renewable investment or development decisions.
- For the second year in a row, investors ranked utility-scale solar, energy storage, and commercial solar as the top three most attractive clean energy sectors for investment over 2023-2026.
- PJM, MISO, ERCOT, and CAISO were selected as the top power markets for renewable energy investment and development in 2023-2026.
- Many survey respondents reported plans to participate in domestic efforts to expand clean energy manufacturing. More than one-third of investors (38%) plan to invest in domestic clean energy manufacturing facilities in the U.S. Twenty-eight percent of developers report plans to open a new manufacturing plant, and 33% plan to incentivize their suppliers to open domestic facilities.

The report (https://acore.org/Re-finance-i2023-2026) concludes with the policy reforms and market drivers that ACORE is pursuing this year to accelerate renewable energy growth, maximize the impact of the IRA, and reduce the effect of sector headwinds. ♻

Solar Energy Increases the Value of Your Home

Ben Joslin

The benefits of installing a solar array include energy cost savings, a positive environmental impact, and renewable energy tax incentives and rebates. But did you know solar can also have a huge impact on your home's value? In today's highly competitive and expensive housing market, solar energy can add value and increase the selling price of a home. Buyers are ever more focused on sustainability and are increasingly prioritizing energy efficiency when evaluating a home purchase. Most buyers view solar as a major home enhancement.

The Financial Advantages of Solar

Houses with solar – either rooftop or ground-mounted – have a significant market premium. According to a study done by Zillow in 2019, houses with solar installations sell for an average of 4.1% more than those without solar. These findings were confirmed in a 2022 study published in the *Journal of Management in Engineering*.

These benefits can increase depending on your location. A study done by national home appraising experts in Washington D.C. found that solar-powered houses in the D.C. area sold for 7.7% more than those without. Another recent study published in the *Journal of European Real Estate Research* further supports the added home value benefits, stating "valuation experts further validate the positive influence that on-site energy production has on property valuation."

Houses with solar installations sell for an average of 4.1% more than those without solar. (ReVision Energy)

These diverse studies collectively paint a powerful picture of the economic advantages associated with solar installations. Let's dig deeper into the reasons behind these price premiums.

Energy Savings: A Marketing Tool

Energy savings can be used in marketing your home to potential buyers. A study done by The American Council for an Energy-Efficient Economy found that on average, houses that disclose their energy costs sell faster, and sell at a higher percentage than their original listing price.

Many homes equi[[ed with solar have little to no electricity costs, so the added benefit of disclosing a very low electric utility cost can absolutely help sell your house. This is particularly true in states like Massachusetts, where residents pay 25% more in electricity costs than the national average. Massachusetts also boasts some of the best incentive programs in the nation, like the SMART Program, and various other tax credits for residential solar adopters, making solar more affordable and appealing for potential home buyers.

Solar Outshines Other Renewable Infrastructures

Did you ever wonder why other forms of renewable energy infrastructure do not enjoy these same advantages? After all, wind turbines, high-efficiency HVAC systems, and other "green" home additions seem like viable options.

The answer is simple: none of these systems have been proven to consistently increase home value like solar photovoltaic (PV) installations.

According to a meta-analysis study published in *Energy Research & Social Science*, solar installations are "the only energy infrastructure associated with consistently positive property value increases."

Solar electric power is a smart investment that pays off not only in energy savings but also increases your home's worth.

In addition to reducing your carbon footprint, harnessing energy from the sun is a powerful investment for immediate electricity bill savings and for your future home sale.

Ben Joslin works at ReVision Energy. He studied business at Ithaca College and enjoys researching and writing about renewable energy. Joslin lives in Maine, where he and his family have invested in a solar farm, cutting their energy consumption significantly.

Reprinted with permission from ReVision Energy's Value of Solar blog on July 10, 2023 found at https://bit.ly/ReVision_SolarIncreasesHomeValue. ♻

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

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

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

USDA RURAL DEVELOPMENT PROGRAM

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

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

Biorefinery Renewable Chemical, and Biobased Product Manufacturing Assistance Program

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

REGIONAL

The Grassroots Fund's Grant Programs

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

Three grant programs are offered:

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

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

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

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

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

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

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

Advanced Wood Heating Advanced wood pellet heating systems -- $3,000 per pellet boiler/furnace (in partnership with Efficiency Vermont). Commercial spaces over 5,000 sq. ft. may also be eligible for incentives. For the most updated information, see www.rerc-vt.org/advanced-wood-heating-systems or call (877) 888-7372.

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

• Residential Bulk Pellet Bins. Up to $1,500 or 50%, whichever is less, of the total bin/materials cost (not including labor).

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

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

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

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

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

Other Utilities Heating Offers

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

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

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

VT TAX CREDITS

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

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

Tier III programs

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

EFFICIENCY VERMONT

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

Lighting

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

Weatherization

• Comprehensive air sealing and insulation projects with an Efficiency Excellence Network contractor: 75% off eligible project costs, up to $2,000. Moderate income Vermonters get 75% off up to $5,000.

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

Appliances (must be ENERGY STAR)

• Dehumidifiers: $25 - $40 rebate

• Clothes Dryers: $200-$400 rebate

Heating/Cooling/Water Heating

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

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

Heat Pumps:

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

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

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

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

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

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

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

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

• Electric utility rebates may also be available.

Other Opportunities to Save

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

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

Contact your utility for more information.

Incentives for Pro-environment Agriculture Behaviors

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

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

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

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Department of Energy

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

Commercial Solar Rebate Program

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

Incentive levels for PV systems are as follows:

• $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, check NHDOE website.

Residential Solar Water Heating Rebate Program is currently closed.

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

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

Residential Wood Pellet Boiler/Furnace

• 40% of installed system up to $10k

• Must meet thermal efficiency and particulate emissions standards

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

LOCAL INCENTIVES

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

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

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

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

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

NH Home Performance with ENERGY STAR

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

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

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

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

NH ENERGY STAR Homes

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

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

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

NHSaves Residential ENERGY STAR ® certified Products Program

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

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

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

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

NHSAVES Online Store

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

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

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

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

NHSaves: www.nhsaves.com

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

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

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

Other NH Electric Utility Programs

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

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

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

Electric Vehicle & Charging Incentives:

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

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

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

High Efficiency Heat Pump Incentives:

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

Business Programs

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

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

NH Weatherization Assistance Income-Eligible Programs

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

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

Community Development Finance Authority (CDFA) Clean Energy Fund

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

to support energy efficiency and renewable energy projects.

Small Business Energy Audit Grants

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

Community Facilities Energy Assessment Grants

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

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

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED IN NEW YORK

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

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

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

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

Clean Energy Incentives and Tax Credits for Renewable Energy

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

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

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

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

Electric Vehicle Charging Station Make-Ready Program

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

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

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

MAINE

EFFICIENCY MAINE

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

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

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

Multifamily Insulation:

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

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

Heat and Cooling:

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

Heat Pumps: Residents of any income are eligible for heat pump rebates up to $1,200. Income-eligible residents qualify for rebates up to $2,400, and businesses are eligible for incentives up to $4,800. Learn more at the Efficiency Maine heat pump website: bit.ly/EffME_HeatPumps. Efficiency Maine also offers commercial incentives to qualifying building types for heat pump water heaters with 80 gallon storage tanks, 120 gallon storage tanks, and split-system heat pump water heaters with a minimum of 80 gallon storage tanks. Learn more at www.efficiencymaine.com/at-work/water-heating-incentives/

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

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

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

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Geothermal, the Underground Revolution

By Matthew Desmarais

This could be the headline. Geothermal heat pumps are the best tool that environmentalists have to fight climate change. The technology works for residential, commercial and industrial buildings and can reduce emissions by 80%. Someday in the future, the heat rejected by a grocery store down the road could be recovered, stored underground and used to heat your home in the winter. Seemsutopian, but consider that it's already happening. Geothermal is experiencing an underground revolution and people like myself have dedicated our lives to making it even better.

Geothermal being drilled in a tight building lot. (AdobeStock_610909047)

Let's start with some basics. Ground source heat pumps, commonly known as geothermal heat pumps, are used to heat and cool buildings. A geothermal heat pump does not create heat, it moves heat from one place to another and can concentrate it into more useful forms using a refrigeration cycle. For instance, in the winter, a geothermal heat pump can move heat from the 50°F deep earth into the building at a temperature of upwards of 120°F. In the summer, it can operate in reverse, moving heat from inside the building into the earth, making the building cooler.

The refrigeration technology has been around for a long time; refrigerators, AC units and dehumidifiers all use a basic refrigeration cycle. What makes geothermal green is that 75-80% of the heat delivered will come from the ground (the rest is electricity to power to fans, pumps, compressor, etc.). For example, a building that uses 1,000 units of heat per winter will only need 200-250 units of electricity to heat their whole building, the rest came from the ground. This high efficiency is why geothermal heat pumps have the lowest operating costs of any heating source in North America: about ⅓ the cost of fuel oil and 20% cheaper than pipeline natural gas.

Geothermal drilling rig in action. (Matt Desmarais)

Geothermal being drilled in a tight building lot. (Matt Desmarais)

Geothermal heat pumps can use a very small amount of renewable electricity and generate a huge amount of heat. A 50,000 BTU geothermal heat pump produces as much energy (in the form of heat) as a 20-kW solar array could and it can be used 24/7, rain or shine. The geothermal heat exchanger is typically a closed-loop plastic tube that is 300-600 ft deep, depending on the size of the building. These heat exchangers, the loops in the ground, are essentially giant thermal batteries that can run for months at a time and recharge on their own, for free. Making them is relatively easy, a qualified contractor can drill a hole and put the heat exchanger down it. Alternatively, in some locations a heat exchanger can be laid horizontally under about 6 ft of soil. The horizontal method makes a bit of a mess to install, especially trenching it into the home, but grass will grow back within a few months and the heat exchanger is made of tough, HDPE pipe which lasts over 100 years.

District loops can be formed by connecting geothermal loops together, which means that this technology works great in both urban and rural areas. In our experience though, anytime the buildings are a suburb distance away, it makes the most economic sense to use "1 hole per building."

So does geothermal qualify as a silver bullet? Let's think: high efficiency-check. Renewable energy? Check. Land use? Only used near buildings -check. Speed of Deployment? Well, it could probably be installed faster, but the technology is growing with innovative new systems that can retrofit to the home's current system, so check.

Geothermal has several major advantages to their popular cousins, air source heat pumps. First, a geothermal system with 50°F water will be a lot more efficient than an air source heat pump drawing from the cold winter air. This is because the efficiency of all heat pumps decreases proportionally to the amount of temperature that has to be "lifted". Second, because the earth's temperature is stable below a few feet deep, geothermal will work in any weather. -50°F with crazy windchill? No problem at all. Last winter, the northeast got a 24h period of extreme cold and every one of our geo heat pumps worked great. We also got a few calls from folks in frozen homes that had air source who were looking to switch to geothermal!

Even though geothermal systems may cost upwards of $40,000, there are great incentives and financing options that bring the net cost way down and the ROI between 4-10 years.

Geothermal heat pumps are the best tool that environmentalists have to fight climate change. Every building converted is a vote for a sustainable future with the fewest big picture costs. Let's make it happen together.

Matt Desmarais is the founder of Energy Catalyst, an Albany-based geothermal heat pump manufacturer and geothermal installer. Energy Catalyst operates primarily in NY and VT. He can be reached at mattd@energycatalysttech.com or visit EnergyCatalyst.org. ♻

SolarFest Adapts to Climate Change

July Festival Postponed; Events Rescheduled for October 28th

Mike Bailey

Bill McKibben is one of the greatest communicators of our time. In mid-July, when SolarFest had just been postponed, he wrote that, "I told you so are the four least satisfying words in the English language."

Our planet experienced an unprecedented number of catastrophic weather events in just the few weeks preceding the planned launch of SolarFest at its new home in Brandon, Vermont. Bill's description of that week powerfully explains why the Board of SolarFest decided to call off the July festival.

Cleanup from the flooding in VT in July. (Mike Bailey)

My beloved Vermont was one of many places that took it on the chin this week – huge flooding in Japan and India and China and Spain, but also in Montpelier and Ludlow and Barre and a dozen other places I know intimately. And this weekend, a second round of bucketing rainfall across the Green Mountains unleashed a landslide a half mile from my house.

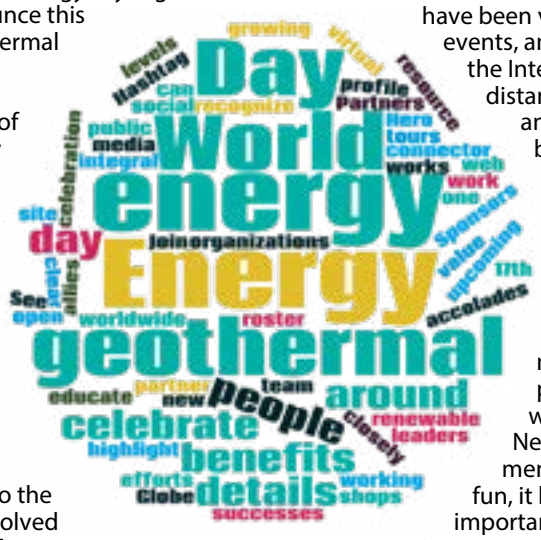
Despite months of planning, and tens of thousands in unrecoverable costs, the safety of performers, speakers, sponsors, and attendees was paramount, so SolarFest'23 was postponed due to climate change and volunteers instead responded to help

Cont'd on p.38

World Geothermal Energy Day

Jim Scherrer and Steve Krug

WorldGeothermalEnergyDay.org is pleased to announce this year's World Geothermal Energy Day to celebrate the people and achievements of geothermal energy and systems. The celebration will highlight noteworthy contributions of geothermal systems to society around the globe. On October 17th, we encourage all of you to give a shout out and a special acknowledgment to the stalwart people involved in the thousands of energy-efficient geothermal systems that keep providing reliable, resilient electricity, heat, and cooling to our essential facilities and homes. As the climate changes, and we turn towards net-zero carbon systems for our environment, geothermal offers tremendous advantages. This is the year to celebrate geothermal leaders, operators, and team members. It is safe to say that the world is changing. And though most people are not aware, energy-efficient geothermal systems are making people heathier by keeping our environment cleaner, sustainable, and resilient during everchanging times.



Fortunately, people and the earth can offer dependable and efficient geothermal energy technology — and we are finding new ways to stay connected. Some of the most helpful tools have been virtual meetings, events, and webinars on the Internet. With social distancing, masks, and quarantining becoming more commonplace, technology has become even more integral to the lives of many. And while the Internet has certainly provided people with hours of Netflix entertainment and plenty of fun, it has also played an important role in supporting one another.

On October 17th, we will virtually highlight key geothermal projects and people internationally. Geothermal systems, play an important role in supporting carbon emissions reduction and electrification. Geothermal systems use the heat of the earth as an energy source, at high efficiency, to produce low or no-carbon energy. Generating electricity, heat and cooling using the earth's stored energy translates into low or carbon-free energy.

October 17th was selected to acknowledge a famous geothermal event on Pompei that occurred in the year 79 AD. Geothermal is represented by the power of Vesuvius.

The residential, healthcare, food, agricultural, and power sectors use the efficient and reliable geothermal approach today, and we are proud to honor the frontline workers that serve our communities to keep the lights, heat and air-conditioning on during emergencies. World Geothermal Energy Day shows examples of how geothermal systems around the world provide dependable cost-effective, net-zero, energy resilience to our indispensable facilities and homes. These people maintain resilient, efficient, distributed geothermal energy that is sustainable for the future energy transition and electrification of our most vital facilities and homes.

The sponsors of World Geothermal Energy Day will celebrate on a world-wide basis because some challenges must be met with a global response. Celebrants will take to social media, the internet, offices, geothermal facilities, and the airwaves to teach us what is obvious — that there will be no future for us if we destroy the environment that sustains us. This one day helps us all to also pursue a "green recovery" in response to the challenges that confront us; showing that healthy energy supplies enable healthy environments.

Jim Scherrer and Steve Krug are the event coordinators for World Geothermal Energy Day. ♻

Many thanks to our sponsor:

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These can be stacked with the State incentives.

Residential- 30% tax credit (Form 5695 - https://bit.ly/Geo_incent_1)

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Non-profits/government - 30% direct repayment + 10% bonus for domestic content.

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STATE INCENTIVES

New York- $1,500 per 10,000 BTU - (https://bit.ly/Geo_incent_3a) of capacity in most areas, including National Grid, paid as utility rebates

Con Edison Territory- $25,000 per building or $35,000 per building if in a disadvantaged community.

$5,000 State Tax credit (https://bit.ly/Geo_incent_4), primary homes only.

On-bill utility loans of up to $25,000 (https://bit.ly/Geo_incent_3)

Vermont - $2,100 per ton (12,000 BTU) (https://bit.ly/Geo_incent_6) through Efficiency Vermont

Massachusetts- $15,000 per home or $25,000 if income qualified (https://bit.ly/Geo_incent_7)

MassSave HEAT Loan

- 0% interest loan up to $25,000

New Hampshire Electric Coop

members: $250/ton mail in rebate. Not eligible in other utility zones.

Maine -1/3 of the project costs up to $3,000 and up to $7,500 loan through Efficiency Maine ♻

The NY HEAT Act Bill Is 'Good For You'

– Assures Energy Affordability and Climate Action –

Anshul Gupta

Climate conversations often get mired in mindless money minutiae – how much will a certain climate policy cost and how will we pay for it – as if it were possible to put a price on civilization. But what if there were a policy with great impact that did not cost a dime, saved money from day one, and helped relieve energy burdens while leading to healthful homes and communities?

The NY HEAT Act will lower home energy bills for millions of New Yorkers by directing the state's Public Service Commission to limit the average energy burdens of low-to-moderate income households to 6% of their earnings. (foto.wuestenigel.com)

Such Goldilocks policy options aren't hypothetical; there's one in front of New York State lawmakers right now – the New York Home Energy Affordable Transition or NY HEAT Act – a popular climate and energy affordability bill that deserves Governor Hochul's immediate attention.

The NY HEAT Act will lower home energy bills for millions of New Yorkers by directing the state's Public Service Commission to limit the average energy burdens of low-to-moderate income households to 6% of their earnings, which the Commission can accomplish while shielding higher earners from cost shifts. Just this provision of the bill could lead to average monthly home energy savings of $75 or more for families earning under 80% of Area Median Incomes.

This bill, however, does a lot more than provide short-term relief from escalating home energy bills; it helps all gas customers of all incomes and protects existing natural gas customers from future price spirals.

Many New Yorkers are unaware that outdated state laws allow gas hookups worth thousands of dollars each to be given away at no or minimal cost to new customers. Existing customers are forced to pick up the tab that grows by about $200 million each year, raising everyone's gas bills. Luring new customers with ratepayer funded free hookups adds tens of thousands of dekatherms of unnecessary gas demand, which increases upward pressure on supply prices. With the U.S. becoming the world's largest exporter of liquified natural gas, the era of cheap natural gas is over.

Dug up streets for old pipe replacement are more than a traffic nuisance; these will also add billions to utility bills. The new pipes laid at the cost of $6 million per mile will be mostly empty in just a few decades, but utility customers would be on the hook to continue paying for them for years after these are retired. Just like new hookups, our outdated laws allow the utilities a 9 to 10% return on these investments at ratepayer expense.

Whether these are service lines for new customers or replaced mains, these costs are added to utility bills based on an anticipated 60 to 80 years of service life that the new pipes will never see – heating and cooking with gas is not just going out of style, it will also be out of compliance with New York's climate law by 2050. Without squeezing the cost-recovery into a couple of decades, which will dramatically increase the impact on gas bills, ratepayers could be on the hook to continue paying for decades after the pipes are retired.

There is even more trouble brewing for existing gas customers. As gas bills rise, awareness of gas stoves' serious health harms grows, and heat pumps buoyed by federal and state incentives gain popularity, gas customers will increasingly make the switch to the superior electric alternatives. This will leave fewer customers to bear the growing costs of the gas distribution network. Bill hikes will cause more customers to defect, raising the costs for those whose circumstances prevent them from making the switch or the most ardent gas-stove aficionados who prefer not to switch, setting a feedback loop.

This is not just a hypothesis, but a conclusion that utility experts have arrived at after rigorous analysis. The NY HEAT Act has provisions for modernizing New York's laws governing utility regulations to address each of these issues. Not surprisingly, the gas industry is busy fomenting opposition to utility reform among labor and business groups.

Last year, the state passed legislation backing utility thermal energy networks (UTENs) with strong labor support for highly energy- and cost-efficient district heating and cooling. Strategically replacing leak-prone pipes with thermal energy conduits would build lasting energy infrastructure and offers a path for many union workers with pipe skills to transition to a clean-energy future. The NY HEAT Act clears certain legal hurdles without which the labor-friendly UTENs cannot be implemented at scale.

It is unconscionable that despite lofty goals set by our climate law, we are still expanding the distribution network for fracked gas that leaks and pollutes everywhere, from drilling to distribution to domestic appliances. And it's even more unconscionable that we are doing this on the backs of our energy customers reeling under inflation while the gas utilities laugh all the way to the bank. Every day without NY HEAT is a day that we're digging ourselves deeper into a climate and financial hole. Every day without NY HEAT makes meeting our climate and energy security goals harder and costlier in the future.

Governor Hochul has included climate action and affordable energy among her policy priorities. There is no better way to deliver on this promise than to include all provisions of the NY HEAT Act in the 2024 state budget without delays or loopholes.

Anshul Gupta is a Senior Policy Analyst with New Yorkers for Clean Power and a steering committee member of the NYS Climate Reality Chapters Coalition. ♻

Rally in the NYS Capitol on May 23, 2023 in support of the NY HEAT Act. (Amber Ruther)

Efficiency Vermont's Efficiency Excellence Network (EEN)

Contractor Spotlight: Turner Piping and Refrigeration, Rutland, VT

Interview with Sam Major, Foreman

G.E.T. Staff

Turner Piping and Refrigeration team.(Courtesy photos)

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

Sam Major: I started in this industry as a laborer working nights on supermarket refrigeration installs as a 19-year-old trying to make extra money while living with some friends in college. Whilst doing so, I was intrigued and became interested in refrigeration, because it was a of mix plumbing, electrical and HVAC all in one. The days were never the same or boring and I enjoyed it.

When did you start your company?

SM: ITurners started in 1911 as an electrical contractor. In the 1930s, Sam Turner transitioned to refrigeration. Sam transitioned the company to now owner Kurt Matzke's mentor, Joe Kuentze, and then he transferred the company to Kurt. .

What is your service territory and about how many customers do you serve??

SM: All of Vermont, as north as Derby and as south as Bennington, New Hampshire and eastern New York. We serve around 250 customers.

What is your area of expertise?

SM: Our focus is on supermarket and industrial refrigeration design, install[ation] and maintenance. I specifically have expertise in building controls and energy management systems specific to refrigeration systems.

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

SM: I think the low-hanging fruit here is heat pumps. In the commercial space I think that too many people try to do anything electric themselves and think that wire nuts and electrical tape can fix anything.

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

SM: Clean and proper maintenance of refrigeration systems is almost always deferred by a majority of our new customers. We make a large effort to show the importance of keeping things clean. But after that, recommissioning systems to manufacturer specifications.

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

SM: Recently at a Price Chopper in Colchester, VT we removed and replaced almost every single frozen food case on the sales floor. The rack system, installed in the 1960s quickly became oversized and inefficient with outdated pressure controls. Between us, Price Chopper and Efficiency Vermont, we were able to install an updated refrigeration rack controller and equip the rack with a Bitzer variable speed compressor that ramps up and down in line with current load conditions on the rack. This decreased energy use by 30%.

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

SM: At Turners, we are not interested in the repair that is going to just get you by. We want to get you back running and make your system better and more efficient than it was before. Increasing the performance of your refrigeration systems is the quickest and easiest way to immediately find a reduction in your energy use footprint, and your electric bill.

Turner Piping and Refrigeration installation.

Why should people use an EEN member over someone else?

SM: The Efficiency Excellence Network is a network of hardworking, professional contractors that have not only the customers' best interest in mind but our state's energy future in mind as well.

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

SM: I think it is most important not to try and find the cheapest option. Ask your contractor to inform you on why another product or service may be more expensive. Sometimes the more expensive option is going to be cheaper in the long run, because it may include updated control strategies and future-proof refrigerants. ♻

First-of-its-Kind Energy Collaboration Seeks to Help Peterborough, NH Meet Sustainability Goals

Trisha Nail

A technology startup focused on helping municipal officials implement sustainable energy strategies in their communities could lead the charge in the Monadnock Region on electrifying and decarbonizing buildings currently dependent on gas and oil power.

The Town of Peterborough is working to have local contractors make renewable energy upgrades in partnership with BlocPower, a Brooklyn, N.Y.-based consulting company that works with local contractors to upgrade power, heating and cooling systems in older structures.

Contractors, who can send applications to BlocPower to partner with the company, will electrify between 10 and 15 buildings, update appliances in them and evaluate the structures' weatherization and solar power capabilities. The program runs through June 30, 2024.

"We're looking at municipal buildings and we're looking at privately-owned buildings," said Dennis Luong, general manager of BlocPower's Northeast region. "There's a few multifamily buildings that we'd love to look at and then small commercial buildings."

Luong said such buildings have been "left out of transition" in similar projects BlocPower has observed because while they're larger than single-family homes, they are not the scale of facilities like hospitals that take priority.

On the low end, individual building projects can cost between $10,000 and $15,000, Luong said, but on the high end could range into six figures. To help cover the costs associated with these additions — air-source heat pumps and hot water heat pumps, for example — BlocPower works directly with building owners through the option of a 15-year financing plan.

With the plan, property owners are not required to make a down payment and don't see a lien on the building. In the case of hot water heat pumps, BlocPower oversees maintenance of the heat pump and at the end of leasing, the building owner can buy the pump for $1.

Downtown Peterborough, New Hampshire. (Flickr/Joseph)

The Peterborough project, which kicked off May 9, is a pilot program for BlocPower, with Luong noting it's the company's first project in a municipality the scale of Peterborough.

"One of the things that set Peterborough apart was how engaged the town was with this initiative and how they want to see it grow from a pilot to a full-on program moving forward," Luong said.

BlocPower's consulting in Peterborough cost the Town an initial $5,000 fee up front, but the money ended up coming from Peterborough Renewable Energy Planning (PREP). PREP is an ad hoc committee appointed by the selectboard comprised of town residents, many of whom have experience in the energy industry.

PREP formed after residents voted to pass a warrant article during Peterborough's town meeting two years ago pledging to transition to 100 percent renewable electricity sources by 2030 and other energy needs by 2050, according to Dori Drachman, co-coordinator of PREP.

"Trying to get out ahead of where our state was leading us was absolutely a big part of the whole initiative," Drachman said. "It definitely includes the piece with BlocPower — that we need to get as much help from wherever we can to be able to meet these goals because the state hasn't been very helpful at all."

Bob Haring-Smith, a co-coordinator of PREP, said New Hampshire is an outlier in New England for a lack of resources and support for renewable energy and climate concerns.

"It's a tougher environment politically and financially for BlocPower to be working in than a lot of places where they were before," Haring-Smith said. "But I think the Inflation Reduction Act and the climate support policies that were in it have made it much more feasible for BlocPower to provide attractive financing for the work they do in a state where they would not otherwise be available."

Cont'd on p.27

Cont'd from p.26

Peterborough and BlocPower hope to look toward upgrading the rest of the community after the pilot's conclusion, and Drachman said town officials and PREP are in the process of applying for a community block grant from the U.S. Department of Energy — the Energy Efficiency and Conservation Block Grant — that would expand the program.

"We have applied for $500,000. That is for being able to get access to a couple of staff members at BlocPower to help manage the program, and it's also for direct incentives for building owners that are on some kind of federal assistance program," she said. "We really want this program not just to be for wealthier residents — we want it to be for everybody."

Peterborough officials are hopeful their town could be a pioneer in sustainable energy upgrades in the state through coordination with BlocPower, and they're thinking of their neighbors in the Monadnock Region as the next few communities that could benefit from the consulting work.

"We will be looking for other towns and Keene to join with us," Drachman said. "We think this could be a really great thing to do one of the hardest parts of this transition to 100% renewable. It's a lot easier to buy a new car than it is to retrofit a house."

Mari Brunner, senior planner for the city of Keene, said she had an early conversation with Drachman and Haring-Smith to learn about the BlocPower pilot program and that it's "something we're interested in learning more about."

Brunner cited Keene's Sustainable Energy Plan as an indication of BlocPower's potential in the Elm City. Like Peterborough's goals, Keene officials aim for 100% electricity usage in the city to be generated from renewable sources by 2030.

In the wake of the program's installation work beginning sometime this summer in Peterborough, Drachman highlighted energy contractor training courses slated to be offered later this year that teach participants how to become energy auditors as well as classes that end with people receiving certification to install heat pumps.

"If we do succeed in getting these grants and getting people excited about electrifying and weatherizing their homes, we need a lot more people to do this work," Drachman said.

Building owners in Peterborough interested in working with BlocPower can complete a questionnaire at https://blocpower.io/electrify-peterborough and interested contractors can apply to partner with BlocPower at https://www.blocpower.io/contractor-partnerships.

Reprinted with permission from The Keene Sentinel. *This article has been edited from the original. The full posting can be read at https://bit.ly/PeterboroughPartnerswithBlocPower.*

Trisha Nail is a business-focused reporter for The Keene Sentinel. ♻

Old House Remodel Allows an All-electric Lifestyle

Dan Vastyan

Maureen Mahle and her husband, Steve Klocke, both work for Steven Winter Associates, Inc. (SWA) – a firm that helps designers, developers, and owners improve their buildings. SWA, a large energy and sustainability consulting firm, has offices in CT, DC, MA, and NY.

In early 2020, Mahle and Klocke purchased a neglected, 100-year-old Colonial-style home in Norwalk, CT, with plans to put their professional expertise to use.

After a long renovation, the 100-year-old home now boasts a final blower door test of 1.6 ACH at 50 pascals.

The goal for the renovation was to attain LEED v4.1 for Homes Platinum, ENERGY STAR Homes, and Zero Energy Ready Homes certifications, all of which are currently pending. This inherently meant using lower embodied energy materials and a creating a healthy indoor environment.

The old 2,400 s.f. home needed structural improvements, windows, doors, roofing, insulation, electrical rewire, sheetrock, plumbing, heating and air conditioning.

Mahle is SWA's managing director of residential building services and Klocke is a senior sustainability consultant. – The couple started the renovation knowing they wanted an entirely-electric residence, including a solar array and battery storage. The obvious HVAC solution was inverter-driven heat pump technology for heating and cooling.

"We decided on mini splits because our professional research showed that the technology provides the best performance," said Mahle. "But even the most efficient systems can't overcome an inefficient building envelope. Work began there."

Wall cavities were sealed using AeroBarrier whole-house air sealing before mineral wool batts were installed. The exterior walls were covered with one-inch rigid foam. The attic was spray foamed to accomplish both air sealing and insulation in minimal space. The windows featured i89 glass for lower U-values.

"We ended up with a final blower door test of 1.6 ACH at 50 pascals," explained Mahle. "That's not enough for Passive House but it's excellent for an old structure."

SIZING AND SELECTION

"At first, we weren't certain whether to use ducted or non-ducted mini-splits," said Mahle. "What finally pronounced a clear winner was the fact that we have lots of windows and very few walls. It left us with few places to install wall-hung indoor heads.

"Robb Aldrich, principal mechanical engineer at SWA, sized the systems aggressively," continued Mahle. "Most contractors would say that the system is undersized, but after a winter in the home, I can say with certainty that we have plenty of capacity. Of the heat pump brands we considered, and given the efficiency and the static pressure needed, only Fujitsu offered units in capacities small enough at the time."

Aldrich said, "For colder climates, Fujitsu has had some of the best low capacity, single-zone, ducted systems." "Their mid-static air handler is also really nice to reach several rooms, and to get there with more reasonable-size ducts."

Optimum Energy, LLC. installed a one-ton slim duct unit in the attic to serve the five rooms on the second floor, and a one-ton ducted unit in the basement to serve the five rooms on the first floor. A 9,000 BTU wall-hung unit serves a finished portion of the basement.

Indisputable performance

A tight house and high efficiency HVAC system were only half the requirements to reach the energy goals set forth. The rest came by way of solar PV, power storage, and a split heat pump water heater. Con Edison Solutions installed an 8.64 kW solar array on the roof, paired with two Tesla Powerwall batteries providing a total of 27kWh storage capacity. The upstairs of the home features a RenewAire ERV system, which provides 100 CFM of tempered outdoor air.

"We're mindful of the energy we consume, but we don't sacrifice convenience or comfort," said Mahle. "We keep the house comfortable year-round -- 70°F in the winter because of our two-year-old -- and we're not shy about running our appliances when we want to. The solar array allows us to reduce our environmental impact and still run a household as anyone else would."

Over the course of the couple's first year in the home, the property consumed 8,892 kWh, while the PV system generated 12,273kWh in the same timeframe. The 38% net positive result was even better than hoped for.

"Predicted energy use by categories suggests that annual end-use energy consumption for space heating should total 4,281kWh, with space

Cont'd on p.29

cooling consumption around 578kWh," said Mahle. "But the home has already proven to outperform the energy modelling."

Comfort and efficiency

"After living in the house for a year, our actual energy consumption was 17% lower than our HERS modelling had predicted," said Mahle. "Our HERS Index, as modeled, was 2, meaning not quite net-zero. In fact, the actual occupancy data has proven that the home performs substantially better than net-zero.

Klocke and Mahle describe the home as "extremely comfortable," with no spaces that are overly warm or cool. Indoor air quality was of concern during the retrofit as well. There are no fuel-fired appliances in the home, and the fireplace remains in place but it is blocked off.

Air filtration was another top priority, and the RenewAire ERV is equipped with a MERV 13 filter that is changed every two to three months.

"The return filters on the Fujitsu air handling units have been surprisingly clean," said Mahle. "We think that's a product of clean finishes and tight home construction."

During the entire process, consideration was given to sustainability in building materials. The foundation, framing, flooring and doors were all reused and the countertops are wood.

"After seeing the performance and comfort level, we're very happy that we made the investment in the electrification lifestyle," said Mahle.

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

Counter clockwise: Top left: All appliances in the home are electric; Klocke's office is served by a 9,000 BTUh wall-hung unit; top rt: Optimum Energy's Ryan Bouchard, and Nicholas Olsen, testing the ducted system in the insulated attic; the installed mini-split condensing units and heat pump water heater.

(smartenergy.illinois.edu)

$46 Million in Funding for Energy Efficiency to Slash Emissions in Buildings

Summary: 29 Projects Across 15 States Will Advance State-of-the-Art Building Technologies and Retrofit Practices to Cut Utility and Operating Costs, Reduce Energy Waste, and Support Healthier Communities

In support of President Biden's Investing in America agenda, the U.S. Department of Energy (DOE) announced $46 million for 29 projects across 15 states to develop advanced building technologies and retrofit practices that enable healthier households and communities and reduce energy waste. The Buildings Energy Efficiency Frontiers and Innovation Technologies (BENEFIT) funding opportunity will help advance cost-effective solutions to successfully electrify buildings across the nation while also improving their energy efficiency and demand-flexibility. These projects support innovative decarbonization strategies that, when deployed widely and properly, significantly reduce the building sector's greenhouse gas emissions, eliminate unnecessary or wasteful energy consumption, and reduce strain on the nation's electric grid. Accelerating breakthroughs in innovative technologies that increase building resiliency while mitigating local pollution is essential to delivering on the President's plan to combat the climate crisis and build a clean energy future.

"Exploring new ways to build and operate America's buildings is key to cutting harmful emissions and combatting the climate crisis," said U.S. Secretary of Energy Jennifer M. Granholm. "With this funding, the Department is providing critical new resources to teams from across the nation to transform game-changing ideas into innovative solutions, creating safer and healthier homes and buildings while cutting energy costs."

Residential and commercial buildings are the largest energy-consuming sector of the U.S. economy, responsible for approximately 40% of the nation's energy consumption, 74% of its electricity use, and 35% of its total carbon emissions. Estimates indicate roughly one-third, or more, of the energy used by buildings is wasted at a cost of $150 billion annually. Utilizing current technologies and developing new innovations are essential to ensuring buildings across America can quickly and more effectively improve their energy efficiency and decarbonize their on-site processes while advancing environmental and energy justice priorities.

DOE works to reduce the energy intensity and related carbon emissions of homes and commercial buildings by supporting cost-effective technologies and practices, and these selected projects will drive innovations that help drive breakthroughs and continued progress. More than half of the 29 projects selected will pursue advancements to improve space conditioning and water heating, which accounts for just over half of all energy use in American homes. The remaining projects will help advance other components impacting homes and commercial buildings.

Selection for award negotiations is not a commitment by DOE to issue an award or provide funding. Before funding is issued, DOE and the applicants will undergo a negotiation process, and DOE may cancel negotiations and rescind the selection for any reason during that time.

DOE's Office of Energy Efficiency and Renewable Energy (EERE) is accelerating the research, development, demonstration, and deployment of technologies and solutions to support President Biden's ambitious plan to transition America to "net-zero" greenhouse gas emissions economy-wide by 2050. EERE is helping to ensure the clean energy economy benefits all Americans, creating good paying jobs for the American people—especially workers and communities impacted by the energy transition and those historically underserved by the energy system and overburdened by pollution.

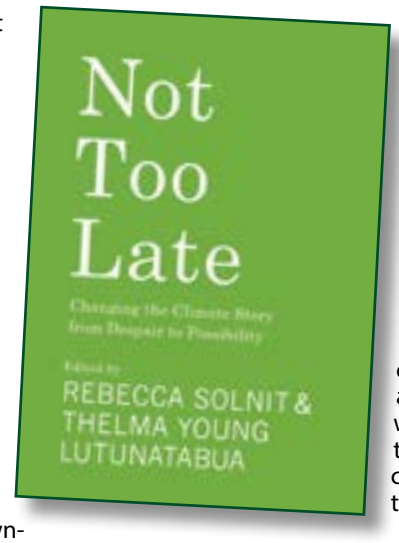
For more information on DOE's efforts to make our homes and buildings more affordable and comfortable, visit the Building Technologies Office homepage at: https://www.energy.gov/eere/about-office-energy-efficiency-and-renewable-energy. ♻

U.S. DEPARTMENT OF ENERGY

HOPEFUL, HOPELESS AND POSSIBILITIES

John Bos

I must admit that I am one of those people who believe we have passed the tipping point that guarantees our climate crisis can be turned around. My belief is based primarily on: what I have learned about those who control the legislation so essential to stemming carbon emissions; how corporate practices reliant upon the extraction of fossil fuels to maintain bottom lines are preserved; and lastly, how a small number of billionaire owners from Elon Musk to Rupert Murdoch have a powerful hold on so much of the information that reaches the public. Media that want to please different sides by engaging in false equivalence in the name of "neutral" reporting.



How about taking an approach emphasizing right and wrong, and naming who is responsible? Both are often missing from our American media bubble. The result is widespread defeatism about solving our catastrophic climate crisis.

Rebecca Solnit's climate anthology, "Not Too Late: Changing the Climate Story from Despair to Possibility" is a must-read. She writes that the climate scientist Zeke Hausfather said, "It's fair to say that recently many of us climate scientists have spent more time arguing with the 'doomers' than with the 'deniers' in a *Washington Post* story titled, 'Why climate doomers are replacing climate deniers.' The people putting out defeatist frameworks have more impact than outright deniers, not least because deniers are right-wingers and the right is already committed to climate inaction. Doomers discourage people who otherwise might act, so they're working toward the worst outcomes they claim to dread."

Despite the widely held view that experiencing climate change might lead to greater acceptance of climate policy, research on the link between public opinion and climate events is mixed. It's not clear one way or the other whether extreme weather triggers people to reassess their views on climate change. Partisanship matters here. A 2020 paper in the journal *Nature Climate Change* pointed to a clear dividing line. In the U.S. extreme weather tends to reinforce the link between climate change and weather effects in Democratic or highly educated communities - and less so elsewhere.

This dynamic might suggest that extreme weather may actually be creating an opportunity for conservatives to cater to their base. As heat waves or flooding raises the specter of climate change for certain groups, others can use it to raise the specter of the costs of climate policy to rally their base.

Solnit writes, "I was told the public doesn't care, a couple of other people told me that 'the media is not covering' the climate crisis. This was a reasonable position five or 10 years ago, but isn't at present. Mainstream print media, with its own enthusiasm for grim takes, oversimplification of nuanced climate reports, and distractions like last fall's fake fusion energy breakthrough, is not doing the job the way I'd like to see it get done. But it is covering climate. There were, for example, multiple climate stories on the online front pages of the *Washington Post* and the *New York Times* that day."

AdobeStock/66738610_Zerophoto

Green Energy Times, in addition to its focus on sustainable energy information, has covered climate change consistently for 14 years.

Solnit writes "I don't know why so many people seem to think it's their job to spread discouragement, but it seems to be a muddle about the relationship between facts and feelings. I keep saying I respect despair as an emotion, but not as an analysis." That last sentence is extremely important to me. It makes me wonder if my own defeatist feelings are because I don't think I can feel hopeful and hopeless at the same time. A couple of people I deeply respect have said to me. "Of course, you can."

"You can feel absolutely devastated about the situation and not assume this predicts outcome;" Solnit states, "you can have your feelings and can still chase down facts from reliable sources, and the facts tell us that the general public is not the problem; the fossil fuel industry and other vested interests are; that we have the solutions, that we know what to do, and that the obstacles are political; that when we fight, we sometimes win; and that we are deciding the future now."

Rebecca Solnit has helped me back onto the path of possibility.

John Bos is also a contributing writer for Green Energy Times. *His bi-weekly column "Connection the Dots" is published every other Saturday in the* Greenfield Recorder. *Questions and comments are always welcome at john01370@gmail.com.* ♻

Citizens on Capitol Hill for the Climate

John and Katharine Gage

What can one person do about climate change? Key negotiator of the 2015 Paris Climate Accord and former Executive Secretary of the UNFCC, Christiana Figueres, said, "None of us individually, but all of us collectively, have the capacity to change the trajectory we are on."

This is the principle on which the grassroots, non-partisan organization Citizens' Climate Lobby (CCL) was founded. CCL's mission is to create the political will for effective and fair bipartisan policies to address climate change by helping ordinary people develop new skills and work with others to advance legislation. Powerful polluting industry influence has prevented change for decades, but political will is a game of numbers. With a rapidly growing volunteer membership of over 200,000 concerned citizens, CCL is a force to be reckoned with.

CCL volunteers work locally to inform their community and leaders about expert-recommended bipartisan climate policies. They share simple actions with others, collect policy endorsements from community and business leaders, and lobby Congress. Many citizens are not accustomed to doing things like this, but CCL encourages people to try because taking actions beyond one's comfort zone "is where the magic happens."

Every June, CCL invites its members to gather in Washington, D.C. for an annual Conference and Lobby Day. Participants span the political spectrum and come from all 50 states.

The conference provides two days of training in lobbying techniques, climate policy, and current legislative opportunities. Participants hear from climate scientists, economists, policy experts, and community organizers to prepare them to work together in lobby teams. Conference sessions are available on YouTube (e.g. #CCL2023 June Conference).

On June 13, 2023, 895 citizens gathered on Capitol Hill before meeting with 436 Congressional offices to call for bipartisan climate legislation. (Photo courtesy of Citizens' Climate Lobby.)

Among the participants this year was Thea Dugas, a skier and rising freshman at Portland High School in Maine, who said, "As someone deeply concerned for our future, looking around the conference room was so empowering to see so many different people who all made the trip to D.C. because they are worried about climate change, and they are willing to take concrete, policy-based action to enact effective and equitable climate legislation."

The third day was lobby day. As 895 CCL volunteers from across the country gathered on the Capitol steps on a beautiful summer morning, we felt a sense of shared responsibility not just to the climate, but to each other. We had all worked hard to prepare for this day, and we were ready. The morning photo was taken, and we headed off to meetings with 436 Congressional Offices.

Our primary "ask" for House members was to co-sponsor the bipartisan Energy Innovation and Carbon Dividend Act, which will be reintroduced in Congress soon. This legislation uses a cash-back carbon price on fossil fuels to drive U.S. emissions down to net-zero by 2050 while protecting low and middle-income households and incentivizing other countries to price their pollution through a carbon border adjustment. While no single policy will solve climate change, this solution is the most powerful, equitable, and far-reaching.

The Conference keynote speaker Francis Rooney, former Republican Congressman from Florida, said of this solution, "This is just so logical. It works. It's a win-win for everybody." Rooney cosponsored the Energy Innovation and Carbon Dividend Act in the 116th Congress before his retirement. Support grew to 96 cosponsors last Congressional session. Please ask your members of Congress to become co-sponsors in this session using CCL's action tool at cclusa.org/write-cfd.

Our primary "ask" for Senate offices was to cosponsor the bipartisan PROVE IT Act. This bill directs the Department of Energy to calculate the carbon emissions of energy-intensive goods (steel, aluminum, etc.) in the U.S. and other countries. Collecting this data is the first step towards leveraging America's carbon advantage over dirtier-producing countries in trade and holding them accountable for their climate pollution. That is a benefit of the carbon border adjustment part of any national carbon price, such as the Energy Innovation Act. You can ask your Congressional delegation to support the PROVE IT Act at cclusa.org/prove.

Cont'd on p.32

Satellites Identify Problematic Methane Pollution Sites

George Harvey

In June 2023, *The Guardian* ran an article called, "US deal could plug Turkmenistan's colossal methane emissions" (www.bit.ly/Methane_pollution). It is worth reading. One quote from it is this:

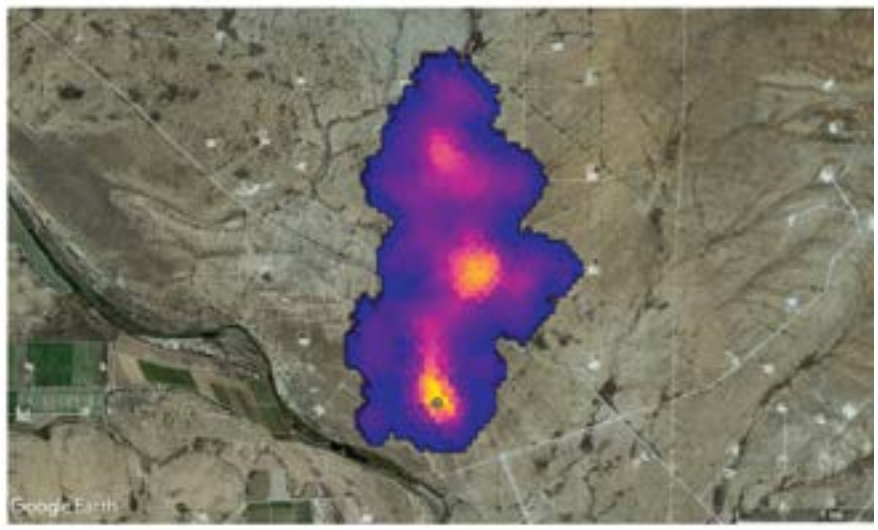
Turkmenistan was responsible for 184 "super-emitter" events in which the powerful greenhouse gas was released in 2022, the highest number in the world. One caused climate pollution equivalent to the rate of emissions from 67m cars.

The article discusses a collaborative effort of the U.S. and Turkmenistan to reduce methane emissions. It is an important effort, because over a short time, twenty years, methane is eighty times as powerful as a greenhouse gas as carbon dioxide.

One of the things the U.S. is offering Turkmenistan is expertise. The offer is worthy of a blush, considering that the U.S. is one of the worst offenders and does not seem to be doing as much as it could about the problem (note the word, "seem").

Back in 2012, some students drove a car along every street in Boston. It was equipped to locate natural gas leaks by measuring methane in the air. It found six leaks that were bad enough that they could have caused explosions, and those were repaired. But it found a total of over 3,300 leaks, according to an article posted by Boston University (www.bit.ly/Methane_2).

The leaks the students found are just at the place where natural gas is being used – a final destination after the long process of getting it out of the ground and through the pipes transporting it. But Boston is just an example of a problem that exists everywhere methane is used. Unfortunately, methane leaks exist along a large proportion of pipelines, which carry the gas under pressure, and at natural gas and oil wells. Methane also leaks from coal mines, because methane off-gasses from coal.



Methane leak in New Mexico. (NASA Jet Propulsion Laboratory and Caltech)

The problem is really worse than all that. Methane leaks from abandoned gas and oil wells and from long-closed coal mines. There are millions of abandoned oil and gas wells that are still uncapped and leaking gas in this country, according to an article by the NRDC (www.bit.ly/Methane_3). Much of the cost of capping them will have to be born by taxpayers, because the companies that ran the wells are mostly out of business, and they did not leave behind funding to cap the wells.

Methane leaks are obviously a big problem and a major cause of climate change. But please note: we have satellites that can locate the worst methane leaks, showing both where they are and roughly how much methane is leaking.

Various types of satellites can find methane emissions. Among them are satellites belonging to NASA, which were described by that agency in a web post, "Methane 'Super-Emitters' Mapped by NASA's New Earth Space Mission" (www.bit.ly/Methane_4).

Specifically, NASA has a mission, Earth Surface Mineral Dust Source Investigation, (EMIT) that is intended to map where key minerals are in dust-producing deserts. As part of that work, EMIT is also able to detect methane emissions.

While the many emissions in a city like Boston might not show up by satellite, the largest emitters will. They are visible from space, regardless of where they are on Earth. This means that the worst emitters, some of whose methane could be from natural sources, can get necessary aid to reduce their emissions. And so, we have a partnership between the United States and Turkmenistan, as they try to reduce emissions to combat climate change.

Clearly, the satellites are not the only tool needed to address the climate change problems of methane, but they can identify the locations most in need of action. ♻

Methane leaks from orphaned oil wells. The well pictured is in Guadalupe Mountain National Park. (National Park Service image, public domain)

No, This is Not the New Normal

Cont'd from p. 1

New York had $50 million in damages from the flooding. After that happened, Governor Kathy Hochul said, "This is possibly our new normal." Whether she was correct might depend on what she meant. If she means that we have come to a time when setting a record is a normal event (ho-hum), then perhaps she was right.

Climate scientist Michael E. Mann posted his opinion at LinkedIn, "The new 'abnormal': Experts agree climate change will intensify droughts and heatwaves in the future."

Why climate change will not slow down soon

There are aspects of the climate issue that we might do well to examine. Let's take a look at a few:

1. The primary driver of climate change is greenhouse gas emissions, GHGs. A 2019 overview of 11,602 peer-reviewed studies found not even one that disagreed with this. That was not 97% - it was 100% References to that study and several others can be found at "Surveys of scientists' views on climate change," in Wikipedia (https://bit.ly/CC_surveys).

2. Clearly, to stop climate change, we must stop emitting GHGs. Unfortunately, we are still at a point where emissions are increasing. We are nowhere close to stopping them altogether.

3. Climate change will not stop just because we stop emitting GHGs. To do that, we have to draw down a lot of carbon dioxide from the atmosphere. If we draw it down as fast as we have emitted it, the process will take decades.

The reason why climate change will continue after we stop emitting GHGs can become clear by considering cooking an egg. If you want a soft-boiled egg, you don't boil it for three minutes, shut off the burner, and wait until the water has cooled off to get it out of the pot. If you do that, you won't get a soft-boiled egg because the egg will still cook in the hot water, even when the heat is off. To get a soft-boiled egg, you have to remove the egg from the pot altogether.

Flooding on a road near West Point, NY in July 2023. (U.S. Military Academy, public domain)

Heating the Earth with greenhouse gasses takes a long time. When we shut off the emissions, the GHGs in the atmosphere will continue to heat the planet for a long time.

Some recent science shows we may be in far worse shape than we realize. A article published this month by CNN covers what happened when scientists discovered a long-lost frozen sample that had been taken in Greenland in 1966 (https://cnn.it/43CjZZi). The core was twelve feet of rock and soil that had been found after drilling through 4,500 feet of ice.

The core was 416,000 years old, according to analysis. It contained "twigs, mosses, leaves and seeds." That part of Greenland, 416,000 years ago, was ice-free. But GHG levels of today are about 1.5 times as high as they were then. The authors of the study say in a statement that Greenland "may be more sensitive to human-caused climate change than previously understood – and will be vulnerable to irreversible, rapid melting in coming centuries."

We might infer that we have far more GHGs in the atmosphere already than it would take to melt all the ice in Greenland. The CNN article says, "If Greenland's ice sheet were to melt completely, sea levels would rise by about 7 meters (23 feet) causing devastation to the billions who live along the world's coasts." And that amount of sea level rise may already be baked into the system.

Of course, we can hope that the scientists are wrong about some of this. Maybe the crust of the Earth has shifted and Greenland was closer to the equator in those days. But we don't have to go to speculative denialism to see that the world is changing far faster than we should let happen.

One thing feels certain. Where we are just can't be the "new normal." We are just starting on the way to that. ♻

Citizens for Climate

Cont'd from p. 30

We also lobbied for clean energy permitting reform and other complementary climate policies.

We used CCL's positive, polite, and persistent approach to build upon the respect and trust the organization has earned in Congress. New Hampshire resident Matt Stein, a father of three and CEO of weather modeling company Salient Predictions, noted, "This was my first time attending CCL's June Conference and Lobby Day. What impressed me most was the respectfulness, knowledge, and dedication of the CCL members and staff. I now understand why CCL receives such a warm welcome from members of Congress across the political spectrum."

After a full day on Capitol Hill, CCLers attended the annual reception to share stories, successes, hopes, and plans, hear new volunteers talk about their experiences, and enjoy another CCL post-lobbying tradition – fantastic cupcakes!

CCL volunteers will continue working to build political will for climate solutions locally throughout the year, then some will return to Washington, D.C. for another conference and lobby day next June. If you are interested in taking meaningful action to help solve the climate crisis, joining Citizens' Climate Lobby at cclusa.org/join and getting active in your local group is a great place to start.

John Gage is the volunteer state coordinator for CCL in New Hampshire. Katharine Gage is a student at Bowdoin College and a CCL group leader. ♻

Climate Extremes and Surprises

Dr. Alan K. Betts

Climate extremes and surprises have both been part of life this summer in the Northeast and elsewhere. Smoky hazy air was blown down again from widespread fires in Canada. In big cities like New York, visibility fell to new low values and the smoke pollution was dangerous to those with respiratory problems, and more generally for the young and old. But why the Canadian fires are so severe this year is not fully clear although, although it is clearly a feature of the rapidly warming climate system. In addition Canada refuses to bring its fossil fuel exports under control.

Some places in Vermont got substantial rain in June, followed by many days of sunshine. Then massive floods occurred across the state on July 10 and repairs are still ongoing. With around seven to eight inches of rain in 24 hours across most of the state, almost all the rivers rose above flood stage and flooded many towns and washed away many roads. Montpelier (see photo) and Barre in the north had the worst floods. It was a reminder of the floods from tropical storm Irene in 2011, but this time there was no tropical storm, just day-long bands of heavy rain over the whole state and some surrounding regions. For days, Vermont was effectively closed in order to evacuate people from flooded regions.

On the larger scale, the ocean circulation in the Pacific and Atlantic is shifting to the warmer state known as 'El Nino' after three years of the cooler 'La Nina'. The global temperatures set new records on July 4, 5 and 6. As the oceans warmed rapidly, the evaporation of water and flooding accelerates, so the climate crisis is fast deepening.

We should not be surprised since the US is largely responsible for the catastrophic climate change now under way. Back in 1978, the Exxon senior scientist James Black identified and modeled correctly the impact of doubling CO2 on global climate. He warned management that a climate disaster lay ahead if they did not change their business plan. His report was suppressed. Exxon and its collaborators (that I called the Fossil Empire in reference1) bribed 139 Republicans in the US Congress for a mere $61 million to publically lie and deny climate change. Webs of lies and 'greenwashing' for decades have created an acquiescent public. These are deliberate criminal actions by companies like Exxon-Mobil to make billions destroying life of Earth both now and for our grandchildren; as well as killing so many across the globe in extreme heat waves. We should bill them for the flooding damage this summer, and in future years. Climate change will simply accelerate until society forces the Fossil Empire to take responsibility for its deception. So far there has been absolutely no willingness to do this in the US and other oil companies have noticed. Shell is considering moving its headquarters from the United Kingdom to the United States. Britain has implemented a windfall-profits tax on energy companies, which suggests to Shell that the U.S. is more "supportive of oil and gas companies".

A Vermont road is washed away due to the extreme flooding experienced this summer. (Greg Whitchurch)

Massive climate change is underway and everything is interconnected. Increased evaporation from warming oceans is the major driver of our summer floods, but our region is mountainous so the distribution of rain is not uniform. Our historic building strategies along the flood plains of rivers need to be reviewed, because extremes are likely to get worse.

The climate system is fully interconnected on a global scale. The Polar Regions are warming faster than lower latitudes as ice melts and this weakens the N-S temperature gradients and the jet stream circulations. Forests and vegetation are also fully coupled to the climate system in complex ways and our understanding increases every year. This is an area where many indigenous people understand the forest-climate coupling better than our models.

Globally there have been many extremes of both heat waves and floods this summer. In late June 2023, weather extremes gave record-breaking heat waves in China, where Beijing surpassed 40 degrees Celsius (104 degrees Fahrenheit) for the first time. Around China, cities used bomb shelters as cooling centers during a 10-day streak of days above 35°C (95°F). In July 2023, temperatures in Texas surpassed those of Northern Africa, as they reached 43.3°C (110°F). This past week, European temperatures along the Mediterranean in Spain, Italy and Greece all approached 45°C (113°F). A deeper analysis of the summer temperature extremes over land and ocean will emerge this fall.

We have moved into the climate crisis stage that we knew was coming for 45 years and the situation will only get worse. It is bizarre that societies like the US have tolerated the destruction of life on Earth to protect the profits of the fossil fuel companies for so long. When will we face the truth, rather than continue to accept the webs of lies?

[1]***Climate Change and Society*** *2021. AIMS Geosciences, 7(2): 194–218. DOI: 10.3934/geosci.2021012*

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

Earth Closes In on 1.5°C Increase – *Cont'd from p.1*

biosphere and living nature; protecting freshwater for all; and acing the challenge of excessive non-organic fertilizer and nutrient deficits in our soil.

"Justice is a necessity for humanity to live within planetary limits. This conclusion is seen across the scientific community in multiple heavyweight environmental assessments. It is not a political choice. Overwhelming evidence shows an equitable approach is essential to planetary stability. We cannot have a biophysically safe planet without justice." This is the fundamental conclusion of Professor Johan Rockström, Earth Commission Co-Chair, lead author and Director of the Potsdam Institute for Climate Impact Research.

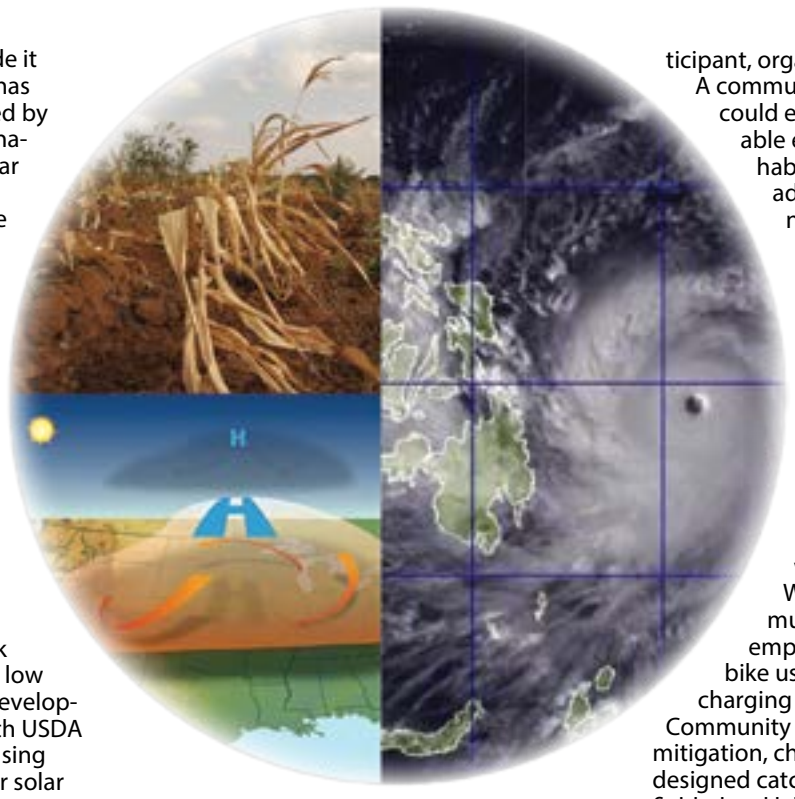
Human health, wellbeing and justice are inextricably linked to maintaining the five key biophysical processes creating an equitable safe zone. Safe boundaries maintain stable and resilient conditions. Earth's stability and resilience rests on balancing feedback that allows for buffering and dampening disturbances. We must understand that preventing climate tipping points is a major line of defense in setting safe boundaries.

"A safe and just transformation to a manageable planet, requires urgent, collective action by multiple actors, especially in government and business to act within Earth system boundaries to keep our life support system of the planet intact. Stewardship of the global commons has never been more urgent or important," said Wendy Broadgate, Earth Commission Executive Director, and Global Hub Director (Sweden), Future Earth.

The summer of 2023 has made it abundantly clear that weather has become climate. The air is fouled by smoke from drought driven Canadian wildfires. Temperatures soar to dangerous levels. Torrential rain storms make roads collapse and epochal floods drive rivers over banks where flood waters covered the center of Montpelier, Vermont and nearly reached the Statehouse floor. Something is happening here, and we do know what it is.

Steps we can take include taking advantage of many provisions in the Inflation Reduction Act (IRA), especially grants installing heat pumps to slash carbon emissions, reducing energy expenses. Existing furnace or boiler remain as back up. The IRA includes billions for low income and community solar development that can be combined with USDA programs like REAP and PACE using grants and guaranteed loans for solar development. Community Supported Agriculture (CSA) can be combined with farm dual-use solar development and community solar.

Justice and fairness mean all energy users have the opportunity to become energy owners of renewable energy systems powering our civilization. The IRA allows the 30% to 40% Solar Investment Tax Credit (ITC) to be turned into cash and become a tool for farmers and community solar users to become owners. Local and sustainable agriculture integrated with renewable energy is a fundamental part of the five basic geophysical processes, supporting safety and justice. A contact for taking advantage of the IRA and USDA program for solar ownership is Jake Marley (jakemarley.diversified@gmail.com), a long term dual-use AG solar developer.



A basic local approach in which each of us can participate ranges from participant, organizer, to letter writers.

A community sustainability plan could encompass 100% renewable energy, restoration of local habitat, species protection, advancement of Community Supported Agriculture (CSAs), and agricultural products sold locally in markets large and small. In addition, organizing and developing community-based cooperatives, associations, or municipal ownership of renewable energy resources can make all energy users, poor and rich, owners of renewable energy systems whether owners or tenants. We must implement community transportation plans emphasizing mass transit, safe bike use rental programs, public charging stations for electric vehicles. Community plans are needed for flood mitigation, channeling flood waters into designed catchment areas like athletic fields, local lakes, and developing safe and sustainable water plans for everyone's community water use.

A sustainable and just future is the work of each of us. Together we have billions of hands. Ecological and social justice is much more a matter of committed local community action than the pronouncements of the rich and powerful.

Roy Morrison Builds Solar Farms. His latest book is The New Green Republic. ♻

Hot Summer

Cont'd from p. 1

in early 2021, as inflation made the payment offered by the city too small. And it is not a city-wide cooling program as yet. Juan Louis Lopez, the project supervisor, is currently focused on proving that the pilot project can work. "The goal is to test the technology, to learn from it and fine tune it so we can replicate what works elsewhere."

Knowing that it is possible to cool our living spaces without making climate change even worse is very important. But a qanat is a big engineering project. Curro Onate, biologist and president of Red Sevilla por el Clima, a citizens' group advocating for more climate measures in the city, told *Bloomberg Green Daily* that "Pilot projects are very interesting as experiments. But they are totally insufficient because they benefit a very small share of the city's population—and usually the most privileged." Projects like Cartujaqanat must go hand in hand with low-tech solutions like planting trees. According to a Lancet study, about one third of the 67,000 premature deaths attributed to heat in 2015 (which was an average European summer) could have been prevented if 30% of city surfaces were covered with trees. Only about 5% of Seville has been planted with trees, and only 13% of Naples, Italy.

It will be important for this to become a widespread effort and for the benefits of low-tech, natural cooling to come to all neighborhoods. We know already that poor neighborhoods have far fewer trees and air conditioners. Progressive action will only come when the benefits of this new-old technology are extended to all.

Above: The Sevilla CartujaQanat program is by design, an ambitious and particularly relevant program for regions facing extreme heat phenomena adhering to the zero-energy consumption target. Right: Through the combined use of old (the qanat) and 21st C technologies the renovated open air amphitheatre has 10° less heat with netzero energy consumption (Images uia-initiative.eu_May2023)

That will take time, but there is much we can do to keep cool. Low-tech solutions can be found in the vernacular architecture of most hot climate cultures. Densely packed buildings that shade the streets can reduce the temperature considerably; these are a fixture in Arabian and southern Mediterranean cities. Covered walkways prevent people and pavement from heating up. So do parking lots covered with solar panels, which have recently been mandated in France. Paris has also begun jackhammering its many concrete and blacktopped playgrounds to replace them with natural vegetation. Plants will cool the city and restore degraded habitat, both for wildlife and for French school-children who will benefit from more contact with nature.

In Mexico and the American Southwest, windows, doors, and walkways are frequently shaded with awnings made of wooden slats or simple natural sticks laid on a wooden framework. Pergolas, shade sails, and other simple structures can be an inexpensive, even rustic way of reducing the temperature in a home that lacks air conditioning. Recently Dr. Gulrez Shah Azhar, a heat wave researcher who grew up in India, contributed to two pieces on National Public Radio listing the many ways people in hot regions have cooled themselves off without air conditioning. One of the simplest and most intriguing: Sleep in damp socks, which somehow sounds more comfortable than sleeping under dampened sheets.

In the United Arab Emirates, the Dubai heritage old quarters use wind-catcher technology for natural air conditioning. (AdobeStock_433501686)

Meantime government organizations around the world are trying to raise public awareness about the dangers of extreme heat. An initiative by the Adrienne Arsht-Rockefeller Resilience Center is testing solutions, including an insurance program for outdoor workers underway in India. In collaboration with Seville's city hall, the Center has begun naming heatwaves. When the heat risk is very high, a local public information campaign is triggered. Seville has had three named heat waves since July of 2022, Zoe, Yago, and Xenia. The Italian Meteorological Society has followed suit, as are other organizations world wide. When people understand that heat is not just uncomfortable, but frequently lethal, they make different choices. One city in India undertook a public information campaign after a heatwave in 2010 killed hundreds of citizens. In their most recent heat wave, they had 47 people hospitalized for heat stroke, but no deaths. Noel Coward, or possibly Rudyard Kipling, coined the phrase, "Mad dogs and Englishmen go out in the midday sun." It was a satirical comment on the arrogance of empire, but it's applicable to all of us. Many recreational hikers have died unnecessary deaths during the ongoing southern heat wave. Heat kills. Stay out of the midday sun.

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

Read about the Seville project at https://bit.ly/3Ox8Van-Spain-Natural-A-C. ♻

Agrivoltaics Has Potential to Diversify Income for Farmers

Jessie Haas

Solar arrays or farm fields: it's no longer an either-or proposition, thanks to agrivoltaics, the practice of using land for both agriculture and photovoltaic electricity generation. A variation is solar grazing, in which livestock graze under and around solar arrays. Agrivoltaics creates a symbiotic cooling relationship in which the panels and the growing crops or native plants keep each other cool. Plants are buffered from intense sunlight and many grow well in the diffuse light under photovoltaic panels. The panels also reduce the air temperature, and the amount of water evaporating from soils, and they can provide shade for animals and farm workers. Water that does transpire from plants helps cool the panels, which can increase efficiency.

Installing solar panels on agricultural lands maximizes their efficiency (progressive-charlesown.com)

New inventions and new approaches, many coming from university research, are changing the field, literally. BlueWave, a solar developer based in Boston, is studying how squash, blueberries, corn, and cattle can be raised around and under solar panels. BlueWave will take part in four research projects in 2023, some in partnership with the University of Massachusetts. All will use single-axis tracker arrays, elevated to a ten-foot clearance to leave space for farm equipment. The rotation of the tracker panels evens out the distribution of light beneath the panels, which can help minimize shading of crops. Shade can affect growth, sometimes reducing it, sometimes providing needed cooling during hot spells. It can also allow dew to linger longer, promoting fungal growth, so there are many factors to study for different kinds of crops.

Spacing between support poles will be wider than normal, 25 feet between posts, and rows will be oriented north-south (like a row crop) rather than the traditional east-west. The wide row spacing and roomy margins of the research fields allow moderate-scale farm equipment, like a nine-foot mower-conditioner, 18-foot tedder, and 4-by-4 round baler to operate, according to Jesse Robertson-Dubois, BlueWave's director of sustainable solar development. The spacing is still probably undersized for larger farm machinery, such as big cab tractors or a side-pull hay baler towing a kicker wagon.

Purdue University is working on a fix for that scale problem. Researchers there have invented a solar array that rotates to a near-vertical position when farm equipment needs to work the field beneath. Otherwise, the dual, off-axis rotation system tracks the sun as needed to optimize electricity production. The ability to swing out of the way reduces the need for tall posts, which must be sunk deep into the ground for stability and increase the cost of the array. The Purdue structures have been designed for use in row crops like corn, soybeans, wheat, and rice. The Purdue Research Foundation Office of Technology Commercialization has applied for a patent and is seeking commercial partners to move these arrays into production.

BlueWave, meanwhile, is developing research projects in vegetable, corn, and potato fields, and has one underway in Rockport, Maine, on a 100-year-old wild blueberry field. Part of the blueberry research is to understand which construction methods best-protect the plants. BlueWave is also collaborating with farmers to figure out the best use for the narrow strips of land between poles where equipment cannot reach. Grazing, asparagus, or potted plants on landscape fabric could all provide revenue.

Sheep are the animal most commonly grazed under solar arrays, but BlueWave is building sites that can accommodate cattle. This means elevating the panels and adding protection to electrical components. Cattle do love to scratch themselves on posts, so those might also need protection. Solar arrays have the potential to provide shaded grazing during the summer slump, when production often drops.

One cause of controversy around agrivoltaics is the concern that solar panels take farm fields out of production. Researchers are considering that as well. BlueWave's arrays on potato and corn fields are spread out more than 60 feet to accommodate a boom sprayer. Had the panels been clustered in one corner of the field, they would have occupied 20 acres. But spread over 100 acres, the panels will only take eight acres out of production, according to Robertson-Dubois. Similarly, the Purdue arrays allow for double functioning of fields, and as climate change intensifies, the shade they cast may prove a benefit for crops.

BlueWave has been developing agrivoltaic projects in Massachusetts and New Jersey, states with incentive programs, and is now expanding to work in California, Michigan, New York, and Pennsylvania. Meanwhile the University of Massachusetts in Amherst has been taking part in a three-year study of agrivoltaics in various crops including pumpkins, strawberries, cranberries, and mixed vegetables. New York Power Authority (NYPA) is also conducting a study to explore ways of optimizing both agricultural and photovoltaic yield. This is an active area of university study with the potential to help farmers diversify income while cooling the planet.

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

Elmore Roots' Permaculture Know-How

It Really Is About Water

Watercolor painting by Joyce Dutka.

Water is amazing.
We drink it we swim when it is hot.
We water our plants. We water our bodies. We dance in the rain like Bing Crosby.
They help ripen our Bing cherries and pie cherries.
Sometimes we get a bit too much of it.
Then we have to travel by canoe to visit our friends or to pick up a copy of *Green Energy Times*. Water can wash out roads and wash new mulch away.
Water can be fresh or salty.
Watercolor paintings are my favorite.
Water can help grind wheat into flour, olives into olive oil.
Water in little trays in the freezer helps cool off our drinks.
Water can steam our broccoli, so it is soft and ready to eat.
Water can keep us apart or can bring us together.
There is no word for one molecule of water.
Water is always plural.
Water is modelling integration for us.
As soon as two drops of water come together, they form one.
Water can rise up to protest the way we are treating the earth, and it rises up where it believes people may care and do something about it, like in Vermont.
Water is life.
Water is destructive if too much is in a place that is not meant to hold it.
Water is healing, think of entering the healing waters.
Water is where we go to sit and meditate.
Water is where fish live and dance when we are sleeping.
Water connects all parts of the earth to each other.
Water is magical. Water is wet.
You cannot go to the store and buy powdered water because what would you add to it?
Water is what we are mostly made of.
Water is what makes earth a green and blue planet.
Plants move water up and down their stems.
Streams move water down our hills.
In the Sahara, water is sacred and carried carefully.
In Vermont, water is channeled away from our homes and gardens and roads. In Vermont, water is piped and hosed to our gardens and homes. In Vermont, we love our water and want to keep it clean forever.
The first compound seemingly self-created is water.
Water takes a positive and negative charge to hold it together.
Water is a great example of a substance that demonstrates all life is cooperative.
The fourth phase of water demonstrates a self-assembling around molecules of life.
Studies show our emotions are making patterns in the structure of water and are carried through it.
Water keeps us feeling well, and we get more water from a deep well.
A well-watered garden is how we describe a balanced and healthy life.
Every restaurant in the world usually brings you a glass of water as the very first thing they do; even when fasting is required for a hospital test, we are told to only drink water.
Our planet is mostly water. Our parents are mostly water. Our history is mostly water. Our gardens are mostly water.
We cannot go back in time. That is why they say, "A lot of water under the bridge."

A lot can be planted now that we can harvest in the fall or later so plant your seeds today. As long as we have enough rain but not too much, our gardens will be beautiful again.

As long as we can see the fresh and pure Vermont spring water our glass at least half full

David Fried runs Elmore Roots Nursery in Vermont. ♻

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/

C02.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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E-BIKES ON THE MOVE

The Upper Valley E-Bike Lending Library, managed by Vital Communities, is coming to a town near you! The next several locations are:

- Aug 17-29: Plainfield Cornish, NH
- Aug 3-Sep 3: Woodstock, VT
- Sep 12-19: Norwich, VT
- Sep 28-Oct 10: Orford, NH
- Oct 19-24: Reading, VT

Sign Up to Try an E-Bike at: https://vitalcommunities.org/transportation/upper-valley-e-bike-lending-library/ or call them at 802-291-9100

BOOKS

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ADVERTISERS INDEX

Sustainable Product Solutions Review

Product reviews by N. R. Mallery, Publisher of G.E.T.

SKINCARE AND SCENTS

Brown Sugar skincare products are handmade by Kesha Janaan. Kesha is a vocalist and bassist who loves to bring the gift of music to the world singing jazz, blues and rhythm and blues, as well as making natural skincare products.

I tried the soaps and the infused oil samples. The soap is great and does not make me sneeze when used on my face, as most other soaps do. I would like to have tried the whipped body butter which is getting rave reviews for leaving skin hydrated all day (even with eczema). Keesha started making whipped body butter to use on her own hair while living in dry, arid Arizona. She started selling the body butter in January 2017 leading to other bath and body products that were being made for herself. All products are handmade using organic fair-trade ingredients (sustainable as well when possible) and are at least 90% natural with most items being 100% natural. Kesha's Space LLC is in Albuquerque, NM (www.keshajanaan.com).

Brown Sugar Jasmine and lavender set with body butter. (Courtesy photo)

urthy scents Kwench body oil and a coconut wax candle by urthy Scents. (N.R. Mallery)

Urthy scents began from the passion of sisters, Ali and Jen. Both have the beginnings of autoimmune diseases, so it was important to them to use clean, quality ingredients that do not result in headaches and adverse reactions. They decided to make their own products. Out of their need for clean-burning candles, high-quality natural scents and their love of curating a mood, Urthy Scents was born!

I received a sample of two products with the warm sands scent: KWENCH body oil and a coconut wax candle. The presentation was very impressive.

The body oil is made from a botanical blend of ingredients designed to help soften, smooth, and brighten the skin while also improving the look of skin firmness and elasticity. The scent of the oil is mild and very pleasant. Even children comment that it smells really good. In addition to spraying it on my skin, I spray the body oil on my dog and around the room as an air freshener. Urthy scents also offers room sprays and diffusers for home or car and many other natural products.

The coconut wax candles come in a simple white glass container with a cork cover, a wooden wick and matches in their own box. I like both products very much and definitely recommend them with no hesitation. Urthy scents are made in Bradenton, FL (www.Urthys-cents.com).

BIO-PLASTIC PACKAGING SOLUTIONS

President Biden announced a plan to move America to using 90% bioplastics, leaving many businesses wondering how to get there and make a switch. Food brands like Karma Baker and Flax4Life have successfully scaled their businesses using the 99% plant-based plastics that look and feel just like regular plastic, but decompose much faster and with no harsh chemicals of concern. The packaging is 100% petroleum and fossil fuel free.

I received a sample of the product including a sample of its baked goods. The intention is to share my experience with the good natured® packaging, but the treats were tasty. The company, good natured® is passionately pursuing its goal with earth-friendly products by offering a broad assortment of plant-based products made from renewable resources instead of fossil fuels. They are focused on making it easy and affordable for business owners and consumers to shift away from petroleum to better everyday products® that use

Cont'd on p.38

Karma Baker and Flax4Life products in good natured® *packaging. The donut was delicious! (Courtesy photo)*

October is Co-op Month – Celebrate Co-ops!

Erbin Crowell

Recent research has suggested that the success of humankind is rooted in our ability to collaborate, to recognize our interdependence and that the best route to our own well-being is to work together for shared benefit. The modern co-operative movement, which emerged in response to industrial globalization, reflects diverse cultural traditions around the world, and an expression of the ideals of mutual self-help, participation, and sustainability. As businesses that are owned and democratically governed by the people who use them to meet their shared needs, co-ops offer an alternative vision for a more inclusive and sustainable economy that puts people and our collective future before profit.

In 1948, Minnesota was the first state to celebrate Co-op Month, and the U.S. Department of Agriculture issued the first national proclamation in October of 1964, reflecting the importance of co-operatives to America's family farmers and rural communities. Since 1971, the National Co-operative Business Association (NCBA CLUSA) has continued this tradition, promoting co-operation as a model for inclusive economic development.

For example, farmer co-ops such as Organic Valley and Cabot Creamery Co-op play a key role in the survival of family dairy farms that contribute so much to the character of our region and the vitality of rural communities. More recently, Deep Root Organic Co-op, founded in 1985, has enabled a new generation of farmer-members to market fresh, organic produce across the Northeast and beyond.

A survey by the Neighboring Food Co-op Association (NFCA) found that grocery co-ops across New England and New York play a key role on supporting our regional economy, selling more than $112 million in local products annually — or an amazing 25% of total sales. Taken together, the more than 40 food co-ops and start-ups of the NFCA are locally owned by 173,000 members and provide employment for over 2,465 people, more than 60% of whom are also members, sharing in the ownership of their local grocery store.

Co-ops also show up in some less familiar places. Acorn Renewable Energy Co-op in Vermont, for example, was founded in 2008 to help transition area communities from dependence on fossil fuels to a greater reliance on renewable energy. Real Pickles in Massachusetts, which transforms produce from Northeast family farms into fermented foods such as organic dill pickles, sauerkraut, and kimchi, converted to a co-operative in 2013, demonstrating the potential for a more sustainable path for business succession that roots wealth, jobs, and infrastructure in our region over time.

Credit unions, with more than 393 million members in 118 countries, will be celebrating the 75th annual International Credit Union Day on October 19. As not-for-profit financial co-operatives, these community based financial institutions are owned by their members, the people who use them for savings and checking accounts, loans, and retirement funds. This year's observation will focus on the proud history of the movement and its continuing efforts to building financial inclusion around the world through the co-operative business model.

As we enjoy summer's bounty and prepare for the arrival of fall color in our region, Co-op Month offers an opportunity to learn more about the many co-operatives that are part of the fabric of our communities. From farmer co-ops to food co-ops, worker co-ops to credit unions, housing co-ops to artisan co-ops, co-operative enterprise empowers people to meet their needs together, growing stronger, more inclusive and resilient local economies, and building a more sustainable world for everyone. For more information on Co-op Month and resources on co-operatives, visit https://nfca.coop.

Erbin Crowell is Executive Director of the Neighboring Food Co-op Association, serves on the Boards of Directors of the National Cooperative Business Association and the New England Farmers Union, and is an adjunct professor with the International Center for Co-operative Management at Saint Mary's University (Nova Scotia). He may be contacted at erbin@nfca.coop. ♻

Sustainable Products

Cont'd from p. 37

more renewable materials, less fossil fuel, and no chemicals of concern.

Over 400 plant-based home organization products include certified compostable food containers, bio-based industrial supplies and medical packaging, and services. They can be purchased from wholesale, direct to business, and retail channels. The company is focused on making plant-based products more readily accessible to people as a means to create meaningful environmental and social impact (https://goodnaturedproducts.com/).

Ok, I guess i need to leave this on a yummy note. I must tell you what i learned about the Good Karma Bakery after all. Their vegan bakery offers a wide range of treats, all made with plant-based, gluten-free ingredients. And it is delivered to your doorstep in as little as three days. They bake, wrap and send your treats in sustainable packaging. How good does it get? Check them out at www.karmabaker.com.

Watch for another product review in our October edition related to our feature about composting. ♻

SolarFest

– Cont'd from p.20

with the struggles of neighbors throughout the region.

McKibben's' warning is clear, "This is what climate change feels like -- still in the earlier stages since we're less than halfway to the temperature our current trajectory will produce." And he lays out the importance of our continued action to respond to these challenges: "The current horrors are not a reason to stop working. The next round of mobilizations has got to be bigger and it's got to come soon."

Thanks to the dedication and commitment of so many, SolarFest made arrangements to reassemble key pieces from the planned 2023 festival. On Saturday, October 28th, SolarFest will present an incredible one-day festival of music and workshops in the historic Grace Congregational Church in Rutland, Vermont.

Titled, "A Climate of Change -- Preparation & Action for Our New Future," the activities focus on different ways we can create a meaningful impact in the fight against carbon pollution, while identifying resources for adaptation and building resiliency to the worst impacts of climate chaos in the future.

The workshops begin at 11:00 am with a powerful cross-section of entertaining and inspiring speakers. Singer-songwriter Dar Williams discusses her book, "What I found in a Thousand Towns: a travelling musician's guide to rebuilding America's communities," and Vermont State Representative Robin Chesnut-Tangerman and Renewable Energy Vermont (REV) Executive Director Peter Sterling combine to lay out, "Getting Vermont to a 100% Renewable Energy Future."

Humorist and stunt memoirist extraordinaire Eve O. Schaub describes what she and her family found with the story behind "A Year of No Garbage: Recycling Lies, Plastic Problems and More," while VEIC Senior Engineering Consultant Li Ling Young explains the carbon and climate implications and future grid effects of cold-climate heat pumps.

And there's plenty of urgently useful information in the explanation of the Inflation Reduction Act from Paul Lesure, president of Green Mountain Solar and the roundtable discussion of career options for women in renewable energy.

Following a video message from Bill McKibben, founder of Third Act (which organizes people over the age of 60 for action on climate and justice) the musical performances will begin at 5:00 pm in the beautiful church hall kicked off by the Caribbean percussion of Gammy Moses, followed by celebrated singer-songwriters Louise Mosrie Coombe, Pamela Means, and Lara Herscovitch & the Highway Philosophers, concluding with headline performances by Dar Williams and the Ray Vega Band.

Complete details and tickets are available at www.SolarFest.org.

Mike Bailey is a sustainable energy consultant and a trustee of SolarFest, Inc. ♻