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SUMMER EDITION - CONGRATULATIONS HANOVER, NH: 100% RENEWABLE GOAL!

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Lobsters in Trouble

Is climate change affecting New England Lobsters? Turn to p.35

Rebellion!

By George Harvey

Donald Trump would abdicate America's climate leadership.

But states, towns, cities, schools, businesses, and ordinary people are stepping up to make America great again.

And that just may be the year's biggest story.

By withdrawing from the Paris Agreement, Donald Trump left America's seat at the table empty. But the states of California, Washington, and New York formed the U.S. Climate Alliance to take up leadership, representing America. They have been formally joined by nine other states in the alliance, including the New England states of Connecticut, Massachusetts Rhode Island, and Vermont.

Ten other states that have not yet formally joined announced they would meet the climate targets, as did the District of Columbia. Hawaii went even further, making its target legally binding.

A second organization working on meeting the Paris Agreement climate targets is the Mayors National Climate Action Agenda. Cities and towns have joined this group so fast that it is hard to know how high the number has gone. The last official count we could find was 323. These communities represent over 64 million Americans.

Yet another group that has taken up the cause is We Are Still In. On June 5, this group announced that it had 1,219 members, including states, mayors, businesses, investors, and institutions of higher education. A press release said the organization represents 120 million Americans, and $6.2 trillion in investments.

The European Union, China, and India have all indicated willingness to take up America's leadership position. But they also said the place at the table abdicated by Donald Trump could be filled by other representatives of the country.

This issue of Green Energy Times has several relevant stories. Please see Carl Pope's article, "Withdrawal from the Climate Accord," on page 3; a staff article, "Governor Cuomo Announces a Major Climate and Jobs Initiative, on page 10; Chris Gillespie's "More States Aim to Go 100% Renewable," on page 14; John Gage's "Climate Activity that Makes a Difference," on page 18; an article by Dr. Alan K Betts, "Clarity and Courage Are Needed Now," on page 25; and Kirsti Blow's "Trump, Ticks, and Wind," also on page 25.

And hold your head high.

Hanover Pledges to Go 100% Renewable

HOW ARE THEY GOING TO DO IT?

Hanover, NH, 29th US municipality to commit to replacing fossil fueled energy with renewable energy. Image: Dartmouth Flickr

By Rick Wackernagel

On May 9, 2017, the townspeople of Hanover, New Hampshire voted to make their town the 29th municipality in the United States to commit to getting all its energy from renewable sources. It was the first U.S. municipality in which residents approved this goal by popular vote. That vote was unanimous.

Hanover plans to be 100% renewable in electricity by 2030, and in heating and transportation by 2050. Among other cities and towns adopting 100%-renewable goals are San Diego, Atlanta and Moab, Utah. Burlington, Vermont, also on the list, is the first city in the U.S. to derive all its electricity from renewable sources.

This renewable Hanover tale begins about two years ago. Judi Colla, of the Sierra Club Upper Valley Group, saw an opportunity in a request for proposals from the Sierra Club national organization and applied for a grant to bring the Sierra Club's "Ready for 100" program to the Upper Connecticut River Valley region of Vermont and New Hampshire. Communities participating in the program commit to working individually and collaboratively to transition away from fossil-fuel energy to clean, renewable energy. The Sierra Club provides its expertise in helping communities organize to deal with environmental problems, and access to its national research and grant-making

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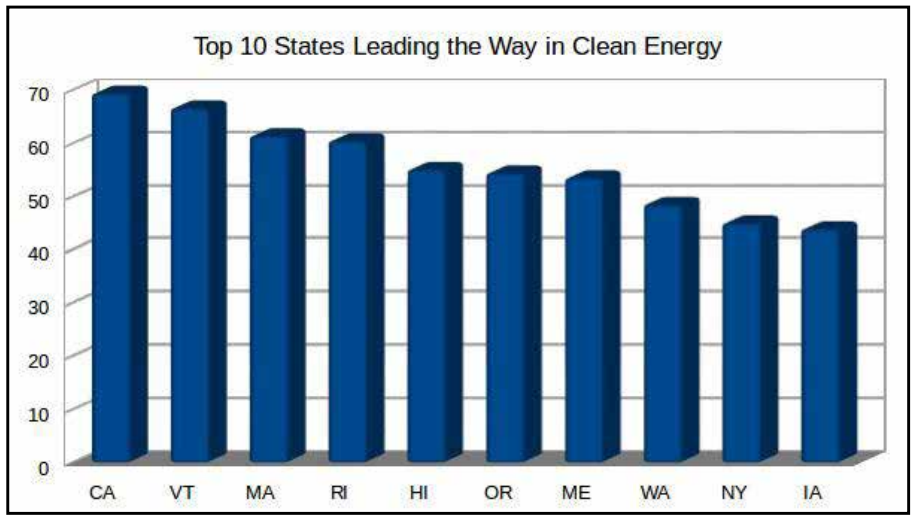
Clean Energy Momentum

- Ratings for the Top 10 States -



To determine the clean energy momentum state ranking, UCS analyzed the 50 states on 12 metrics, such as job creation, pollution reduction, renewable energy in the electricity generation mix, and policies to advance clean energy. California leads the way, with strong showings on eight metrics and the number one position in electric vehicle adoption. (A state's overall score is the total of their metric scores. The highest possible score is 120.)

Reprinted with permission from Union of Concerned Scientists, Catalyst, Volume 16, Spring 2017. Read more at http://bit.ly/ics-state-report.

New Union of Concerned Scientists analysis shows that renewable energy is riding a wave of momentum in states across the country. Which states are leading the way to a cleaner future?

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New Hampshire's Legislature Votes to Accelerate Solar Deployment

Solar advocates throughout the Granite State helped convince the New Hampshire legislature to vote in overwhelming favor for SB129. This historic vote shows that there is wide bipartisan support for clean energy. The bill more than doubles the requirements for solar procurement, removes the ten kilowatt limit for the residential solar rebate program, and funds Renewable Energy Fund benefits to more low-income customers.

The bill, also known as "The Clean Energy Jobs Act of 2017" is only waiting for Governor Sununu's signature.

CORRECTIONS FROM APRIL, 2017

On page 31 of the April 2017 issue of *Green Energy Times*, the article "Colby-Sawyer College Students Partner with PermaCityLife" incorrectly identified the instructor in the top left field studies picture as Todd Workman instead of Professor Nick Baer.

We also wanted to share with our readers a picture of the ribbon cutting ceremony for the PermaCityLife storefront and field studies office for the Sustainable Learning Initiative.

Ribbon cutting: Executive Director of PermaCityLife Todd Workman, City Manager Elizabeth Dragon, Mayor Ken Merrifield, Assistant Professor of Environmental Studies and Director of Sustainability Jen White '90, Colby-Sawyer President Susan D. Stuebner and Community Development Coordinator of PermaCityLife Jenisha Shrestha '14 gathered to cut the ribbon to the PermaCityLife storefront and field studies office for the Sustainable Learning Initiative. Photo by Chris Kontoes.

Solarize Rockingham, VT

A unique program to lower cost and increase adoption of renewable energy

Starting May 1, 2017 and ending December 15, 2017, four local solar companies have agreed to lower their prices and offer the residents and businesses of Rockingham, Vermont a chance to purchase solar at a discount. For this program, installers are working together to pool their resources in reaching out to potential customers. A 15% discount is offered on standard installations or panels in community solar installations.

Any local business or resident can take advantage of the discounts. In addition to the discounts the program is focusing on providing additional money saving opportunities for low or middle income residents, who may not be eligible for loans. Please visit http://solarize.it for more information. For questions and to sign up, contact Daniel Hoviss, program coordinator, at 802-254-1410 or daniel@e-Solutions.org

Rockingham Vermont is on the Connecticut River in Windham County. It includes the incorporated villages of Bellows Falls and Saxtons River.

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Withdrawal From the Paris Climate Accord

by Carl Pope

Donald Trump has done what Al Gore, Jim Hansen, climate scientists, the Sierra Club and the rest of the environmental movement could never do – make climate disruption breaking cable TV news. Trump's histrionic, largely symbolic and recklessly self-destructive decision to abandon the Paris Climate Agreement means, among other things, that far more Americans knew about the Paris Climate agreement the morning after his announcement than 24 hours earlier. Never has climate dominated a news cycle as it did yesterday – even when the Paris Agreement was signed by all of the world, (Nicaragua and Syria excepted).

Trump did this by providing the climate crisis with what it lacked – a single villain. He has now cast himself, for most of the global community, as a James Bond-style villain, a Dr. No or Goldfinger, plotting global destruction for personal power and gain. But he is, in reality, President of the United States – not a character in a movie. And in the real world the response to villainy doesn't come from a heroic special agent but through the collaborative response of a wide array of actors – other countries, U.S. cities, many of America's most powerful states, and hundreds of businesses and civil society organizations.

Trump's decision to abandon Paris has catalyzed, amplified and intensified this response. We actually, ironically, owe him a favor.

Let's begin with the depressing decision, and then look at the hope we can all take from the resistance.

Trump's decision to use the established process to exit Paris, but to remain in the underlying Rio Treaty on climate, means it will take four years for the U.S. to get out – and the American people will have a chance to vote for the next President before we leave.

Demonstrators at Copenhagen Climate Talks in 2009. Flickr

So this announcement is largely symbolic. Trump also made clear that he would not honor the commitments President Obama made in his Paris pledge – but he was already busy undoing as many of those as he could. (Fortunately, far fewer of these climate solutions than the media has implied are actually things Trump can reverse – we're already half-way to meeting our Paris pledge, and Trump can't undo history.) And since Paris is a coalition of the willing, not an enforcement-based agreement, Trump was always free to walk away from our pledges, and knew it.

So as a practical matter, withdrawing from Paris in four years will have no impact on U.S. climate emissions between now and 2025. Yesterday's announcement doesn't give Trump a single additional tool to roll back Obama's climate legacy.

So why do it? Why alienate virtually the entire global community, and abandon America's good standing as a diplomatic leader? Why let China and Germany step forward into our shoes? Why stiff more than 1000 American businesses, including hundreds of the biggest, who begged Trump not to withdraw from Paris, including Exxon-Mobil and Chevron? Why make his climate denial such an embarrassingly big story?

It's hard to know exactly what motivates President Trump. My guess, though is that he withdrew from Paris precisely because he needed to show his isolationist, America-first followers that he would walk away from a passel of treaties, and that he rejected diplomacy as a tool of global leadership – in a way that would have fewer real world repercussions than keeping his campaign promise to terminate NAFTA.

Trump ignored the fact that the Paris Accord was, for the United States, an unbelievably favorable deal, in which everything we agreed to do was something most Americans wanted to do anyway: replace outmoded, expensive and dirty coal power with cheaper, cleaner renewables; stop wasting valuable natural gas by letting it leak or be flared; provide motorists with cars and trucks and waste less fuel and go farther on a dollar's worth of gasoline; modernize our building stock to reduce utility bills and increase comfort; and replace climate-destructive HFC refrigerants with modern, American-developed safe alternatives.

His false and inflammatory remarks about the financial implications of the Paris Agreement were clearly aimed at the minority of Americans who believe that global cooperation hurts the United States, and displayed Trump's usual callousness about what most Americans hear or think about him – in this case, they are reading once again he is just not telling the truth. (For example, U.S. support for the Green Climate Fund under Paris is a tiny fraction of the $100 billion Trump cited. And nothing in the Paris Agreement hampers the U.S.'s ability to build any particular energy project it chooses.)

But Trump's entire campaign and presidency have been premised on the notion that the passion of the minority which supports him will enable him to govern, even as the majority rejects his leadership – so this is nothing new.

What is new, however, is the intensity of the response. Many feared — and Steve Bannon hoped — that a U.S. withdrawal would create a domino collapse of global confidence in Paris. Instead it greatly solidified the commitment of Europe, China, Canada and India to filling the gap left by American withdrawal, while isolating and marginalizing the U.S. in other key diplomatic forums. India's Narendra Modi commented, "Paris or no Paris, our commitment to preserving the climate is for the sake of future generations."

Domestically, Trump has forced a large swath of American business, which had welcomed the predictability and global consistency of the Paris Agreement, into public opposition to his Administration, a break companies had been very reluctant to risk. Elon Musk, who had controversially clung to his seat as one of Trump's economic advisors, walked out in protest. Jeff Immelt tweeted, "Industry must now lead and not depend on government." The Governors of California, Washington and New York began assembling a new coalition of states willing to challenge Trump and coordinate their climate leadership, expecting at least 10, and perhaps as many as 25 participants. Former New York Mayor Michael Bloomberg was pulling together a broad coalition of cities, states and the private sector to prepare an "American Pledge", a replacement set of strategies to meet America's Paris commitment to a 26% emissions cut, using state

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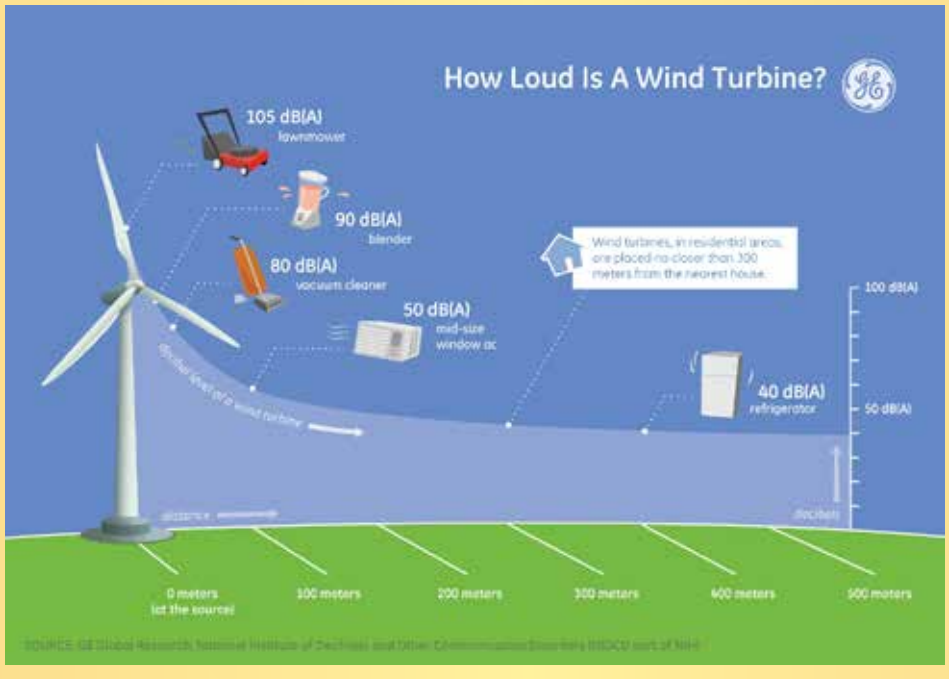
THE SOUND OF WIND TURBINES AND THE HORROR OF GENOCIDE

By George Harvey

In May, as debate was going on before the Vermont Public Service Board on the sound of wind turbines, we got an email from Sarah Wolfe, VPIRG's Clean Energy Advocate. It began, "Last night, someone compared sound from wind turbines to genocide. I wish I was exaggerating. But this is the kind of misinformation and fear-mongering that has filled this discussion. When someone can be applauded for publicly comparing the annoyance of a few neighbors to the senseless murder of thousands, this has gone too far."



We should observe a moment of silence in memory of the millions of people who have died in genocides.

The first Nazi concentration camp was opened in 1933, and the last was closed in 1945. During that time many millions of people died in those camps. No one really knows how many. But taking a medium estimated value, it comes to another human life lost about every 25 seconds, for twelve years. That is pretty horrifying.

There have been many genocides. One of special note is going on today. It is a genocide of randomly chosen victims around the world, who are being killed at a far greater rate than the average in Nazi concentration camps. It kills another person every ten seconds. Most of us do not notice it, because we think it is normal. It is a mass murder of people who die of lung cancer, asthma, emphysema, chronic bronchitis, liver cancer, kidney cancer, or other diseases. Many of these diseases are caused by air pollution associated with our cars, oil heating systems, coal-powered electric generating systems, and other uses of fossil fuels.

The damage is not just deaths. Scores of millions of people who have these diseases and others suffer because our society is unwilling to move to reduce their burdens. And many of those people live in Vermont.

A recent study by the California chapter of the American Lung Association concluded that of the states studied, six of which are in the Northeast, Vermont's "clean" air had the highest health costs to those who breathe it. The study was limited to the health problems arising from the use of fossil fuels in transportation, for which Vermont's costs came to $330,000,000 per year, about $480 per person. Since transportation is 47% of our fossil fuel use, the costs given are probably less than half of the total. These are burdens all of us bear, in our taxes and insurance premiums.

Clearly, there are reasons to say the sound of wind turbines is genocide. One is to spread fear, to induce others will take up the anti-wind cause. Another is folly, reacting to the fear spread by others. But one certainly is to prevent one specific real problem wind turbines create, which is the declining fortune of the fossil fuels industry, the same industry that is costing heavily, by destroying the health and lives of so many.

Nissan Leaf Power Program

Green Mountain Power Teams Up with Freedom Nissan to Give Customers $10,000 Off Leaf Purchases


2017 Nissan Leaf. nissanusa.com

Reduce emissions and lower your transportation costs with the 2017 Nissan Leaf.

Green Mountain Power (GMP) customers who bring their energy statements and a special code to Freedom Nissan in South Burlington now through September 30, 2017 will get $10,000 off the manufacturer's suggested retail price (MSRP) of a 2017 Nissan Leaf. The newly dubbed "Leaf Power Program" is the newest in GMP's many programs encouraging Vermonters to go green and reduce costs.

"At GMP, we are committed to helping our customers find ways to use clean sources of energy and to save money, as we partner on a new energy future," said Mary Powell, GMP's President and CEO. "The Leaf, a fully electric car, allows the owner to never have to rely on gasoline or get oil changes again. And with the growing number of charging stations for electric vehicles across the state, Vermont is ready to go electric."

Customers who take advantage of the rebate will also receive up to a $7,500 tax credit when filing their 2017 taxes making the 2017 Leaf, which start at approximately $30,000 as low as $12,500. Green Mountain Power customers who wish to take advantage of the rebate should bring a copy of their GMP monthly energy statement to the dealership and give the Fleetail Certification Code of "B66059" in order to get the $10,000 off the MSRP.

"This rebate and the tax credit combined will make electric vehicles financially viable for more Vermonters. Additionally, some employers like GMP will give further incentives to employees who purchase electric vehicles making them even more affordable," Powell added.

The Nissan Leaf offers a battery with a range of up to 107 miles, giving most Vermonters plenty of time between charges. Nissan also warrantees the car for the first eight years or 100,000 miles, whichever comes first.

"Mobile sources, primarily motor vehicles, are the largest source of air pollutants in Vermont, making up 46 percent of the state's greenhouse gas emissions," said Abby Bleything, Vermont Clean Cities coordinator. "GMP's Leaf Power program will help increase the number of zero-emission vehicles on the road, thereby taking a critical step towards reducing our state's air pollution and dependence on petroleum."

Interested buyers may contact Nissan in South Burlington at 802-864-7400 or visit http://bit.ly/Nissan-leaf-program or http://bit.ly/GMP-leaf-program. To explore more about electric vehicles in Vermont, including where to find electric charging stations, visit http://www.driveelectricvt.com/.

Fuel Cell Cars Are Coming To The Northeast

EarthTalk® — from the Editors of E - The Environmental Magazine


Toyota's Mirai fuel cell vehicle is already available in California, the only U.S. state with any kind of hydrogen refueling infrastructure in place. Image: RynseOut, FlickrCC.

For years, green car enthusiasts have been heralding the dawn of a new era of pollution-free driving powered by fuel cells, which combine readily available hydrogen with oxygen to power the engine. NASA created the first commercial grade fuel cells in the 1960s to power satellites and space capsules, and automakers have been talking up their potential for use in cars and trucks ever since.

But the idea has never gotten beyond the prototype stage, due mostly to the lack of any refueling infrastructure. After all, drivers are used to being able to refill their tanks on almost every corner, while the new generation of electric and plug-in hybrid and electric vehicles (EVs) can be recharged from any electrical outlet.

But FCVs (fuel cell vehicles) may still represent the holy grail of auto travel because they combine the environmental benefits of electric vehicles (no reliance on fossil fuels and no pollution) with the driving range (about 300 miles between refueling) of conventional cars. While GM, Hyundai and Daimler are heavily invested in fuel cell vehicle production, Toyota and Honda are already offering fuel cell vehicles for sale or lease to drivers in California, given the Golden State's head start in creating a hydrogen refueling network. According to the California Fuel Cell Partnership, 27 hydrogen refueling stations are already up and running around metro Los Angeles and the Bay Area, with 33 more coming online soon.

Toyota's Mirai FCV seats four and offers all the trimmings of any new car—touch-screen entertainment, dual climate control, steering wheel-mounted controls, radar to prevent accidents and help with parking, and a 312 mile range per fill-up. The MSRP on the Mirai is $57,500, but Toyota is currently offering $7,500 back. Another

Cont'd on p.6

Why Ride an Electric Bike?

By Larry Gilbert

Tim Maker of Calais tries an e-bike at an electric vehicle demo last year. Courtesy photos.

After selling and promoting e-bikes for five years, I found there are a handful of common reasons people find an e-bike to be a great investment. There are four very common reasons people purchase an e-bike.

First, many people have stopped riding their regular bikes but want to keep riding. American garages almost always have a bike stored inside. But the sad fact is that as we get older, we find reasons to not use our bikes. The hills are more daunting, the knees just aren't what they used to be, and the thrill seems to have slipped away. It is so easy to get in the car and run to town for a loaf of bread, that we don't even consider that there might be another option.

Second, some people have a spouses or partners who are avid riders who are very fit, and it becomes daunting just to keep up with them. Riding together is a great way to cement a relationship. But when one person is way ahead and waiting for the other to catch up, it can be less enjoyable for both. For Jeb Bouchard of Waitsfield, an e-bike was the solution: "I haven't ridden a bike in 30 years, because the Vermont hills are too exhausting. Now I climb them with ease and leave my biking enthusiast hubby in the dust. We now have a fun outdoor activity we can do together. It really levels the playing field for me."

Third, many people want to reduce their use of their cars. A smaller carbon footprint is the goal of a lot of environmentally concerned riders. If the average trip with a car is less than five miles, a bike is a great alternative. Or if the daily commute can occur on two wheels instead of four, it reduces fossil fuel use and gives you some exercise.

Fourth, people usually find riding an e-bike to be a lot of fun. Behind all the health, relationship and environmental reasons for choosing an e-bike, the undeniable truth is that riding e-bikes can be a thrilling experience. Getting a little assistance suddenly makes the hilly world look a lot flatter and a lot more accessible.

One question I often hear is: if I have an electric motor, will I get any exercise? A recent study from Portland State University showed that on average, owners of electric bikes ride nearly twice as often as when they owned regular bikes. It is true that the workout is not as rigorous, but if you are clocking more miles, you are getting exercise. Most of the new e-bikes are what's called pedal assist. This means that when you crank the pedals, the assistance kicks in. If you don't pedal, nothing happens. So you have to work to receive the benefit of the motor.

Electric bikes are not a complete solution to our transportation concerns. Riding in January or in the pouring rain is not much fun on any kind of bike. But for well over half the year, having a tool that flattens the hills and is a blast to use, electric bikes are a great choice.

Larry Gilbert is the owner of Zoombikes, Vermont's first electric bike dealership. Larry lives in East Montpelier, VT, where he operates his e-bike business. He can be reached through www.zoombikes.net.

Linda Chesaux of Calais owns three electric bikes.

Is There a Future for Electric Buses in Vermont and New Hampshire?

Electric Buses Trials in Vermont and New Hampshire

By George Harvey

A BYD electric bus. Photo credit: Wikimedia Commons

In February of 2017, Green Energy Times ran a story, "Electric Bus Trials in Vermont and New Hampshire," describing what were then upcoming trials of an electric bus in Vermont. The bus to be used for the test was a forty-foot unit built by BYD, the Chinese company that provided the bus to test.

That bus has now been tested by two local transit companies. One is Advance Transit (AT), which operates in some areas of the Upper Valley of Vermont and New Hampshire. The other is Green Mountain Transit (GMT), whose bus lines are in and around Burlington, Vermont. Assistance for the program has been provided by the Vermont Agency of Transportation (Vtrans), and the Vermont Energy Investment Corporation (VEIC), and the Burlington Electric Department (BED).

The bus arrived for AT's trials in late February, and was used over a period of seventeen days. During that time, it served on a number of regular routes, including hospital shuttles, the Blue route running in Lebanon, Hanover, and Canaan, New Hampshire; and the Red route in Lebanon.

The trial produced very few problems. One was a pair of unexpected noise issues that were dealt with easily. Another was learning to adapt to how electric buses operate on slippery surfaces, an issue partly related to regenerative breaking that was resolved by disabling that system while the bus was on winter snow and ice.

From the customers' point of view, the bus served well. It's noteworthy that it was warm, even when the temperatures dipped down to near zero Fahrenheit.

An important system to test was the battery. It performed as advertised, with 33% to 37% of the charge remaining at the end of a twelve to thirteen hour day, driving 130 miles. A test with the

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Adding an Electric Assist to Your Bike!

By George Harvey

Have an old bike you are not using for one reason or another? Maybe you should add an electric assist!

When I gave up my last car, a 2001 Prius, my world shrank to only those places within walking distance. I was able to expand the range again by buying a used Gary Fisher mountain bike. While I had been able to walk a few miles at most, now I could take much longer trips.

Even with a bike, however, my range was still limited by any steep hills I might encounter. A real breakthrough came when I added a Dillenger electric assist to my bike. With that, I could go places that were previously out of the question.

The proof of this came shortly after my seventieth birthday. To renew by driver's license, I had to visit the closest DMV branch, a twelve mile round trip. The clerks at the DMV must have chuckled when I walked in, and they saw the contrast between my black bike helmet and my white beard.

E-BIKES

There are many super-efficient electric bicycles available, including cargo e-bikes, which are great for meeting a variety of transportation needs. Visit the VBike coalition or the Electric Bike Report for more info: www.vbikesolutions.org and www.electricbikereport.com.

SMART COMMUTING IN NH & VT

Transportation emissions are among the worst offenders that add to the rising CO2 levels in our atmosphere. In recent months we have learned that our efforts have begun to reduce the detrimental air quality counts (NHDES), but as you may have learned from numerous other reports such as the International Panel on Climate Change (IPCC), http://climatechange2013.org/, global warming is still advancing faster than expected.

How do we get our emissions down now? By making new commuting choices!

Lots of choices. Smart Commuting is all about knowing your options and planning ahead. There are many choices to get around in New Hampshire and Vermont, The first place to start in Vermont is "Go Vermont" for statewide choices to travel more efficiently. Whether getting around town, commuting to work or school, or planning a day trip, share the driving or ride with someone else to help save our planet and to save approx. $2,000 annually. The statewide VT site also lists services for commuters, tourist, and shoppers.

In New Hampshire you'll find a similar site at "NH Rideshare" where you can find carpools, transit routes and schedules, bike and walk trails and links to statewide transportation information.

When carpooling, remember to use the local Park n Ride lots to meet your connections. Start your trip planning at connectingcommuters.org or nh.gov/dot/programs/rideshare/ for statewide choices.

IN NEW HAMPSHIRE

UPPER VALLEY RIDESHARE (UVRS) - Carpool matching, benefits and support for commuters in/out of Upper Valley. 802-295-1824 x208. **uppervalleyrideshare.com**.

ADVANCE TRANSIT (AT) – Free weekday bus for Lebanon, Hanover, Enfield, Canaan, NH, and Norwich and Hartford, VT. Dartmouth and DHMC Shuttles. ADA & Travel Training Services. 802-295-1824. **advancetransit.com**

CARROLL COUNTY TRANSIT - Services and connections to Belknap County. 888-997-2020 **tccap.org/nct.htm**

CITY EXPRESS - Serves Keene. 603-352-8494 **hcsservices.org/services/transportation/cityExpress.php**

SCS TRANSPORTATION - Services for Sullivan County.. 603-542-9609. **SCSHELPS.ORG**

CONCORD AREA TRANSIT (CAT) - Serves Concord 603-225-1989 **concordareatransit.org**

CONTOOCOOK VALLEY TRANSPORTATION (CVTC) - Monadnock Rideshare for the southwest region 877-428-2882 **cvtc-nh.org**

COOPERATIVE ALLIANCE FOR REGIONAL TRANSPORTATION (CART) - Serving the Chester, Derry, Hampstead, Londonderry, Salem and Windham, limited service to Plaistow. 603-434-3569 **cart-rides.org**

DARTMOUTH COACH - Services to Boston, Logan Airport and NYC 800-637-0123 **dartmouthcoach.com**

MANCHESTER TRANSIT AUTHORITY (MTA) - Manchester, with links to Nashua and Concord. 603-623-8801 **mtabus.org/services/local-buses**

NASHUA TRANSIT SYSTEM (NTS) - Buses and trolleys with bike racks. 603-888-0100 **RideBigBlue.com**

NH RIDESHARE – Your Source for Transportation Alternatives. **nh.gov/dot/programs/rideshare/**

WINNIPESAUKEE TRANSIT SYSTEM (WTS) - Services Belmont, Franklin, Tilton, Laconia. 603-528-2496 **bm-cap.org/wts.htm**

IN VERMONT

UPPER VALLEY TRANSPORTATION MANAGEMENT ASSOCIATION (Vital Communities) - Works with UV employers and communities to promote and improve commuting options. 802-291-9100 **vitalcommunities.org/transport/index.htm**

VERMONT PUBLIC TRANSPORTATION PUBLIC TRANSIT - Lists transit, ferries and more at **aot.state.vt.us/PublicTransit/providers.htm**

AMTRAK - Long distance train service. Discounts for AAA members and student advantage card. (800) 872-7245 **amtrak.com**

CHITTENDEN COUNTY TRANSPORTATION AUTHORITY - Burlington bus service with links to Montpelier, Middlebury and commuter route to Milton. **cctaride.org**

CONNECTICUT RIVER TRANSIT - Services in Bellows Falls and Springfield. **crtransit.org**

GO VERMONT - Offers carpool matching and commuter connections in VT 800-685-7433 **connectingcommuters.org**

GREEN MOUNTAIN RAILROAD - Day trips from White River, Champlain Valley, Bellows Falls and Rutland. **rails-vt.com**

GREEN MOUNTAIN TRANSIT AGENCY - Local service in Barre, Montpelier, Grand Isle, Stowe and Lamoille. 802-223-7287 **gmtaride.org**

GREY HOUND/VERMONT TRANSIT - Long distance bus services. 1-800-231-2222 **greyhound.com**/

LAKE CHAMPLAIN FERRIES - Transport between New York and Vermont via Lake Champlain. 802-864-9804 **ferries.com**

MARBLE VALLEY REGIONAL TRANSIT- For Rutland, Killington, rural Manchester, Poultney and Rutland to Bellows Falls. City routes Free on Saturday. 802-773-3244 **thebus.com**/

RURAL COMMUNITY TRANSPORTATION (RCT) - Buses, vans, and volunteer drivers. Routes via The Jay-Lyn, The Highlander (Newport - Derby Line); The US RT2 Commuter (St. J. to Montpelier) and Free routes to rural areas. 802-748-8170 **riderct.org**

STAGE COACH - Commuter buses from Randolph and Fairlee to Dartmouth, Local village buses. 800-427-3553 **stagecoach-rides.org**

Fuel Cell Cars Are Coming To The Northeast

Cont'd from p.4

option is a 36-month lease on the Mirai for $349 per month plus $2,499 up front.

Meanwhile, Honda's new Clarity FCV is similarly appointed but offers a roomier interior (seating for five) and a longer range (366 miles per fill-up). Californians can lease the Clarity (it's not for sale in the U.S.) for $369 per month for 36 months plus $2,868 due at signing, with Honda covering the first $15,000 worth of hydrogen fuel.

Drivers behind the wheel of the Mirai or Clarity qualify for a one-time $5,000 tax rebate from California for driving a green car, not to mention access to HOV lanes statewide even with just a single occupant.

Of course, fuel cell drivers won't want to leave California just yet. Outside of the Golden State, there are exactly three publicly accessible hydrogen refueling stations (Massachusetts, Connecticut and South Carolina each have one). But later this year Toyota, in partnership with France's Air Liquide, will start to roll-out a new network of hydrogen refueling stations around the northeastern U.S., so drivers there can start to enjoy the benefits of driving the latest, greatest and greenest technology ever to grace the American road.

Contacts: California Fuel Cell Partnership Stations Map, cafcp.org/stationmap; Honda Clarity, automobiles.honda.com/clarity; Toyota Mirai, toyota.com/mirai.

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Electric Buses In VT, NH?

Cont'd from p.5

regenerative braking system disabled showed the value of that system, but also showed it was not absolutely necessary.

Chris Andreasson, Director of Transportation at AT, expressed appreciation to Michelle McCutcheon-Schour and Bethany Whitaker at VEIC who initiated the company's test project, and to Carlos Antunes and Chris Batiste of BYD, who provided help as needed. He also said AT was pleased with the overall test result.

The bus left AT on March 17 for the rest of its next tests, which were in Burlington and lasted until April. There, it was tested by GMT. CEO Mark Sousa summed up the experience in that city, saying, "We did a pilot program and captured a lot of data on efficiency. … We may possibly purchase four electric buses." He mentioned that there is a considerable difference between the initial cost of electric buses and those operating on diesel. The electric buses cost more, but are much better for air quality and operating costs, so GMT is looking for grants, with cooperation with BED, VTrans, and VEIC.

Sousa said the bus GMT tested was designed for the inner city and worked well in Burlington. It did not do quite as well for longer distance rides to Montpelier, but BYD makes different models for longer trips. "We are excited about the project and the partners," he said. "We would love to be able to get electric buses."

We also talked with Darren Springer, BED's CEO. He also hopes for a purchase of four electric buses in Burlington. He told us of a number of other exciting projects at BED that aim to reduce fossil fuels use for transportation. One of these is the utility's own electric vehicle rebate program.

BED customers who buy electric vehicles that are registered in Burlington can get rebates of up to $1,200 on the purchase. There is a limit of one per customer, and the vehicle must cost less than $50,000. BED is also looking at extending the program to qualify plug-in hybrids, and is even looking at green pricing options for electricity, which we regard as remarkable for the first sizable city utility to be 100% powered by renewables.

Late Breaking News You May Have Missed

Green Energy Times staff

Focusing on more in-depth reporting, Green Energy Times cannot do justice to every news item. Here are some news items that are not reported elsewhere in the magazine.

April 28 – CleanTechnica published an article saying that oil discoveries in 2016 had declined to the lowest levels seen since before 1950.

April 28 - The Indian Express told us that the U.S. Environmental Protection Agency (EPA) is getting a makeover to reflect the views of President Donald Trump and EPA Administrator Scott Pruitt. This included deleting material on climate change from the EPA website.

May 9 - The Desert Sun had an article saying the U.S. added over 11 gigawatts (GW) of solar power in 2016, increasing the amount of solar power by almost 50% in that year alone. Also, wind power had its best quarter since 2009.

May 10 – An article in CleanTechnica said Navigant Research projected the global market for distributed solar photovoltaics plus energy storage is expected to exceed $49 billion per year by 2026.

May 12 – PennEnergy ran an article saying Maryland regulators approved plans for the nation's first large-scale offshore wind projects. They could have a total of 368 megawatts (MW) of capacity.

May 13 – An article from Hellenic Shipping News Worldwide said China will suspend approvals for new coal-fired power plants in 29 provinces to reduce overcapacity because of health risks.

May 20 – CNN reported that President Trump's fiscal 2018 budget request would slash EPA spending by almost a third.

May 24 – An article at Utility Dive said Tucson Electric Power signed a power purchase agreement for a system with 100 MW of PVs and 30-MW, 120-megawatt hours (MWh) of storage. Exact prices are confidential, but it was said that the solar portion of the project at below $0.03/kWh.

June 1 – The BBC reported that shareholders in ExxonMobil have backed a motion requiring the company to assess the risks from climate change. The plan was supported by over 62% of those eligible to vote.

June 6 - Environmental Leader reported that New York's attorney general alleged in new court documents that ExxonMobil's internal accounting practices were a "sham," misleading its investors on climate risks.

June 14 – An article in pvbuzz media said that according to a newly published report, the U.S. solar market added 2,044 MW of new capacity in the first quarter of 2017. The report said prices continue to fall, with utility-scale system prices dropping below $1 per watt for the first time.

June 18 - Climate Central said that a new report from Bloomberg New Energy Finance projected worldwide investments for power generation would be $10.2 trillion from 2017 to 2040, with renewable power sources such as wind and solar getting almost three quarters of that. The report also said that $5.3 trillion more for renewable power would be needed to keep global temperatures from rising more than 2° C.

June 20 – An article in pv magazine said renewable power hit a series of records in the UK. There were times when no coal was burned for power, and there were times when solar produced more power than nuclear reactors. And, the UK recorded its first negative power prices.

Links to the sources of the articles will be included when this article is posted online.

MARCHIONNE'S BET AGAINST HISTORY

By Carl Pope

The news that Fiat-Chrysler is the latest auto-maker caught having massively – and probably illegally – exceeded allowable emission levels for its diesel cars raises a major question: will this crisis shake Chrysler CEO Sergio Marchionne's long standing bet against history, in particular against the replacement of the internal combustion engine by the electric drivetrain? Marchionne stands almost alone in the auto industry in denying the electric future – but now that he too faces an existential crisis over diesel cheating, how much longer can he – or his shareholders – cling to the combustion past?

Chrysler, we now know, installed software designed to deceive emission testing procedures on 100,000 U.S. Dodge Ram and Jeep Cherokee diesels from 2014 to 2016. It also apparently pulled similar manipulations in Europe. The company has agreed to recall and fix the vehicles, but denies it broke the law – standard operating procedure for auto companies when first caught exceeding pollution limits.

Fiat stands accused of having installed similar emission "cheat" devices on much larger numbers of cars it sold in Europe – it is not yet clear how widespread the issue is, but this feels very much like the early stages of what could be a major scandal. The European Union has initiated legal action against Italy for failing to adequately enforce EU standards for auto emissions testing on cars made by Fiat. And the University of the Ruhr reports that Fiat installed cheat devices on the Fiat 500X, a compact diesel widely sold in Europe.

The U.S. violations were clearly part of the company's strategy to use somewhat more efficient diesels to meet increasingly stringent U.S. fuel efficiency and carbon emission rules while clinging to a vehicle mix very stuffed full of SUV's and almost entirely devoid of the zero emission electric vehicles which other auto makers are relying on to average out with their big

Sergio Marchionne with Fiat. Wikipedia.org.

cars. (Chrysler has consistently shown the worst fuel economy performance of any U.S. auto manufacturer.)

Marchionne has historically derided the future of the electric vehicle, at one point urging customers not to buy Fiat's EV 500 because, "I lose $10,000 making every one." He is also the major auto executive least interested in producing standard sedans for ordinary customers, cancelling many of Chrysler's biggest selling sedans and emphasizing SUV's even more heavily.

Without a strong car line, and with no meaningful EV presence, Marchionne really had no choice but to rely on diesels to cut fuel consumption – regardless of the inability of small diesels in particular to meet pollution requirements. Now he, like Volkswagen, is nakedly exposed as having allowed his company to sell vehicles whose emissions kill its customers and their neighbors. A new study this week calculated that the excess emissions from diesels that fail to meet pollution standards already kill 38,000 people a year globally. Now the burden from non-compliant Fiats and Chryslers will be added to that total.

The diesel scandal forced Volkswagen to make a major shift away from diesels and towards electric drivetrains. Will Marchionne follow? After all, the other six of the big seven auto manufacturers are all far ahead of Chrysler in their investment in the electric future. But Marchionne has said that Fiat's next likely model of electric car won't arrive until after he has retired; he worries that allowing electrification to get a firm hold in the auto market will open the industry up to new competitors; and the SUV heavy product line he deploys does not offer easy opportunities for early electrification.

But if he stays his electro-sceptic course, Marchionne is betting even more heavily against what appear to be the historic trends. The two fastest growing auto markets in the world, China and India, have national governments sending strong signals that they plan to phase out market access for the internal combustion engine altogether, perhaps as soon as 2030, as does the biggest market within the U.S., California. A recent Financial Times story reported that Torotrak, an engineering company which a year ago was lining up contracts with auto makers to improve the efficiency of their internal combustion engines, is now being cut off from contracts because the companies have decided, "the shift to electric vehicles is accelerating, and we have only limited R&D money to invest, and we are going to put all of it into the electric car revolution."

The head of Shell Oil, one of the ultimate losers in an electrified transport sector, warns, "The energy transition is global. It must be embraced. It is unstoppable." And it means, he spells out, electric vehicles. "The world needs to make a massive shift towards consuming energy as electricity."

While short-term the scandal is bad news for Fiat Chrysler, its shareholders and its workers, it may give the company one last time to catch up with history – and recognize that electrification is the future of the automobile.

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

A veteran leader in the environmental movement, Carl Pope is the former executive director and chairman of the Sierra Club and is now the principal advisor at Inside Straight Strategies. He continues to serve as a board member or adviser for a long list of environmental organizations.

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

Can President Trump Stall Clean Energy's Momentum?

In March, President Trump signed an executive order aimed at dismantling the Clean Power Plan, a 2015 policy that had incentivized the growth of renewable energy by requiring states to lower carbon emissions. It's unclear how effective this effort will ultimately be but, no matter what, it can't change the reality that clean energy is a bright spot for the U.S. economy, providing more full- and part-time jobs in the electricity sector than natural gas and more than twice as many as coal. The rapid expansion of solar power jobs is particularly noteworthy, tripling since 2010.

Equally important, these are good-paying jobs that benefit people in all walks of life: solar installers earn on average $26 per hour, and wind turbine technicians – projected to be the fastest-growing occupation from 2014 to 2024 – earn on average $48,800 annually. Neither of these jobs requires a four-year college degree, and each is available to people in rural and low-income areas. Solar and wind power also employ Hispanic or Latino people and veterans at higher rates than the overall U.S. workforce. Plus, the solar and wind sectors are winning support in diverse quarters. Farmers and cattle ranchers, for instance, like that they can continue to run their businesses while generating substantial extra revenue by leasing small pieces of their land for wind turbines.

Backing like that helps boost bipartisan support for clean energy and keep its momentum going. On February 13, a group of governors comprising twelve Democrats and eight Republicans sent a letter to President Trump asking him to "strengthen America's energy future" by extending government support for a modernized electricity grid, offshore wind, and more research. The letter noted that 70% of U.S. wind farms are located in counties with below-average incomes, and urged that any major infrastructure bill put forth by the Trump administration include funding for an electricity grid that is more secure and can accommodate more renewable energy.

Given the foothold solar and wind power have gained in solidly red states, the president could pay a steep political price if he doesn't heed the governors' advice.

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Solar Projects are Growing in New Hampshire and Vermont

By George Harvey

Vermont and New Hampshire are both seeing much larger solar developments than any previously undertaken. NextEra Energy Resources (NEE) is developing one in New Hampshire, and it will likely be the largest solar array in New England. GroSolar, working with Green Mountain Power (GMP), is also developing what might, at least for a short time, be the largest in Vermont, along with considerable battery storage. Another array in Vermont will probably be that state's largest, but will be just the first of five of the same size undertaken by Ranger Solar of Yarmouth, Maine.

Hinsdale, New Hampshire

Hindsdale Town Hall. Photo: Wikipedia

The Chariot Solar Project (CSP) in Hinsdale, New Hampshire will likely be the largest solar farm in New England when it is completed. Originally developed by Ranger Solar, the project was recently sold to NEE, which is continuing the development for up to 65 megawatts (MW), as planned. It will be built on 250 acres of land, which is largely out of sight of neighbors and passersby.

Ranger Solar chose Hinsdale because of its proximity to the Vermont Yankee Nuclear Power Plant, which closed down in 2014. The power lines used by that plant to feed electricity onto the grid are still in place and useable. This makes the land where the lines are easily accessed especially valuable for either generating electricity or consuming it in large quantities.

The addition of a large solar plant will doubtlessly benefit consumers in the area. The highest demands for power happen during the daytime, when the sun is shining. Solar power can cover much of that demand, especially on hot, sunny days, reducing peak wholesale costs. Since the retail price of electricity is highly dependent on the highest wholesale rates paid by utilities, addition of large amounts of solar power benefits all grid-tied power customers.

Another benefit of renewable energy projects in general is that they pay taxes but have very little need for services from the towns where they are located. Hinsdale has signed a PILOT agreement (payment in lieu of taxes), under which it will receive about $500,000 each year for twenty years in exchange for hosting the solar array.

At present, the project is proceeding smoothly. The select board is very supportive, as are most Hinsdale residents, according to reports. The expectation is that the permitting process will take until sometime in 2018, and the array will be completed in 2019.

Hartland, Vermont

Damon Hall, Hartland, VT is home to the town offices. Photo: Wikimedia Commons

A solar project in Hartland, Vermont may turn out to be the state's largest, at least for a while. It is being developed by GMP, with groSolar undertaking construction. This array is 4.99 MW. The project is of special interest because it will include two MW of battery storage.

The Hartland project is intended to be built on 35 acres of land owned by the Greater Upper Valley Solid Waste District. GMP would lease the land for $60,000 per year for 25 years, with two possible five-year extensions. The Town of Hartland would receive $25,000 to $35,000 in taxes each year.

The selectboard of Hartland has been very supportive of this solar array, as it may be of great benefit to the community. Hartland Town Manager Bob Stacey said the land "is not used and the array would not be visible."

The battery storage will be able to provide power on an emergency basis during outages, but its primary purpose is to help even out peak demand loads, stabilizing wholesale prices and reducing the retail cost to ratepayers. GMP has already tried a similar system in Rutland.

The permitting process for the Hartland project is moving ahead, and it may be finished in 2018.

Ludlow and Cavendish, Vermont

The Coolidge Solar Project (CSP) was the first of five 20-MW arrays Ranger Solar plans for Vermont to be permitted. When it is built, it will probably be by far the largest solar array in the state, as it is four times the size of the next largest planned. It will consist of 82,000 solar panels on 88.5 acres of an old farm in Ludlow and Cavendish, and will need permitting from both communities. Similarly-sized arrays are planned for Brandon, Highgate, Randolph, and Sheldon.

Ludlow, VT with Okemo Mountain in the background. Photo: preservationinpink.wordpress.com

CSP has worked with the Vermont Agency of Natural Resources to minimize harm to wildlife. It has also worked on landscaping to minimize visual impact of the array.

The Public Service Board has granted CSP a certificate of public good. Its position is that even though the electricity produced at the array will be sold to utilities in Connecticut, it will reduce the cost of electricity to Vermont ratepayers. The board also wrote that CSP "will result in significant economic and environmental benefits for the state of Vermont." Construction is expected to start within a year.

GMP and Tesla Batteries

Lease one for $15 per month.

By George Harvey

The Tesla Power 2 home battery system can fit inside or outside. Its dimensions are a height of 1.3m, width of 0.86m, and a thickness of 0.18m. Photo credit mcelectrical.com.au

Green Mountain Power (GMP) is making an extraordinary offer to its customers. They can lease a Tesla Powerwall 2 battery at the unheard of price of $15 per month. An alternative to the monthly fee is a single payment of $1,500. Since the usual price to buy the battery is $5,000 plus installation, renting is an amazing deal. The lease is good for ten years, so the total payment will be $1,800, only a fraction of the purchase price.

The Tesla Powerwall 2 is advertised as providing 13.5 killowatt hours (kWh) of useable battery storage. According to GMP, this provides eight to twelve hours of battery backup for an ordinary household, operating at usual use levels. It can produce five kWh continuously but will produce as much as seven for a short time. The Tesla Powerwall 2 is rated for indoor or outdoor installation, though its operating range is -4° F to 122° F, so in Vermont it may be best to install it indoors.

There are two advantages for the customer who leases the battery. One is an ability to buy power at a low price during times when demand is low, and then use it later at a time when demand is higher. Since demand alternates between high and low cost periods daily, this may be sufficient to reduce electric bills significantly, a pretty good deal for $15 per month.

The other advantage for the customer is that the battery will provide power during grid outages. These tend to be short in Vermont, averaging only

Cont'd on p.37

A New York Community Solar Project

By George Harvey

The Helderberg Solar Farm is a 200-kilowatt system, with power supplied by 600 solar panels. It was built in Johnsonville, New York, and went on line January 2017. Photos courtesy of Monolith Solar.

Joanne Coons, who has contributed in a number of ways to Green Energy Times, sent us an email updating the several community solar projects in her area of New York. She said Kevin Bailey from High Peaks is building the Hope Solar Farm and mentioned projects from Solstice. One solar farm of special interest is the Helderberg Solar Farm, which was built by Monolith Solar, an installer based in Rensselaer, New York.

Monolith Solar has promoted community solar in the New York capital region's Solarize program. And now, those efforts have paid off. The Helderberg Solar Farm will be the first community solar project in the Capital Region to go on line.

The Helderberg Farm is a 200-kilowatt system, with power supplied by 600 solar panels. It was built in Johnsonville, New York, and its power is being sold through National Grid, the local utility. The power is being credited to the electricity accounts of the 26 residential off-takers, who include both home owners and renters.

The members are all people who wanted to have solar power, but were unable to provide adequate places to site solar systems of their own. In some cases, this was because of a poorly oriented property, in others it was because of shade from trees or nearby buildings. Some members did not have their own property at all, but were renters rather than owners. Off-site community solar systems are open to just about anyone with an account with the utility and lives near enough to the solar farm, a distance that could be quite a few miles.

The way a community solar farm works is that the electric utility customers who buy the solar power do not use the electricity directly. Instead, it is sold to their local utility, and their bills are credited based on how much power their shares in the community system produce.

Lindsey McEntire, the Business Development Manager of Monolith Solar is also one of the members of the Helderberg Farm. She said, "The installation and activation of this community solar farm is going to change the way power is distributed in New York. Now, instead of having panels located directly on your roof, you can instead buy into a Community Solar Farm and generate your power remotely."

McEntire was particularly pleased with the fact that customers, such as herself, could have solar power even though they do not have good sites of their own. "Everyone with an interest in solar can now participate. It's truly incredible. I myself have bought into the Community Farm, I live within a historic district in downtown Troy, and could otherwise never go green due to lack of space and building restrictions. I am thrilled that my brownstone is now being powered by the sun, 15 miles away!"

Troy Resident Kerry Fagan also addressed the importance of being able to use a remote site, saying, "Our roof is not suited for solar panels, [having] too many trees and not enough light. I have always wanted to go green, and the solar farm gives us access to renewable energy without any hassle – we love it."

One of the biggest challenges Monolith Solar had in organizing the system was to find an appropriate place to site it. Originally, the company planned to build a two-megawatt array, but locating a large enough piece of land that was close enough to appropriately-sized power lines proved not to be easy. A solution to this is to put up a set of much smaller systems, distributed through the countryside. Getting the individual permits for a number of smaller systems is easier than getting a single permit for a large one. Environmental and visual impacts are more easily managed, and interconnections with utilities do not place the same burdens on transmission infrastructure.

Gov. Cuomo Announced a Major Climate and Jobs Initiative

By Green Energy Times Staff

New York Governor Andrew M. Cuomo made a series of announcements soon after President Trump's announcement that the United States would withdraw from the Paris Accord. The first of these was that he had signed an executive order to commit New York to uphold the standards set forth in the Paris Climate Agreement. Then he announced that New York, California, and Washington had created the U. S. Climate Alliance, a group of states committed to back the Paris Accord.

He then announced the Clean Climate Careers initiative, under which the state would invest up to $1.5 billion in major renewable energy projects, expand energy efficiency, and put solar installations on public buildings. The initiative includes a goal to produce an additional 2.5 million megawatt hours of electricity each year. This is the largest clean energy procurement in the history of the United States.

In a partnership with the ILR School's Worker Institute at Cornell University, and Climate Jobs, NY, the Clean Climate Careers initiative will have the following goals:

1. Investing in clean technology and speeding renewable energy development – The investments will enable meeting New York's Clean Energy Standard target of 50% renewable electricity by 2030 and set the state up to double its solar power capacity, from the current 800 megawatts to 1,600 megawatts, by the end of 2018.

2. Producing clean climate careers – The investment in renewable energy will create approximately 40,000 jobs in clean technology and provide funding to train that workforce. These are lifetime careers that pay well.

3. Advancing environmental justice – The program will include an Environmental Justice and Transition Working Group, which will develop programs and policies to help historically underserved communities and those leaving carbon-intensive careers to prepare for a cleaner and greener future.

Oxford Memorial Library

A Nineteenth Century Building with Twenty-First Century Energy

By Chris Gillespie

All public libraries connect history with the present and future, but the Oxford Memorial Library in Oxford, New York has taken that to a new, more sustainable, level.

Originally built in 1811 by Theodore Burr as a private residence, the house and its grounds were donated to the town of Oxford in 1900 to be designated as a free public library. Since then, the Oxford Memorial Library has undergone various significant renovations and additions, the most recent of which is the installation of a solar panel array. The panels were just put in place last October, so this summer will be the first that they will reach their peak performance.

The historic Oxford Memorial Library was built in 1811 and recently completed a project to reduce its energy costs and environmental footprint -- an 18.81kW parking lot solar array. Photos courtesy of Nancy Wilcox, Library Director.

The historic library's journey to acquiring the solar panels started in 2014, when library officials were seeking new, creative ways to reduce their energy expenses in order to help balance the library's budget.

"We knew we needed to do something with the energy cost," Library Director Nancy Wilcox told Binghamton, New York's WBNG 12 News in March.

It was important to the Oxford Memorial Library Board to hire a local company for the project and, as luck would have it, they were only thirty minutes away from Great Brook Solar, a solar panel installer with nearly forty years of renewable energy experience.

Originally established as Great Brook Enterprises in 1978 by David M. Austin, Great Brook's stated mission is to raise consumers' standard of living by saving them money and freeing them from dependence on centralized energy distribution.

The Oxford Memorial Library signed a contract with Great Brook Solar in late 2014 and applied for funding from New York State's Library Construction Grant. The state eventually approved the library's project, allocated nearly $50,000 for the installation of solar panels and released the funds in July 2016. The library was able to cover remaining costs for the project through generous private donations. Great Brook Solar also received financial incentives from the New York State Energy Research and Development Authority for their involvement with the project.

"From all accounts, everyone at the library is quite pleased with the quality of the work that we did, the solar production and the money that it is saving them on their electric bills," Deborah Swann, Great Brook Solar's Office Manager recently told Green Energy Times.

Measuring at 110 feet long, the library's 18.81 kW solar array is made up of sixty-six individual panels and is expected to generate 19,510 kWhrs per year. By switching to solar power, the Oxford Memorial Library will prevent ten tons of carbon emissions from being dumped into the atmosphere per year. At current electricity rates, the solar array will save the library over $2,000 per year in energy expenses.

Another aspect of the project was the installation of LED lighting. Library officials appreciate the reduced energy costs from the solar panels and LED lighting, as well as the environmental peace of mind that they offer.

"We were worried a little bit about the aesthetics," Library Board member Fred Lanfear told WBNG, referring to the solar array. "But, they look good out there. Environmentally we are very proud of reducing our carbon footprint."

In addition to utilizing the solar array itself, members of the Library Board can now use an online program that tracks the building's overall energy use as well as how much energy is coming from the solar panels. They have also put up informational displays at the library that educate guests and patrons about their array and solar energy in general.

In fact, the library's solar panels have been educating the public of Oxford before they were even activated. Given the proximity of Oxford Memorial Library to Oxford Academy Middle School, students were able to look out the windows of their classrooms and receive a firsthand lesson in renewable energy technology and the benefits and importance of clean, sustainable energy.

Chris Gillespie is a contributing writer for the Green Energy Times. He can be reached at chris@greenenergytimes.org.

SOLARIZE ALBANY
Launches Third Campaign

Amy Pokorny and Kevin Johnson educate attendees on the Solarize Albany program at the Punkintown Fair. Photo courtesy Russ Pokorny.

Solarize Albany and Capital Region is pleased to announce the launch of its third campaign! After successful campaigns in 2015 and 2016, the volunteers of Solarize Albany are again working to facilitate the installation of solar power in the eight counties of the Capital Region. Three solar installers will be doing the work for the third campaign. In addition, the benefits of community net-metering are being brought to the Capital Region. Many households and small commercial businesses—tenants or those with unsuitable roofs—cannot install solar. Community net-metering, where one can buy a share in (or buy the electricity from) a solar farm is a great solution. New this year, Solarize Albany and Capital Region is educating the public about electric vehicles and charging stations and energy efficiency.

Solarize Albany is a volunteer group of concerned citizens. It is a non-profit which facilitates the relationship between installers and customers. The first solarize campaigns debuted in 2009 in Portland, OR. This first project was a collaborative effort between the U.S. Department of Energy (DOE) and the City of Portland. It was such a success that Solarize campaigns began to spread across the U.S. Today in New York, there are about 27 community Solarize campaigns sponsored by NYSERDA.

Why is the Solarize model popular? Because it addresses three potential hurdles to solar:

- **Cost** – prices are lowered by organizing bulk purchasing with dozens of community members buying from the affiliated installers.
- **Technical complexity** - only quality equipment is recommended.
- **Expedited decision times** - information is provided to make a decision within the four month enrollment window.

Solarize campaigns also encourage neighbors to get to know one another. As individual homeowners and businesses install solar power, neighbors are inspired by their example.

More information can be found at www.solarizealbany.org or contacting solarizealbany@gmail.com, (518) 328-4SUN

Local Area Energy Initiatives

Lead the Charge for Affordable Renewables in NH

By Hope O'Shaughnessy

Three New Hampshire area energy initiatives are actively leading the way to provide easier and more affordable access to renewable energy throughout several areas of the Granite State. One of these projects has received federal technical assistance as part of a national energy challenge.

Installation of a 24 kW solar PV array at the Bridge House Homeless Shelter and Veteran's Support in Plymouth, NH. Photo: PAREI.

The Plymouth Area Energy Initiative (PAREI) began informally in 2003 in Plymouth, NH and today has grown to an organization of over 600 families and businesses. PAREI's membership includes the communities surrounding Plymouth – from Sanbornton to Thornton and from Wentworth to Meredith. Under the leadership of Co-Directors Sandra Jones and Volunteer Co-Director Peter Adams PAREI has organized over 150 solar thermal, neighbor helping neighbor, energy raisers, has brought multiple grants to their community that have funded projects such as solar PV on the school and library, an energy audit for the town hall, a 120kW solar PV system at the Plymouth Water and Sewer Treatment Plant, solar thermal collectors for a residential home for the disabled and off grid solar PV hands on educational program for the Circle Program's summer camp. In addition to their achievements in the Plymouth area thus far, PAREI is rolling out new efforts this June including the NH Solar Shares program.

The U.S. Department of Energy's Sun Shot Division selected NH Solar Shares as a national team for the Community Solar Challenge. NH Solar Shares in partnership with the NH Electric Cooperative is a program that will design and install solar PV arrays one community at a time for the purpose of sharing solar energy with low-income families, increasing the portion of clean renewable energy on our grid and contributing to building healthier, more sustainable communities.

The value of the solar energy produced by each array (85%) will be credited to a predetermined number of low income families' electric bills per solar array. NH Solar Shares will also provide a basic energy education program too.

Each array will be inspired by a task force of local volunteers and be built using funds from grants, crowd funding, individual donors, fundraisers and the state's solar incentive. The first goal is to build one PV array in Plymouth, NH and two more in near-by communities with the goal of installing 125kW worth of solar by the fall of 2018. The solar will be installed by NH solar installers (who will have an opportunity to bid on the projects) with the help of volunteers to prep the site.

Another example of an ambitious PAREI project came as a result of two other community organizations seeking PAREI's assistance and expertise. More than two years ago, the directors of the Bridge House Homeless Shelter and the Whole Village Family Resource Center sought advice from PAREI about how solar PV could help them save money.

According to a press release about the project, the directors were looking to see "if we could save $20,000 a year in energy costs and instead apply those funds to programs for our clients." By leading with PAREI's motto of "Reduce (energy) before you Produce." the three non-profits developed a whole building energy savings plan for the two buildings. Their vision was made possible through funding from the Thomas Haas fund at the NH Charitable Foundation (NHCF), USDA Rural Development and the CDFA Business Tax Credit program. PAREI acknowledges the key role NHCF's funding played in supporting PAREI's work as the designated project coordinator.

Ultimately, the Bridge House and Whole Village Family Resource Center's energy project will result in over $22,000 annually in energy savings, according to PAREI's news release. PAREI's deliverables for the energy project's work plan included: (1) a 24kW solar PV array at the Bridge House, (2) volunteer DIY weatherization tasks, (3) inside lighting retrofit for both buildings, (4) parking lot lighting retrofit, (5) day lighting tubes at the Bridge House, (6) energy efficient air conditioning system for the Whole Village Center and (7) a 38kW roof mounted solar PV array for Whole Village to be installed in October/November, 2017.

PAREI GROWS

As an exemplar of what a non-profit energy initiative can do, PAREI has inspired spin-offs in other areas of the Granite State including the Seacoast Area Energy Initiative (SEAREI) and the Hillsborough Area Energy Initiative (HAREI).

Scott Lawrence leads the *Cont'd on p.14*

NHEC Breaks Ground on State's Largest Solar Array

Site work is underway in Moultonborough at the future location of NHEC's 2 MW solar PV system. Courtesy photo.

New Hampshire Electric Cooperative (NHEC) has begun construction of what will be the largest solar electric array in the state, a two megawatt (MW) system that will provide its members a clean source of electricity located on NHEC's own distribution system.

The ground-mounted solar photovoltaic (PV) system, consisting of approximately 8,000 panels, will take shape over the next several months on land owned by NHEC adjacent to its substation on Moultonborough Neck Road in Moultonborough. It is expected to be online by the end of 2017 and producing approximately 3.5 million kilowatt-hours (kWh) of electricity per year for the next 25 years or more, enough power for approximately 600 homes.

The Moultonborough solar array will displace electricity NHEC would otherwise have to purchase and pay to have imported from outside its system, and will generate Renewable Energy Certificates (RECs) that NHEC can either use to meet its requirements under the state's Renewable Portfolio Standard or can sell to other electricity providers.

Costs for wholesale generating capacity and transmission, which have risen dramatically in recent years, have been of considerable concern to NHEC and its members. At current costs, the Moultonborough project's output is expected to save NHEC more than $280,000 per year in costs it would otherwise incur for purchase and delivery of the same products at wholesale from sources outside its system. After factoring in the cost of construction and the expected savings, the power from the project is expected to immediately have a net cost comparable to conventionally produced power imported by NHEC from the regional market.

NHEC President and CEO Steve Camerino noted, "Although it will cover a small portion of our members' total electricity needs, one of the biggest benefits of this project is the price stability it offers. Wholesale power prices can vary widely, but this project will provide NHEC's members a reliable source of renewable energy at a fixed cost for at least the next 25 years. The Moultonborough solar project will allow NHEC to build on its experience operating two smaller solar PV systems that currently power our district offices in Raymond and Sunapee by exploring how a larger system will work in conjunction with our facilities and whether such installations elsewhere on our system might make sense."

The project will also support NHEC's efforts to explore new initiatives that can benefit members, including utility-scale power storage that can help further reduce the financial impact of periods of peak demand when wholesale power prices to the utility spike.

The total cost of the Moultonborough solar array is approximately $5 million, which is financed by low interest New Clean Energy Renewable Bonds (NCREBs) made available by the U.S. Treasury Department for public sector renewable energy projects. NHEC has engaged Ameresco, Inc. of Framingham, MA to build the 2 MW array. Engineering services are being provided by McCourt Engineering of Henniker, NH.

NHEC is a member-owned electric distribution cooperative serving 84,000 homes and businesses in 115 NH communities.

Why We Need Wind Power in Vermont and in the Northeast

By George Harvey

SHEFFIELD WIND FARM IMAGE: WIKIMEDIA COMMONS

The Vermont Public Service Board has sent recommendations to the legislature for new sound standards for utility-scale wind projects. Critics say the standards are so strict that the effectively kill development of wind power in the state. This has come as a surprise to a number of people, who have regarded Vermont as very progressive in pursuing clean energy. Those more familiar with what has been going among the Green Mountains have found it more predictable.

People who hate wind power in Vermont really hate wind power. That is a statement I will ask you to remember.

As I see it, there are two kinds of organizations that are actively anti-renewable in this country. There are those that are tied to right-wing politics, and possibly financed with money from fossil fuels. They are fairly predictable, in their unrelenting and outrageous way, in pushing their agenda. They are represented in Vermont by the Ethan Allen Institute, one of the many state organizations associated with the State Policy Network, whose leading members include the American Legislative Exchange Council, Americans for Prosperity Foundation, the Cato Institute, the Heritage Foundation.

Nevertheless, to my way of thinking, it is the "grassroots" organizations that are more interesting. We may only speculate on how they are funded. Some possibly are not funded at all. We certainly can observe that they are passionate, disciplined, and energetic in achieving their goals. Their methods can even include actions that can be described as intentionally intimidating.

In the work I do for my blog, geoharvey.com, I spend about four hours every day just reviewing news relating to energy and climate change. One of the things I have observed is that every technology that has some hope of replacing fossil fuels has some "grassroots" organization that arises at the state level in opposition to it. Wind power, which those in the fossil fuels industries may see as the biggest threat, seems to have the greatest opposition. Certainly, utility-scale solar power also has opposition, as do, to a lesser extent, hydro power and bio-mass. Even rooftop solar has grassroots opposition, based on the false belief that only rich people can afford it, and it gives them a way to save money while costing the rest of us more money for our electricity.

The intensity and savagery of the opposition to renewables in Vermont can be seen by two incidents that took place here. In one, David Blittersdorf, who has developed wind and solar power in Vermont, got an alert from a motion sensor at a cabin he owned. A camera got a fuzzy picture of a woman breaking into the property, through a gate. Later, the police reported that a deer's head had been left at the gate. This was taken to be an obvious threat against Blittersdorf.

Another example is an event in August of 2015 in the town of Pownal. The local fire department had wanted to put in a 150-kW solar array to provide power for a pumping station. The array was to go up on compromised land, a five-acre plot with an abandoned factory building and railroad tracks on it. A group of about thirty people stormed into a meeting where a town committee was discussing the array, loudly demanding, among other things, that committee members give them a year's email traffic and financial records.

The thing that precipitated the Pownal attack on solar power was a rumor that seems to have been actively pushed to frighten people into political action. The rumor was that rain would leach poisonous heavy metals from the solar panels into the soil, contaminating ground water. Organizing the demonstration was done, I have been told, by people in one of the anti-wind groups, using the same tactics they use against wind power.

That demonstration was severely abusive of the local committee, to the point that not only was the array successfully blocked, but four of the five members resigned within three days. (It is interesting to note that whatever imaginary problems could have developed from leaching from solar panels were miniscule compared to the very real problems the town already had but was unaware of. Just about all of the town's wells were soon found to have been long since contaminated with PFOA from a local factory. No residential wells could safely be used, and water from the town well could not be consumed until it had been fitted with a special filter to remove those toxins.)

My belief is that many people in Vermont have become victims of an anti-wind movement intentionally driven by instilling fear in them. People are afraid of "Big Wind." But they are not afraid of "Big Oil," which actually is making them sick, according to medical professionals.

The human health effects of wind power are one of the subjects I keep a special eye out for, as I do my daily blog post. Several years ago, I started noticing a growing body of papers were being published in Australian medical journals relating to those effects. It was clear that some people were getting sick around some wind farms, but not around others. Looking for the "smoking gun," various obvious commonalities were tested and rejected until one was found that produced a match. People around wind farms were showing more symptoms in proportion to the amount of exposure they got to anti-wind activists.

Careful to complete their work according to scientific procedures, researchers next tested groups of people to find out whether the activists might actually be the source of the problem. One group of volunteers was exposed to an anti-wind message on infra-sound. Another group was told by a scientist that infra-sound was not known to be connected to any symptoms. Both groups were tested with and without infra-sound. Those who had seen the anti-wind video had increased symptoms when they were told infra-sound was present, regardless of whether it was or not. Those in the other group did not experience increased symptoms.

The Australian Medical Association ultimately published a position paper on the human health effects of wind turbines. They had concluded that the effects were real, but were not caused by wind turbines. They were caused by stress, which one person said was the result of "scare tactics by anti-wind activists."

The problem of the human health effects of wind turbines would not go away, even if all the wind turbines were removed. The reason is that the hatred people use to motivate anti-wind activity will not go away — with any success, it will merely be directed at something else, which could be solar power or, just as easily, the dairy industry. Wind turbines are not the problem. Hatred is the problem. And that hatred is a problem we need to address, if we are to save ourselves from climate change.

Another thing that needs to be addressed is reality itself. I had the good fortune of sitting next to a leading anti-wind activist at a dinner and subsequent panel discussion. As we were getting up from the dinner, she turned to me and said, "You know, we shouldn't even be talking about wind and solar."

Surprised, I asked, "What should we be talking about?"

"The secret energy sources the government has developed, of course."

"What energy sources?"

She was getting up. "There are too many to talk about now."

"Can you give me one example?" I asked.

"Anti-gravity."

No, I am not kidding.

This piece first appeared at https://cleantechnica.com/2017/05/24/whats-wind-power-vermont/

Withdrawal From the Accord

Cont'd from p.3

and local policy tools and corporate commitments, all aggregated and formally reported to the United Nations in place of the federal government reports previously envisaged. American society is replacing the Trump Administration in climate diplomacy – something unprecedented but very powerful, and something which begins to marginalize the President in a disruptive and one expects unwelcome way.

This kind of a pathway to climate progress was laid out and anticipated by Mike Bloomberg and myself in our recent book, Climate of Hope. But we never imagined that it would be Donald Trump whose desire to remain center-stage for his base would accelerate and jump-start the process.

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

Local Area Initiatives

Cont'd from p.12

Hillsborough (NH) Area Energy Initiative (HAREI) as the president of this initiative reaching southwestern New Hampshire. HAREI currently has 11 residential solar power projects in the pipeline now, ranging from 10 to 60 panels.

As Lawrence explains, "What we do is help people understand the process of designing and installing solar power so that they can make good decisions about what to do. In some cases, that just means understanding it well enough to be an informed consumer when working with a commercial installer, but most of our focus is on helping those able and inclined to design and install for themselves."

Lawrence credits the strong community of volunteers for the initiatives success in enabling new members to learn and eventually produce the installation nicknamed "Solar Raisers," which echoes the tradition of a barn raising. He adds, "This process not only saves everyone money, it allows each member to learn each step in the process while helping others."

Lawrence, who has been with HAREI since 2015, acknowledges the work of the group's most active founding members as integral to their success. Paul Button of Energy Audits Unlimited, who was President until last year, and Andrew Gillis, current HAREI Vice President both "pioneered our Solar Raiser model, and really organized our process and much of our technical information resources," said Lawrence.

"One of the best predictors of whether or not a home will add solar is whether or not they have a neighbor who's done so," Lawrence adds. "What we're doing is a great example of 'acting locally' and being good neighbors. It's an easy model to copy, and we're more than happy to help any other groups that want to learn how we make it work so they can adapt it to their own area."

In the southeastern part of the state, the Seacoast (NH and Maine) Area Energy Initiative (SEAREI) is serving up innovative and engaging events. SEAREI was formed in 2009 by members of the Piscataqua Sustainability Initiative (PSI) in partnership with Plymouth Area Renewable Energy Initiative. SEAREI held a hot-air-panel installation in early 2017 at the downtown Portsmouth Port City Makerspace. The solar hot air panels were gleaned from a large decommissioned solar heating system in Colorado. The 95 refurbished panels led the group to produce a "how-to" installation manual that includes step by step instructions, photos, and cost estimates for this DIY project. SEAREI plans to provide the manual and more discussion about how they can be adapted to your residential heating needs at future events.

SEAREI also kicked off the spring with an ambitious Energize 360 Campaign with various outreach events throughout the seacoast including Dover, NH, which will expand solar to residential customers. The Energize 360 event for SEAREI was featured in the April 2017 issue of Green Energy Times (page 11).

As New Hampshire builds its energy independence, these three local area energy initiatives will continue to contribute substantially to the statewide success at the grassroots and consumer level.

Hope O'Shaughnessy is a Massachusetts-based freelance writer who has written for the Daily Hampshire Gazette (Northampton, MA) and The Republican (Springfield, MA).

More States Aim to Go 100% Renewable

Massachussetts and California to Join Hawaii?

By Chris Gillespie

While the new presidential administration and congressional majority are hard at work in Washington D.C. stripping environmental agencies of their federal funding, some state leaders, bolstered by economic evidence, are already busy introducing legislation to lessen and abolish their states' use of fossil fuels.

Legislators in California, for instance, are working towards setting up a timeline for drastically reducing, and ultimately eliminating, fossil fuels from the state's electric "grid." California Senate leader Kevin de León (D-Los Angeles) recently introduced SB 584, which requires the Golden State to have a carbon-free grid by 2045 and accelerates the state's current goal of powering 50% of the total carried by the grid with renewable energy by 2030.

Leonardo DiCaprio shares his support of California's proposed SB 584 on social media: http://bit.ly/Leo-Dicaprio_Twitter_CA-100

De León, who pushed SB 350—the state's initial '50% renewable by 2030' law—into effect in 2015, recently suggested to the Los Angeles Times that aiming for a half-renewable grid by 2030 was a modest goal, saying that he and his colleagues should have "reached for the stars" when it came to laying out California's renewable future. The newly proposed SB 584 is a big step forward from SB 350 and has received praise from clean energy leaders and experts, including Academy Award-winning actor and environmentalist Leonardo DiCaprio who tweeted his support for the mandate.

Although SB 584 stands to be an improvement on SB 350, the success of SB 350's '50% renewable by 2030' timeline suggests that powering a state with nearly 12% of the national population without using fossil fuels by 2045 is an obtainable goal. Pacific Gas and Electric Company, a leading energy provider in California, announced in 2016 that they are well ahead of schedule in meeting the state's current 33% renewable target by 2020, and followed up in March 2017 by announcing that nearly 70% of the electricity they delivered to customers in 2016 came from greenhouse gas-free resources.

"Delivering this amount of renewable electricity strongly confirms PG&E's continued commitment to a cleaner energy future for our customers and all of California," said Geisha Williams, CEO and President of Pacific Gas and Electric in the recent press release. "We embrace our role as our leader in renewable energy, and we are full speed ahead in reaching our next targets."

Across the country, legislators in Massachusetts have also proposed laws that would put their state on track for reaching 100% renewable energy in the coming decades. State representatives Sean Barballey (D-23rd Middlesex) and Marjorie Decker (D-25th Middlesex) introduced HD. 3357 in the House while State Senator Jamie Eldridge (D-Middlesex and Worcester) introduced SD. 1932 in the Senate. Together, the legislation would require the Bay State to get 100% of its electricity from renewable sources by 2035 and all of its other energy needs, such as heating and transportation, from renewable sources by 2050.

A key component of HD. 3357 is the Clean Energy Workforce Development Fund, which provides economic benefits by increasing access to employment opportunities working with solar, offshore wind, and other clean energy technology.

"This legislation provides a bold step by placing the Commonwealth on a path to a cleaner and more sustainable future," said Representative Garballey in a recent statement. "It encourages job creation, protects and sustains our natural resources, reduces our carbon footprint and would benefit the health and well-being of our citizens in immeasurable ways."

"More importantly," Garballey adds. "It signals to the country our commitment to long-term solutions in meeting the very real challenges of climate change, and lights the way for similar efforts across the nation."

If passed, HD. 3357 and SD. 1932 would join Massachusetts' current commitments to clean energy, such as the Global Warming Solutions Act of 2008, which requires the state to reduce carbon emissions by at least 80% below 1990 levels by 2025. Massachusetts is also a founding member of the Regional Greenhouse Gas Initiative, a cap-and-trade program that has reduced carbon emissions from the electricity sector by 15% since 2011, saving $460 million in electricity bills across nine states in the Northeast.

If their propositions are passed, California and Massachusetts will join Hawaii in being legally held to a 100%-renewable-energy standard. In 2015, Hawaii became the first state in the nation to pass legislation to commit to obtaining a carbon-free energy grid with HB. 623, which requires all of Hawaii's electricity to come from renewable sources no later than 2045. Given the drastic growth of Hawaii's clean energy resources, however, the Blue Planet Foundation has said that Hawaii could reach 100% renewables as early as 2030.

Chris Gillespie is a freelance writer based in southern New Hampshire.

California's Desert Renewable Energy Conservation Plan, a major component of the state's renewable energy planning: photo by Tom Brewster Photography, http://bit.ly/flickr-RE-CA-Desert

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

The federal investment tax credit (ITC) for most technologies, including solar, wind, heat pumps, and fuel cells, is 30% of expenditures. For commercial geothermal generating systems, microturbines, and combined heat and power the ITC is 10% of expenditures.

USDA RURAL DEVELOPMENT PROGRAM

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

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

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

BIOREFINERY ASSISTANCE PROGRAM

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

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

- Increase the energy independence of the United States
- Promote resource conservation, public health, and the environment
- Diversify markets for agricultural and forestry products and agricultural waste materials
- Create jobs and enhance economic development in rural America

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

REGIONAL

NEW ENGLAND GRASSROOTS ENVIRONMENTAL FUND

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

- Must be volunteer driven or have up to 2 full time paid staff or equiv.
- have an annual budget up to $100,000
- "Seed" grants of $250-$1,000 and "Grow" grants of $1,000-$3,500
- Go to www.grassrootsfund.org/grants/ or call 802-223-4622 for more info.

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

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

For more information: www.RERC-vt.org or call (877)888-7372

SOLAR THERMAL INCENTIVES – PER RATED CAPACITY OF SYSTEM

- $0.40 per kWh/year for residential and commercial customers
- $0.80 per kWh/year for Special Category customers

***special customer category limited to municipalities, non-profit housing authorities, public schools., and non-profit hospitals and health care centers. All incentives are subject to availability and may change.*

Pellet Heating

- Advanced wood pellet heating systems -- $3000 per boiler
- Custom Rebate $1.25/ft2 of heated space, $60,000 max or $80,000 max for public/non-profit sector
- **Details at www.RERC-vt.org or call (877)888-7372**

VT TAX CREDITS

- Vermont offers an investment tax credit for installations of renewable energy equipment on business properties. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit from 2011 to 2016. For solar, small wind, and fuel cells this constitutes a 7.2% state-level credit for systems and for geothermal electric, microturbines, and combined heat and power systems, this constitutes a 2.4% state-level tax credit.

Tier III programs

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

EFFICIENCY VERMONT

Lighting (must be ENERGY STAR®)

- ENERGY STAR LEDs supported by Efficiency Vermont incentives available at Vermont retailers for as low as $.95.

Home Efficiency Improvements

- improvements: air sealing, insulation and heating system upgrades - up to $2,500 in incentives - using participating* contractors

Appliances (must be ENERGY STAR)

- Dehumidifiers - $40 mail-in rebate
- Clothes Washers - $40 rebate for CEE Tier 1 qualifying models, $75 rebate for CEE Tier 2, 3 or ENERGY STAR Most Efficient
- Refrigerators - $40 rebate for CEE Tier 1, $75 for CEE Tier 2, 3 & ENERGY STAR Most Efficient
- Clothes Dryers - $50 to $400 rebate on select ENERGY STAR electric models

Heating/Cooling

- LP/Oil boilers & furnaces - $250 rebate*
- Select smart thermostats - up to $150 mail-in rebate
- solar hot water - $950 rebate post installation
- heat pump water heater - $300-$500 point of purchase discount
- central wood pellet boilers (excluding outside wood systems) - $2,000
- circulator pumps - $15-$600 point of purchase discount
- cold climate heat pump $600-$800 point of purchase discount

Residential New Construction

- enroll in Residential New Construction Service – up to $2,000 in incentives and free home energy rating and expert technical assistance throughout construction and eligible for ENERGY STAR label
- Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives (contact EV*)

Other Opportunities To Save

- Advanced Power Strips – coupons at register at participating retailers*
- Pool Pump – up to $600 rebate on qualifying ENERGY STAR models
- Meter Loan – borrow "Watts Up" meter to measure the electric consumption of your appliances
- Commercial Refrigeration Evaporator Fan Motors - $60-$100 each w/ point of purchase discoun

*1. *all rebates/incentives subject to availability, limits and may change – for complete incentives and requirements, and for participating retailers/contractors, visit efficiencyvermont.com or call 888-921-5990*

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Public Utilities Commission

Commercial Solar Rebate Program

Category 1:

≤100 kW AC incentive levels for PV systems:

- $0.70/watt (lower of AC and DC) for new solar electric facilities
- 0.65/watt (lower of AC and DC) for new solar electric facilities
- Expansions to existing solar systems are not eligible.

≤100 kW AC equivalent incentive levels for solar thermal systems:

- $0.12/rated or modeled kBtu/year for new solar thermal facilities fifteen collectors in size or fewer;
- $0.07/rated or modeled kBtu/year for new solar thermal facilities greater than fifteen collectors in size; and
- Expansions to existing solar systems are not eligible.

Category 2:

> 100 kW AC and ≤500 kW AC incentive level for PV systems

- $0.55/Watt AC for new electric facilities.
- Expansions to existing solar systems are not eligible.

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

Note: The C&I Category 2 solar rebate program currently has a waitlist.

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

PACE

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.
Visit http://cpace-nh.com/index.html for more information.

Residential Solar PV Rebate Program

- Rebates for solar electric/thermal projects 10kW (or thermal equivalent) or less
- New Solar PV = $0.50/Watt DC or 30% of total project cost, whichever is less. Max $2500.

Contact karen.cramton@puc.nh.gov

Residential Solar Water Heating Rebate Program

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

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

- 40% of the heating appliance(s) and installation cost, up to a maximum of $65,000. An additional 30% up to a maximum $5,000 is available for thermal storage.

Systems must be 2.5 million BTU or less

Residential Wood Pellet Boiler/Furnace

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

Contact barbara.bernstein@puc.nh.gov

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

LOCAL INCENTIVES

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

- These are offered on a town-by-town basis.
- The state also has passed PACE (property-assessed clean energy) enabling legislation which will allow towns to use the PACE mechanism to finance clean energy projects through property taxes
- Visit http://www.nh.gov/oep/programs/energy/pace/index.htm for more information.

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

- NHEC offers a $1,000 incentive on a Battery Electric Vehicles (BEV), $600 on a Plug-In Hybrid Electric Vehicles (PHEV), and $300 on Electric Motorcycles.
- NHEC offers incentives on Electric Vehicle Supply Equipment (EVSE) of up to $2,500 (only Commercial and Municipal members are eligible for incentives)
- Pre-approval is required.
- Visit: https://www.nhec.com/

NH Home Performance with ENERGY STAR

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

hensive energy audit for $100 (rebated if improvements installed), and 50% instant rebate for eligible weatherization improvements up to a $4,000.

- 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

While we at Green Energy Times try to keep things up to date, incentives are always changing. Be sure to check with the appropriate sources for the latest information.

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.

NH ENERGY STAR Appliances & Lighting

• Mail-in rebates for ENERGY STAR-certified clothes washers ($30), clothes dryers ($40) room air conditioners ($15), room air purifiers ($15) and refrigerators ($20), dehumidifiers ($25), 2-speed pool pumps ($200), and variable speed pool pumps ($500). Refrigerator/freezer recycling available – unit must be in working condition – includes free pickup and $30 rebate.

• Visit www.NHSaves.com/ appliances for more information and rebate forms.

• Instant rebates available for ENERGY STAR-certified LED light bulbs purchased through participating NH retailers (varies by retailer). Mail in $5 rebates on Energy Star certified light fixtures

• Visit www.NHSaves.com/ lighting for more information.

PAREI

• To explore the possibility of a solar installation. Plymouth Area Renewable Energy Initiative. www.plymouthenergy.org

• www.nhsaves.com

NHSAVES Lighting and Efficiency Catalog

Extensive catalog of efficient lighting products, from stylish lamps to hard to find specialty bulbs. Catalog includes other efficiency items such as smart strips, power monitors, and water-conserving devices

Offered at discounted pricing for NH electric utility customers, and fulfilled by EFI.

Visit www.NHSaves.com/lighting-catalog.

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 - $600 on Heat Pump Water Heaters. Rebates of $100 on WiFi Thermostats

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

Other NH Electric Utility Programs

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

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

Business Programs

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

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

NH Weatherization Assistance Income-Eligible Programs

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

Visit www.nh.gov/oep/programs weatherization/index.htm for application criteria, FAQs and local program contacts

MASSACHUSETTS

Commonwealth Solar Hot Water (SHW) Programs

• Applicants must be served by National Grid, Unitil (Fitchburg Gas and Electric), Eversource or a participating Municipal Light Plant community

• Homeowners are eligible for a base rebate amount of the lesser of $4,500 or 40% of the installed cost. The system may also be eligible to receive additional funding ("adders") which increase the amount of the rebate. Adders are detailed in the program manual at http://files.masscec.com/get-clean-energy/residential/commonwealth-solar-hot-water/SHW_Program_Manual_Small_Scale.pdf

• Visit http://www.masscec.com/programs/commonwealth-solar-hot-water

MassSave Heat Loan SHW

• Through this loan program, customers may borrow at 0% interest the costs of a Solar Domestic Hot Water and/or Thermal Heating system. Apply through receiving the MassSave Energy Audit. You can borrow up to $25,000 at 0% interest for a 7 year term.

Energy Efficiency

• After conducting a free residential Energy Audit, residential customers are eligible for up to $25,000, commercial loan up to $100k at 0% interest heat loan with terms up to 7 years to cover the following energy efficiency improvements: atticwall-basement insulation, high efficiency heating systems, high efficiency domestic hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows

• Available only to utility customers of W. Mass Electric, National Grid, Berkshire Gas, Nstar, Unitil and Cape Light Compact

• Visit www.masssave.com/residential/heating-and-cooling/offers/heat-loan-program Please call 866-527-7283 to schedule a free home energy assessment.

Massachusetts Solar loan Program

Mass Solar Loan focuses on connecting homeowners who install solar PV systems with low-interest loans to help finance the projects.

• The $30 million program, a partnership between the Massachusetts Department of Energy Resources (DOER) and MassCEC, will work with local banks and credit unions to provide financing to homeowners interested in solar electricity. DOER's program works with banks and credit unions to expand borrowing options through lower interest rate loans and encourage loans for homeowners with lower income or lower credit scores.

• Since 2008, the solar electric industry in Massachusetts has grown into a robust economic sector with over 1,400 businesses and 12,000 workers, with enough solar electricity installed in the Commonwealth to power more than 100,000 homes.

• Mass Solar Loan will continue to grow this sector, while allowing more homeowners the ability to achieve the cost savings and environmental benefits of this clean, renewable energy source. www.masssolarloan.com. The most updated loan principal buy down rate based on household income can be found at www.masssolarloan.com/loan-support-incentives.

DEPT OF ENERGY RESOURCES

• Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Resources (DOER) SREC 2 program. Systems sized under 10kW single phase or 25kW three phase have an extension until the new incentive program starts in 2017. Note: appropriate, approved Data Acquisition System monitoring must be utilized for PV systems >10kW in order to qualify to sell SRECs.

• Next solar incentive information can be found at http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/development-of-the-next-solar-incentive.html

• MA State Income tax credit for residential solar hot water or PV systems are eligible for a one-time 15% off system cost, capped at $1000 max tax credit.

• No sales tax on residential solar hot water or PV system.

• There is no increase in property tax assessment for residential solar hot water or PV systems for 20 yrs.

MA SREC II POLICY

Massachusetts' Solar Renewable Energy Credits Program, SREC II prioritizes sites, by using an SREC factor based on the type of installation.

• The credits provided for energy produced by a system are calculated by multiplying the factor times a full credit value.

• Full credit is given for residential, parking canopy, emergency power, or community-based systems, or any other system of less than 25 kW.

• Larger systems get a factor of 0.9, if they are building-mounted or at least 67% of the power produced is used at the site. If a larger system meets neither of these criteria, but is built on a landfill or brownfield site, or if it is less than 650 kW, then it gets a factor of 0.8. Systems that qualify for none of the foregoing get a factor of 0.7.

- Expect changes in spring 2018.

• http://bit.ly/Mass_SREC_II.

• MA State Incentives can be found at: www.masscec.com/get-clean-energy

Woodstove Change-out Program

• The Commonwealth Woodstove Change-Out program, a partnership between MassCEC, the Massachusetts Department of Environmental Protection and the Department of Energy Resources, offers rebates to assist Massachusetts residents in replacing non-EPA-certified wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves.

• Standard rebates range from $500 to $1,750 per change-out, and low-income rebates range from $1,500 to $3,000, based on stove specifications

• http://www.masscec.com/get-clean-energy/residential/commonwealth-woodstove-changeout?utm_source=Woodstove%20Change-Out%20Announcement&utm_campaign=Woodstove%20&utm_medium=email

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

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH nyserda

Welcome to the 2017 New York solar incentive and rebate information: 169 programs and incentives at:
http://dsireusa.org (enter your zipcode)
Programs and Services from NYSERDA:

https://www.nyserda.ny.gov/All-Programs

New York State Energy Research and Development Authority.

• Business & Industry
• Communities & Governments
• Partners & Investors
• Cleantech & Innovation
• Residents& Homeowners

Home Energy Waste

Getting a home energy assessment can help you take control of your energy costs. It can identify where your house is using the most energy and which improvements would have the biggest impact on your bottom line. Heating and cooling costs frequently account for 50% of residential energy bills. Identifying your energy waste can lead to big savings.

Visit: http://bit.ly/ny-nrg-waste.

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NY-SUN

http://ny-sun.ny.gov/

NY-Sun is structured around customized Megawatt (MW) Blocks targeted to specific regions of the state. To learn more, see the Megawatt Block Incentive Structure.

The Megawatt (MW) Block Dashboard provides real time information on the status of block and current incentive levels by sector and region. Block status is updated as applications are submitted, so click the refresh button to see the current status.

• https://www.powerclerk.com/nysuniniitiative/dashboard.aspx

Residential and Small Business

http://ny-sun.ny.gov/Get-Solar/Residents-And-Small-Business

Commercial and Industrial

• http://ny-sun.ny.gov/Get-Solar/Commercial-and-Industrial

Community Solar

• http://ny-sun.ny.gov/Get-Solar/Community-Solar

Commercial/Industrial PV Installer

• http://ny-sun.ny.gov/For-Local-Government/Local-Government

Residential/Small Commercial Solar PV Installer

• http://ny-sun.ny.gov/Get-Solar/Find-A-Solar-Electric-Installer

Financing Options

• http://ny-sun.ny.gov/Get-Solar/NY-Sun-Financing

Clean Power Estimator

• http://ny-sun.ny.gov/Get-Solar/Clean-Power-Estimator

Geothermal

• rebate of $1500 per ton of installed capacity for residential/small-scale systems, $1,200 per ton for commercial/large-scale systems up to $5000

Electric car

• buyers in New York State can now get a rebate of up to $2,000 on qualifying EV models from participating dealers. See https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/How-it-Works.

BAE SYSTEMS' BUSINESS SUSTAINABILITY INITIATIVE

Finds Success in New Hampshire and Beyond

By Chris Gillespie

Harrison Williams, a BAE Systems employee uses the EV charging station at the company's South Nashua, New Hampshire location. Courtesy of BAE Systems' Electronic Systems.

BAE Systems is a company known for being on the cutting edge of military and surveillance technology, and they are also making strides to be on the cutting edge of companies which implement large-scale sustainability practices. The company has sites across the country; however, the BAE Systems Electronic Systems site in South Nashua, New Hampshire offers a glimpse at what all of the company's parking lots could look like in the future.

Following the success of an initial electric vehicle charging station at BAE Systems Electronic Systems' San Jose, California location, the company selected their branch in South Nashua, New Hampshire to receive an electric vehicle charging station and installed it in August 2016. South Nashua was selected after BAE Systems surveyed their locations across the country and found that South Nashua had a tremendous amount of employee interest in the electric vehicle charging station.

Harrison Williams of the South Nashua staff, for instance, charges his Chevrolet Volt in the parking lot while he works in the office. Williams commutes a total of a hundred miles every day for work and is able to drive nearly fifty miles of it using only battery power.

In the last six months, BAE Systems employees with electric cars have plugged in more than 900 times, reducing fuel consumption by 1,200 gallons. By doing this, they've also eliminated more than four tons of scope III greenhouse gas emissions—roughly the same amount of air pollutants that the average home releases over the course of a year. BAE Systems is anticipating the number of employees who utilize the electric charging stations to continue to grow.

The electric vehicle charging stations in South Nashua are only a small part of BAE Systems' nationwide Business Sustainability initiative. Started in 2010, the Business Sustainability initiative has functioned with the mission of actively reducing the company's carbon footprint while simultaneously lowering the sector's operating expenses. As of 2017, BAE Systems has completed nearly thirty sustainability projects, ranging from energy and water conservation to waste and site impact minimization. In 2016 alone, they conserved 2.7 million kilowatt-hours of energy, 3.5 million gallons of water and diverted 98 tons of waste from landfills. Since the start of Business Sustainability in 2010, BAE Systems has conserved 40 million kilowatt-hours of energy and reduced its water consumption by 60 percent.

BAE Systems has found success with conserving energy by making a number of improvements to the way their buildings use energy, such as installing and using an advanced cloud-based Building Automation System, upgrading HVAC units and their controls, utilizing high-efficiency motors and frequency drives as well as retrofitting lighting fixtures with LEDs. In order to conserve water, they have improved their sites' irrigation control in addition to installing low/no flow bathroom fixtures and HVAC condensate recovery systems.

BAE Systems' Electronic Systems employee garden in Greenlawn, New York incorporates 150 raised bed boxes for employees to grow flowers, plants, and vegetables. Courtesy of BAE Systems' Electronic Systems.

Not all of BAE Systems' sustainability programs depend on the installation of new green technologies, however. One of their most successful sustainability projects is an employee garden at their Greenlawn, NY location. Established in 2015, the garden covers 150 raised beds and has more than eighty employees who actively use it each season, growing everything from vegetables to flowers. Besides giving employees a stress-free outdoor environment to socialize and bond, the garden also allows Greenlawn employees a place to responsibly compost food waste from their onsite cafeteria.

Moving forward, BAE Systems Electronic Systems has plans to roll out more environmental projects and expand many of their current successful programs. As a company, BAE Systems is constantly evaluating and incorporating new technologies as they progress their mission to reduce resource consumption and lower operating expenses. They are also actively pursuing studies of many of their facilities to see which might be most suited for a large-scale renewable energy project, such as an array of solar panels.

In addition to their mission of finding new technologies to defend and protect our country, BAE Systems is also committed to reaching their long-term sustainability goals because they understand how important and multifaceted the benefits of going green are. Said one facilities planner specialist for BAE Systems Electronic Systems, "We are committed to being socially responsible, not just because it lowers costs, but because it's good for our employees."

Chris Gillespie is a contributing writer for Green Energy Times. *He can be reached at chris@greenenergytimes.org.*

CLIMATE ACTIVITY THAT MAKES A DIFFERENCE

by John Gage

Citizens Climate Lobby's (CCL) NH South Central chapter leader volunteer, John Gage with his daughter meet with Representative Ann Kuster of New Hampshire in Washington D.C. They were among the 1000 CCL volunteers who lobbied 500 congressional offices in teams on June 13, 2017. Photo courtesy John Gage.

Recent federal administration decisions that ignore the strong recommendations of science, and proposals to remove funding from basic scientific research are provoking a strong reaction from educated, concerned citizens across the country. People are being moved by events and increasing their civic engagement, and many are feeling the call to get involved for the first time.

Volunteer groups like Citizens Climate Lobby and organizations like The Union of Concerned Scientists are founded on the enormous potential and benefits of using scientific knowledge and vision to help direct policy decisions for the United States, and the grave risks to the country and world in not doing so. The conclusions of climate science about man-made global warming and ocean acidification are certain, and necessitate a rapid reduction in greenhouse gas emissions from burning fossil fuels. Nearly every other country in the world sees this clearly, as indicated by the near-unanimous global participation in the Paris Climate Accord. By deciding to drop out, our country is ignoring a leadership opportunity that the whole world knows will require US participation to solve. It will take the technological and

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Green Designated Realtors

Sustainability Advocates in Real Estate

By Madeline McElaney

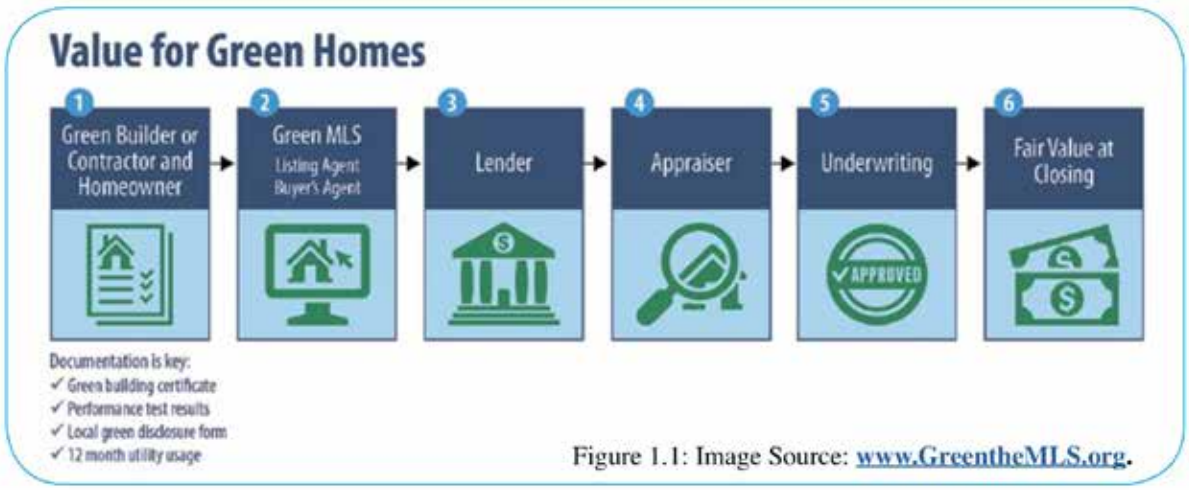


Figure 1.1: Image Source: www.GreentheMLS.org.

Energy efficiency and sustainable energy in buildings has been my passion and my career for over 15 years. During that time I have seen countless property owners in the central New Hampshire region where I live make energy improvements to their homes. From spray foam and pipe insulation in the basement, to shiny sexy PV panels on the rooftops, central NH has a reputation for being ahead of the curve when it comes to energy efficiency and renewable energy in our buildings.

When asked why they made these changes to their buildings, the property owners' reasons ranged from money saved on heating and cooling costs, to creating a more comfortable and cozy home, to better indoor air quality, to energy independence, to "it's just the right thing to do as stewards of this planet."

But what happens when it's time to sell your energy efficient home? How would your homes' HERS rating, LEED certification, or solar photovoltaic system affect the resale value of your home or business? The answer used to be kind of vague and discouraging.

I remember five years ago when I was refinancing my mortgage, I proudly showed the appraiser the solar hot water panels on my roof and told him about the attic insulation we had added with a R value of 60, and the spray foam under the house with a R value of 30. "It takes a cord and a half of wood per year to heat our house!" I said. "That's nice, but I can't see the insulation and it doesn't change your home value" was our appraiser's reply.

Recently I learned that this is no longer true. I was attending the National Realtors Association Green Designation course in Nashua, NH and learned of multiple resources available to appraisers, Realtors, and property owners to help people buy and sell high performance buildings. It was kind of like that classic moment in "The Wizard of Oz" where the movie shifts from black and white to technicolor. The real estate world now has tools and programs in place to help you buy or sell a high performance (aka green) home. And high performance homes are selling at a higher price and spending less time on the market.

Here are some of the tools available to give your green home a fair value at the closing of a real estate transaction:

-There is a national effort to green the Multiple Listing Service (MLS), the platform where all realtors list property for sale. There are fields within a listing where your realtor can enter things like third party home certifications and geothermal heating.

-There is an online tool called PV Value which does exactly that. It asks for your address and some basic information about your solar photovoltaic system and then estimates the value of an installed photovoltaic system. Find this free tool at www.pvvalue.com.

-Property owners also have the right to request a competent appraiser. This means that if you are selling your property and you know that your property has high performance features like a LEED certification or a state-of-the-art pellet-fueled boiler, you or your realtor or real estate broker can request that your appraiser has completed the Valuation of Sustainable Buildings Professional Development Program and uses the Green Addendum as part of the appraisal process to ensure that your building is properly evaluated. (http://bit.ly/green_appraisal)

If you are thinking of buying or selling a green home, look for a realtor who can respond to your specific needs. Your Green Designated Realtor has a comprehensive understanding of how homes with green features should be marketed differently than traditional homes. He or she can work as your advocate throughout the process of helping you buy or sell a high performance building. There are many realtors throughout the distribution territory of Green Energy Times who proudly carry the National Association of Realtors Green Designation. You can find them all at http://www.greenresourcecouncil.org.

Madeline McElaney received the National Association of Realtors Green Designation. You can reach her at madeline@hammond-wheelerrealty.com or 603-306-4348.

Hanover Pledges to Go 100% Renewable

HOW ARE THEY GOING TO DO IT?

Cont'd from p.1

Hanover residents show their commitment to renewable energy.

resources. After the application was approved, the Upper Valley Group brought Ready for 100 to the Sustainable Hanover Committee, and the two groups decided to collaborate. They began by working to expand public support for renewable energy.

Preparing for the town meeting took time and a team. The Sustainable Hanover Committee had a track record of running successful programs and extensive connections within the community. Hanover's town manager, Julia Griffin, and heads of departments such as Public Works and Zoning and Planning joined the effort whole-heartedly. The Sierra Club Upper Valley Group and Sierra Club community organizer Ally Samuell continued their efforts - learning about transitioning to renewable energy and sharing their knowledge at meetings. In the summer of 2016, representatives of Hanover's town government attended the first North American 100% Renewable Cities Dialogue. At that gathering, Hanover's representatives started connecting with Sierra Club resources and with participants from cities and towns across North America. The collective results of everybody's research and planning found a receptive audience. Hanover is a relatively well-educated community, with many of its residents looking for ways to do something about climate change and eager to serve as a model. The roughly 400 residents attending the town meeting voted unanimously to adopt the 100%-renewable goal.

A good goal is a catalyst for new activity. Hanover's case, however, shows the interplay between activity and goals. Hanover has a legacy of environmental stewardship. About six years ago, its town government started budgeting $50,000 per year for energy efficiency and other sustainability improvements to town facilities. These efforts reduced Hanover's municipal energy spending by 31%. In 2014, the Sustainable Hanover Committee successfully campaigned for the town to become a Green Power Community, as well. These experiences made the new goal look attainable. The vote was a formal stamp of approval for work already contemplated. The head of the Department of Public Works responded to the affirmative vote saying, "Now we can start doing all the things we've been talking about."

> "Hanover was the first U.S. municipality in which residents approved the 100%-renewable goal by popular vote. That vote was unanimous."

New activity started quickly. After the town meeting, town manager Griffin established a transition team for municipal operations, focused on finding renewable sources of energy and further reducing energy use. Since the meeting, Hanover has started revising its building codes to require new construction to include renewable energy. The Select Board has authorized the town manager to budget funds for converting town buildings to 100%-renewable electricity. Heat pumps are being installed to replace fossil-fueled heating systems. Solar panels will be installed on municipal roofs. The Town's Ready for 100 team and the Sustainable Hanover Committee are identifying other measures that can be taken right away.

Hanover, NH ranked in the top 30 college towns of America. Dartmouth College is an integral part of the Hanover community and is also committed to the 100% renewable goal. Photo by Eli Burakian '00 - Dartmouth Direct, July 20, 2016.

Forward planning is allowing the town of Hanover to limit the financial impacts of converting to renewable energy. Initial funding for efficiency upgrades and energy investments is coming from capital reserves, minimizing impact on property-tax rates. Savings in energy costs in the future will reduce the impacts of future investments in facilities and equipment. These plans assume no special state or federal funding for the conversion.

Some sections of the path ahead are less clear than those just described. Transitioning low-income households to renewable energy is one of these sections. Energy efficiency and renewable energy save money in the long run. However, they often have high upfront costs. Hanover's Affordable Housing Commission will be looking for ways to make the transition more affordable for these households. Financing sustainability investments through property-tax, electric-meter or gas-meter assessments is a possibility. The Twin Pines Housing Trust has tapped funds from the Federal Rural Utilities Service for weatherization and energy improvements. Vital Communities, a local nonprofit organization, seeks and develops programs for making sustainability easier and cheaper to achieve. While the town recognizes the need to replace fossil fuels used in transportation, action is limited by lack of commercially available technology for vehicles with high power requirements, such as snow plows, dump trucks, fire trucks and ambulances.

Judi Colla urges Hanover residents to support transitioning to renewable energy.

Hanover residents say "Aye" to renewable energy.

Dartmouth College has a big footprint in Hanover. It is also committed to renewable energy and has implemented a variety of measures. It began investing in improving energy efficiency in its buildings a few years ago and has reduced electricity consumption by 30%. This past Earth Day, Dartmouth president Phil Hanlon announced the results of a task force developing recommendations for moving the campus toward sustainability. Dartmouth will replace its steam heating system, fed with No. 6 fuel oil, with a hot-water system using renewable energy. Dartmouth's forests in the White Mountains are a possible source of sustainable biomass for the energy. Solar panels will be installed on rooftops of Dartmouth buildings, starting with the alumni gymnasium and a classroom building this summer. Dartmouth is also partnering with the town of Hanover in developing a 10-MW solar farm on land that they own jointly.

Yolanda Baumgartner, co-chair of the Sustainable Hanover Committee, says, "When the vote was called at town meeting, the 'Ayes' that came back were enthusiastic and unanimous. One could say it was an electrifying moment!" Town manager Julia Griffin says, "This project is a perfect example of how one small group of citizens can make a difference in the community." Other towns

Cont'd on p.21

Hanover, NH has committed to transition to clean, renewable energy

The Sustainable Hanover Committee

- Instrumental for the Unanimous Vote To Go 100% Renewable

By Larry Litten and Yolanda Baumgartner

Ready for 100 meets with Sustainable Hanover and Hanover town officials . Photos from Ally Samuell (pp. 20- 21).

History

The Sustainable Hanover Committee partnered with the Upper Valley Sierra Club on the successful 2017 town meeting vote to commit Hanover to renewable energy goals as part of the national "Ready for 100" campaign. This committee began at least 40 years ago as the town Recycling Committee. Volunteers had been collecting recyclables at the middle school on Saturday mornings for a couple of decades before that. Initially its efforts were focused on weekly collection days during which residents dropped off recyclables at the Recycling Center at the Department of Public Works. Curbside recycling began in 1990 for glass, some plastics, and metal containers, and newspapers with collections of glossy paper and cardboard continuing at the Recycling Center until today's bi-weekly single- sort curbside system was introduced. Over the years, the committee has also held drop-off days for large metal items, electronics, and Christmas trees.

In 2002, the Committee invited Professor Benoit Roisin of Dartmouth's Thayer School of Engineering to help it explore the nature of its mission. Professor Roisin emphasized that the future health of the earth and the well-being of the town would require much more than some recycling. The committee followed with a town-wide environmental summit. Subsequently, the Committee decided to broaden its focus to include climate change, energy efficiency, renewable energy, and pollution issues as well as recycling. In 2007, the Board of Selectmen approved a broader mission for the committee, and the committee held a community workshop on sustainability, advised by a steering committee composed of representatives from the schools, Dartmouth College, town government, and other local institutions. The Recycling Committee became the Sustainable Hanover Committee (SHC) in 2008.

In the meantime, another group of concerned residents formed the Climate Protection Campaign (CPC) to address climate change and had been working diligently on that front. When the Sustainable Hanover Committee emerged out of the Recycling Committee, members of the CPC joined the town committee.

Recent Energy Initiatives

The program to increase the use of electricity from renewable sources began in 2014 when the Committee invited the town's largest electric users to purchase certified green power to support Hanover as an EPA Green Power Community. Six leadership businesses and non-profits (Dartmouth College, Dartmouth Printing, Kendal at Hanover, the Hanover Co-op Food Store, Hypertherm and the Town) joined the effort. The following year, with the addition of SAU #70 and two other programs focusing primarily on residents and small businesses (Solarize Hanover in conjunction with Vital Communities, and a purchasing group buying 100% green certified electricity for residents and small business accounts) Hanover increased to 22% green for all the electricity used community-wide. Feedback from the community about these projects was extremely positive. The Committee felt there would be strong support in the community for a "Ready for 100" campaign.

Other current SHC Programs

The SHC has a Recycling subcommittee which continues to oversee recycling and reuse efforts. In 2016 curbside recycling in Hanover collected 5,500 cubic yards of materials, enough to cover a football field with a five foot high blanket. The annual Hanover - Dartmouth College community yard sale held in September draws a broad range of residents, visitors and students whose purchases give new life to usable items that might otherwise end up in landfill. A new program in 2017 successfully employed Google map technology to direct people in search of usable items to yard sales at the seller's location throughout Hanover and Etna, a village on the east side of Hanover.

The Landscaping subcommittee has developed a new Sustaining Landscape project which will be launched with a public presentation in June 2017. This project will engage businesses, neighbors and students in developing a demonstration garden in downtown Hanover to encourage the use of rain gardens and pollinator-friendly and native plants.

To learn more about SHC and the town of Hanover's commitment to 100% renewable energy, visit https://www.hanovernh.org/sustainable-hanover-committee.

Larry Litten is a retired Dartmouth College administrator, member of the Sustainable Hanover Committee since 2002, member of Hanover's Sustaining Landscapes committee and an Upper Valley resident since 1999.

Yolanda Baumgartner is a retired Dartmouth administrator, co-chair Sustainable Hanover, Core Team Ready for 100, and a Hanover resident.

Sustainble Hanover's successful communiy yard sale. Courtesy photo.

Hanover Pledges Renewables

Cont'd from p.20

in the Upper Valley are watching. A couple of people from Lebanon, New Hampshire may accompany Hanover's Ready for 100 team at the 2nd Annual North American 100% Renewable Cities Dialogue this July. The work done in Hanover is a model for towns in the region to follow. Ally Samuell and the Sierra Club Upper Valley Group are ready to help.

Green Energy Times extends congratulations and thanks to the citizens and Town of Hanover for this outstanding decision! It is an example for all of us working to make a carbon-free energy system a reality. We support your decision and efforts whole heartedly!

Rick Wackernagel is a member of the Energy and Climate Committee, Sierra Club Vermont Chapter

The U.K.'s First Water-sourced Heat Pump for District Heating

By George Harvey

The River Clyde will be used as the source of heat. Image: Thinkstock.

One of Scotland's greatest cities, Glasgow, sits on the banks of the River Clyde. Its situation on that river is a resource that Star Renewable Energy (SRE) is taking advantage of to provide district heating.

SRE is an offshoot of Star Refrigeration, which was founded in 1970 and is one of the largest industrial refrigeration engineering companies in the United Kingdom. The company started producing heat pumps to capitalize on a number of technological advantages. .

General technologies for heat pumps are not new, but it was necessary to get away from the use of chlorofluorocarbons, which produced the hole in the ozone layer, and chlorofluorocarbons, which are greenhouse gases, and the engineers at SRE knew they could do this with ammonia. With half of northern Europe's fossil fuels used for heating, heat pumps had great potential importance. Efficiencies of scale made district heating increasingly important. Heating with fossil fuels is expensive and contributes to climate change. All of these made large heat pumps a good option to consider.

SRE solved all these problems by working on the idea of doing district heating with a river-sourced heat pump. The system using ammonia is much kinder to the environment than the synthetic carbon compounds usually used for refrigeration. The result was a system that does not need to release any greenhouse gases at all, if the electricity that drives it is entirely carbon-free. It is also considerably less expensive to run than using natural gas.

For those who do not understand heat pumps, nearly all of us already live with at least one. Heat pumps power the refrigeration and air conditioning in most homes. The heat pump in a refrigerator extracts what heat it can get from inside the refrigerator, and discharges it into the kitchen.

In the American northeast, we have seen a strong movement toward air-sourced heat pumps, which are among the best choices for saving money in heating. More efficient, but often much more expensive initially, are ground-sourced heat pumps. A good choice for those who have a good body of water nearby is a water-sourced heat pump, which has most of the advantages of both; its special problem is that if the water is in a pond, it must be large enough or it can freeze. The river-sourced heat pump may provide a best case for heating, because when the water gives up its heat, it just flows on, and new water provides its heat to the pump.

SRE is using river-sourced heat pumps for district heating, so a number of buildings can benefit from the efficiency a large unit can provide. This may be the least expensive heating most of us would encounter, outside of a Passive House.

The heat pump SRE is providing in Glasgow will cost £3.5 million. The fluid it uses to deliver heat to nearby buildings will be heated to 80° Celsius (176° Fahrenheit). Carbon emissions are reduced by at least half, and possibly to zero. There are no oxides of nitrogen emitted, and there are no particulates. The result is a system that is kinder to the environment, safer for the health of the people, and nonthreatening to the climate.

One of the interesting things about this is that most cities are built on rivers or large bodies of circulating water, such as the sea or the Great Lakes. This means that the special advantage Glasgow gets from its first river-sourced heat pump could be realized by many cities in exactly the same way. New York City could be heated by water not only in the Hudson River, but in Long Island Sound and New York Harbor.

A Star Renewable Energy heat pump. SRE image.

There are limitations to the amount of heat we can reasonably extract from rivers. It would make good sense to bear these in mind as we move forward. Nevertheless, the large heat pumps built by SRE look like they may represent an important heating solution.

CLIMATE ACTIVITY

Cont'd from p.18

investment power of the United States to lead the world on a clean energy path on the timeline that science indicates is required. The United States could ensure continued growth of our economy and jobs throughout this century by leading in new, clean energy solutions, and leadership in energy in the 21st century is ours to lose. China and others, by focusing on the problem more directly, are now in position to take the lead.

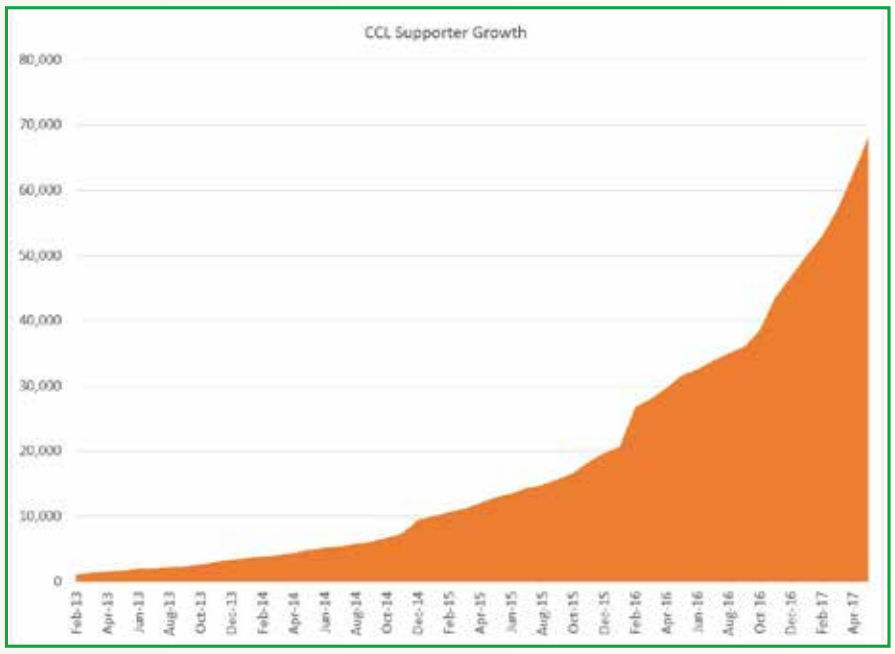
The response across our country to these "isolationist," anti-science, irresponsible actions is reflected in the volunteer growth rate of Citizens Climate Lobby (CCL). CCL is a ten years old, grassroots, nonprofit, nonpartisan organization that formed to help Congress address human-caused climate change. It is one of the fastest growing of such groups, working to create the political will for climate solutions through public outreach, collecting business endorsements, and directly lobbying Congress to provide the tools and support necessary to address the problem in a way that will help the U.S. economy and households. Using the RESULTS methodology, CCL takes a respectful approach to government leaders, and by making personal connections to build trust and a collaborative partnership with Congress, CCL has gained respect and developed strong relationships in Congress.

CCL membership growth has accelerated this year. Before the election, CCL averaged 395 new supporters per week. Afterwards growth climbed to nearly 2.5 times that rate, and by the end of May, membership exceeded 68,000 volunteers. Much of this growth comes directly through the CitizensClimateLobby.org website.

This growth in membership is translating into more letters to the editor, more public outreach, more meetings with Congress, and more effect on Congress. For example, two years ago CCL worked with Congress to create the bipartisan House Climate Solutions Caucus. This caucus had 16 members at the end of December, and grew to 42 members by the beginning of June this year. To enable this caucus to remain bipartisan, membership is kept even at 50% Democrats and 50% Republicans. By raising awareness of this caucus to all members of Congress, and promoting a policy solution that both parties can support, CCL is creating a substantial forum for leaders of both parties to come together to discuss the problem and possible solutions.

"Americans from across the political spectrum are demanding that Congress put politics aside to act on climate change," said Representative Deutch of Florida, one of the co-founders. "The remarkable growth and diversity of this Caucus sends a clear signal to the White House and the American people that Congressional Democrats and Republicans are ready to work together on paramount issues like climate change."

Another group taking an active role in the effort is the Union of Concerned Scientists (UCS). UCS is nearly fifty years old, and since its creation has focused on helping enable Congress to make science-based policy decisions in a wide variety of areas, and to promote policies to use scientific research responsibly and for purposes that benefit society. It was founded to help redirect research from military technologies and toward solving pressing environmental and social problems. Most recently, climate change has become a focus of many of the group's efforts.



Major volunteer growth since election (data courtesy of Citizens Climate Lobby)

Over 30 nations have already put a price on carbon emissions. For example, British Columbia passed a carbon tax in 2008. CO2 emissions fell, fossil fuel consumption decreased, and the economy remained robust. Last year, the rest of Canada decided to follow suit. In fact, of the ten largest economies in the world, only three have not put a price on carbon: Russia, Brazil, and the U.S., and Brazil is considering doing so. China has taken the lead in clean energy technology and manufacturing because their directed economy has been focused in this growth area. We need a market based solution to steer investment and manufacturing might of the United States from fossil fuels to clean energy, for the good of the climate, and to position our country as a leader in energy for this century.

Given the need to greatly reduce greenhouse gas emissions to protect the climate for the near and distant future, and the enormous potential for jobs in clean energy solutions, it is encouraging to see an acceleration of the interests in addressing climate change from fossil fuels with a market-based, revenue neutral solution.

John Gage is a volunteer for Citizens Climate Lobby and is the CCL NH South Central chapter leader, http://bit.ly/CCL-NHSC.

Clean Energy Ratings for the Top 10 States

Cont'd from p.1

Clean Energy Takes Hold

By Bryan Wadsworth

Across the United States, falling costs and improving technology are driving record growth in generation of electricity using renewable sources. Consider the astounding surge in solar power: in 2016, the amount of new solar power coming online nearly doubled from the previous year – enough to power 2 million typical U.S. homes. For the first time ever, solar energy accounted for more new electricity generating capacity than any other resource. And with more than 50,000 new jobs added last year, solar energy now accounts for nearly twice as many electricity sector jobs as all fossil fuels combined.

A recent analysis by the Union of Concerned Scientists (UCS) crunches all these numbers – and many more – to determine which states are driving clean energy momentum. One key finding: support for renewable energy transcends our nation's divided politics. The Trump administration may have installed former fossil fuel industry insiders in key positions of power, but the decisions states have made about their energy future tell a very different story about where our electric sector is headed.

Wind and solar energy are winning in the marketplace even in states whose leaders haven't explicitly promoted the health and climate benefits. To be sure, many coastal, urban states are showing strong clean energy growth. But solid-red states in the heartland – Idaho, Iowa, Kansas, North and South Dakota, and Wyoming – also rank among the clean energy leaders by some measures.

Texas offers another powerful example. Politicians in the Lone Star State sought to encourage competition in 1999 by deregulating the state's electricity market, setting a modest target for clean energy generation. The boom in wind power they spurred led state legislators to raise the renewable electricity standard in 2005, and Texas sped past that revised target 15 years ahead of schedule. It now leads the nation in wind capacity, with almost three times as much as any other state. And last year, when the Texas electric grid operator looked at a range of scenarios to determine its cheapest source of electricity for the next 25 years, solar power came out on top in every scenario. In other words, the people responsible for supplying Texas with its electricity are now predicting that the state can meet its electricity needs without adding any new fossil fuel capacity.

Ranking the states

Accurately charting state momentum on clean energy – to determine who the leaders are – is a bit trickier than it might seem. You could of course measure how much installed renewable energy capacity a state has already put into place, and how it's doing on energy efficiency. But to get a sense of where a state is headed, you also need to track how much renewable energy has come online recently, and how much capacity is being built. A variety of other measures merit consideration too, such as whether a state has an ambitious renewable electricity standard, how many clean energy jobs it has added, or even the amount of airborne pollution from power plants a state has managed to reduce through its energy choices.

The new UCS analysis, "Clean Energy Momentum: Ranking State Progress" (online at www.ucsusa.org/EnergyProgress) takes an in-depth look in order to give credit where it is due on a range of variables. The result is a unique, easy-to-understand scorecard that assesses all 50 states on 12 different metrics – and finds a heartening amount of clean energy momentum even in some surprising places.

Here are some highlights:

Largest increase in percentage of renewable energy: Kansas tripled its wind power production between 2011 and 2015. Wind power also propelled Maine, Iowa, and Oklahoma to top rankings by this measure.

Renewable energy capacity now being built: Wyoming leads the nation with 1,600 watts of new renewable energy capacity per capita under way, followed closely by North Dakota with more than 1,000 watts.

Increases in state renewable electricity standards: New York and California rank first, each having pledged to produce an impressive 50 percent of their electricity from clean energy sources by 2030.

Residential solar capacity per household: Hawaii is the runaway winner, as abundant sunshine and the highest electricity prices in the nation have encouraged one in seven Hawaiian households to install rooftop solar panels. California comes in second (and boasts the nation's highest total capacity of residential solar power overall). It's also worth noting that some states not known for their sunshine, such as Massachusetts, New Jersey, and Vermont, also rank in the top 10.

Renewable energy jobs: Nevada leads in solar power jobs per capita, North Dakota in wind power jobs, and Vermont in energy efficiency jobs. Massachusetts, however, ranks first in clean energy jobs overall based on strong results in both solar and efficiency.

Reducing pollutants: New Hampshire and Delaware lead the nation in percentage reductions of airborne pollutants, while Rhode Island and New Jersey boast the lowest per capita emissions of sulfur dioxide, which contributes to toxic smog. Vermont has the most aggressive target for reducing the heat-trapping carbon emissions that drive global warming – a 60% reduction below 2005 levels by 2030 – followed by Oregon at 50%.

Adoption of electric vehicles (EVs) and plug-in hybrid vehicles: California is miles ahead, with EVs or plug-in hybrid vehicles now accounting for more than one of every 30 new cars sold last year in the state.

Putting it all together

As these data show, clean energy is taking hold around the country. But which states are showing the most progress overall? That requires further analysis. For instance, despite Texas's unquestionable success with wind power and its status as a clear national leader in total wind capacity and jobs, the state does not rank among our winners, because it has more work to do to boost clean energy as a percentage of its overall electricity mix. And, in the years since Texas met its renewable electricity target well ahead of schedule, it has failed to set a new, higher target, costing it momentum. The lesson: policies matter, and state leadership is vital, especially now in the face of a Trump administration that, as UCS President Ken Kimmell puts it, appears to have created a government "of, by, and for the fossil fuel industry."

The good news is the new UCS analysis demonstrates that any state can become a leader and reap all the economic and environmental benefits that clean energy brings. All that's needed is to establish a suite of strong clean energy policies that allows for multiple approaches and technologies.

Our overall state leaders in clean energy perform well across a range of metrics (see the figure). First-place California and runners-up Vermont and Massachusetts, for example, each rank in the top 10 on at least eight separate metrics. These and other state leaders show how smart energy policies can yield swift and demonstrable results for their residents. They also point the way forward for others. As clean energy continues to take hold across the United States, we need to ensure all Americans share in its benefits.

Drawdown

THE MOST COMPREHENSIVE PLAN EVER PROPOSED TO REVERSE GLOBAL WARMING

Edited by Paul Hawken, Penguin Books, 2017, 240 pages, $22.00

Review by Nancy Rae Mallery, Publisher, Green Energy Times

Most of us realize that we are facing the greatest challenge humanity has ever had to deal with. It is climate change.

It is a scientifically proven fact that the world is warming and at an alarming rate. Doing nothing is not an option — at least if you have anyone that you love and want to be able to survive what the future holds. As with Dr. James Hansen, world-renowned climate scientist, I have my own grandchildren to be concerned about. I am not willing to watch them take the consequences of our current lack of action.

I am guessing that if you are reading this, that you feel the same. Although I am the publisher of Green Energy Times, and live a very low-carbon lifestyle, I know it is not enough. I long for more solutions and the ability to share them with you all, in hopes that it will make a difference in each of your lives.

Together, we need to draw down the carbon in our atmosphere and somehow get the whole earth's emissions down below 350 ppm. It is not going to be easy — and we all need to take it as serious as this situation is.

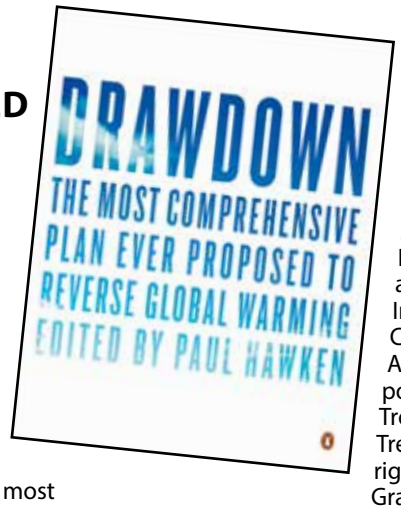
We need to do more. What does doing more mean? Where do we start? Or where do we go from where we are at right now, if you are already doing all you think you can?

The solutions are here in this book, Drawdown. This book really has the answers as to how we are going to make it. To do this book justice would take the entire issue of Green Energy Times. It is the most comprehensive plan I have found in one place — a plan that shows how we can win the war on climate change. We at Green Energy Times agree with almost everything in the book with the exception of nuclear power. You could read all of our articles since May, 2009 at our website, but this book covers everything in a nutshell. Green Energy Times will continue to cover these subjects in depth, so keep reading it.

This is why I can say the book is truly comprehensive —simply from this list of topics in each section that the book covers:

Energy section: Wind Turbines, Microgrids, Geothermal, Solar Farms, Rooftop Solar, Wave And Tidal, Concentrated Solar, Biomass, Nuclear, Cogeneration, Micro Wind, Methane Digesters, In-Stream Hydro, Waste-To-Energy, Grid Flexibility, Energy Storage (Utilities), Energy Storage (Distributed), Solar Water.

Food section: Plant-Rich Diet, Farmland Restoration, Reduced Food Waste, Clean Cookstoves, Multistrata Agroforestry, Improved Rice Cultivation, Silvopasture, Regenerative Agriculture, Nutrient Management, Tree Intercropping, Conservation Agriculture, Composting, Biochar, Tropical Staple Trees, Farmland Irrigation, Managed Grazing.



Women and Girls: Women Smallholders, Family Planning, Educating Girls, Buildings And Cities, Net Zero Buildings, Walkable Cities, Bike Infrastructure, Green Roofs, LED Lighting, Heat Pumps, Smart Glass, Smart Thermostats, District Heating, Landfill Methane, Insulation, Retrofitting, Water Distribution, Building Automation.

Land Use: Forest Protection, Coastal Wetlands, Tropical Forests, Bamboo, Perennial Biomass, Indigenous Peoples' Land Management, Temperate Forests, Afforestation.

Transport: Mass Transit, High-Speed Rail, Ships, Electric Vehicles, Ridesharing, Electric Bikes, Cars, Airplanes, Trucks, Telepresence, Trains.

Materials: Household Recycling, Industrial Recycling, Alternative Cement, Refrigerant Management, Recycled Paper, Bioplastic, Water Saving – Home.

Coming Attractions: Repopulating the Mammoth Steppe, Pasture Cropping, Enhanced Weathering Minerals, Marine Permaculture, Intensive Silvopasture, Artificial Leaf, Autonomous Vehicles, Solid-State Wave Energy, Living Buildings, Direct Air Capture, Hydrogen-Boron Fusion, Smart Highways, Hyperloop, Microbial Farming, Industrial Hemp, Perennial Crops, Ocean Farming, Smart Grids, Building With Wood.

I will leave it at that and let the experts show you. With the cost of just $22, for this very thorough guide, it certainly is worth every penny. This is a book that everyone should own, as well as libraries and schools, and that every book store should be displaying in the front of the store. G.E.T. it!

'Smoke and sunlight in forest' is the picture shown on p. vi in Drawdown. *Photo coutesy of* Penguin Books.

Climate of Hope

How Cities, Businesses, and Citizens CAN SAVE THE PLANET

By Michael Bloomberg and Carl Pope, St. Martin's Press, 2017, 263 pages, $26.99

Book review by N. R. Mallery

Michael Bloomberg speaking with Elon Musk at the Climate Summit for Local Leaders. All images courtesy of St. Martin's Press.

This is the second book I want to share with readers in this important edition of Green Energy Times. These book reviews may be the most important we have ever shared with you. It may be because of the timing, as we live in a country run by an administration that is denying climate change and has threatened to remove the USA from the Paris Climate Accord commitment.

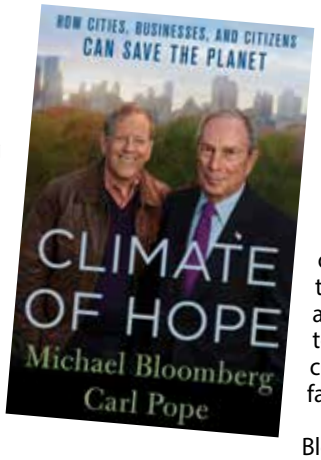
The timing of Climate of Hope is impeccable. Just when we need hope, here it is! Co-authors Michael Bloomberg and Carl Pope show us how we need to handle the planetary crises ourselves. Cities, businesses, and citizens can all together save the planet. Released in time for Earth Day, the book offers real solutions on how we can still tackle climate change.

The book shows that Bloomberg and Pope have the background, experience and passion to work together beautifully. They approach the catastrophic future that we face from a collaborative understanding. The leadership that each of them brings to the book is refreshing.

As mayor of New York City from 2002 to 2013, Michael Bloomberg has a background with how cities operate. The fact that he knows what works and what doesn't is shown from personal experiences he freely shares. His understanding, experiences, and vision relating to the global climate dilemma — from the point of view of a mayor of such a large metropolis — is invaluable to help us move forward with hope. Perhaps, working on the level of a town or city will prove to be more powerful than we all realize.

Bloomberg is also the founder of Bloomberg LP, a global media and financial information company. HIs knowledge of how finances work help to create a reality of what and how it will be possible to transform cities and at a business level, as well. He leads us to understand that it is the responsibility of each one of us to work with the practical solutions that are presented in the book.

It is significant that Bloomberg's history includes the fact that in 2014, the U.N. Secretary-General appointed him Special Envoy for Cities and Climate Change. Bloomberg is one of the world's most prominent philanthropists, and the environment is one of the five main focus areas of his foundation, Bloomberg Philanthropics.



Climate of Hope was co-written by Carl Pope. You are probably somewhat familiar with him as the former executive director of the Sierra Club. You may have read his biography at the end of the numerous articles he wrote that we have published in Green Energy Times.

Pope's passion could not stay contained when he retired from the Sierra Club, and today he continues looking for the underlying economics that link sustainability and economic development, as the principal advisor at Inside Straight Strategies. He has a long list of his accomplishments, along with three other books that he has written. Being a co-author with Bloomberg is a perfect complement to tie this all together with the authority and expertise necessary to give us a road map as we move forward with the hope they believe is real.

Carl Pope meets with then Vice President Al Gore at the WhiteHouse, 1996. (Presidential Materials Division, National Archives, and Records Administration)

Together, in alternating chapters, they not only share their past experiences, but also are able to carve a path for how to tackle the most complicated challenge the world has ever faced.

The book shows that Michael Bloomberg and Carl Pope have the background, experience and passion to work together beautifully. They approach the catastrophic future that we face from a collaborative understanding. The leadership that each of them brings to the book is refreshing.

The United States may leave the Paris Climate Accord, but maybe there is a gift in this happening to our country — it has served to create a higher level of awareness and understanding about the dangers of a warming planet to thousands who never really paid attention to the changing climate. There is indeed hope and this book helps to show the way out of our mess.

It's time for cities, businesses and every citizen to follow the practical solutions laid out in Climate of Hope. The book is sure to be an inspiration for all who read it — with the information that is sorely needed now, more than ever. It is time for action that will produce immediate and solid benefits now and into the future. Let's save the planet together. I recommend that you get yourself a copy of this book and share it widely.

Clarity and Courage Are Needed Now

By Dr. Alan K. Betts

After a cool March, the daffodils and forsythia bloomed relatively late around mid-April. But the maple trees bloomed early and leaf-out started in late-April, as if they were unaware of the cool temperatures in March. A long period of unusually cool, cloudy, wet weather with very slowly moving jet stream patterns followed in May. Potatoes, broccoli, peas and lettuce are flourishing in our garden.

The most exciting aspect of giving talks on climate change this year is that a public awakening is underway. I have seen capacity audiences with a new intense enthusiasm. This took quite a shock, but now more people realize they must stand up, and they must act. For the faint-hearted, it helps that this is the final decade to drop our global emissions of fossil carbon, and still have an even chance of just squeaking below critical earth system thresholds.

The March for Science on Earth Day exemplified this. Most scientists never thought they had to stand up and be counted. They were a rather comfortable part of the Establishment; perhaps too comfortable in their academic worlds. Now they realize that they bear some real responsibility for the truth, not just in science, but a social responsibility for the truth in society. They must protect the concept of honesty against a corrupt political system; and make a lot more effort to reach out since we need a knowledgeable public. Otherwise the democratic enterprise collapses.

It has been a slow awakening. Too many scientists tolerated, for example, the substitution of profit for truth by the pharmaceutical industry. But now they watched in horror as the legal protections for clean air and clean water were denounced, simply because they interfere with the profits of those exploiting the Earth. It is deeply ironic that the Environmental Protection Agency itself is now threatened, as it was set up and strengthened by Republican presidents, who understood the need to protect and conserve our natural resources.

Now our phony conservative leaders would like to sweep it all away in their rush to the dark side. On June 1, they had a moment of triumph with the announcement that the U.S. will withdraw from the 2015 Paris climate change agreement. In reality, their ignorance of the global issues we all face just confirms the irrelevance of our national leaders. It is another call for states and citizens to wake up and act.

The March for Science in Washington, D.C. on Earth Day, 2017. Photo source: Union of Concerned Scientists (UCS), www.ucsusa.org.

The wider conflict going on both in our society and around the world needs explicit discussion, because it must be faced consciously. It is a broad struggle for the soul of humanity that has been ongoing but continually changing since the catastrophe of World War I a century ago. One aspect in recent decades is the consolidation of political, economic and financial power in the hands of the elite. Underlying it are deeper, ego-based power struggles. These cannot be resolved without a change of mindset, because no amount of power and wealth will console and satisfy fearful egos.

What is happening is that many traditional patriarchal, libertarian, religious, racial, economic and financial frameworks are crumbling. Fear and desperation has been rising as groups fight for the survival of their threatened mindsets. Finally we have in Washington a pathetic but desperate parody of the patriarchal system, which is willing to jettison everything rather than face themselves and their responsibilities to either the people or to the Earth. Their moral and intellectual collapse is illustrated by the fact that democracy, science and ethics were valued only as long as they served the interests of the powerful.

So it is not surprising that opposition is on the rise. Many are justifiably fearful of what they may lose. What is needed however is a conscious opposition that is rooted in a compassionate awareness that we must stand up for an inclusive view, where all people and all life on Earth matter, because we are all deeply connected.

Certainly, rooted awareness is a real threat to the fearful, egotistical plutocrats in power; but this should not be seen as yet another battle where the powerful could simply crush us. The moral and practical choices are so clear, that if we stand up in our communities and align ourselves with the Earth, their foolishness will likely crumble. But first we must confront the threat to the soul of democracy from thirty years of corruption by dark money. Next year will be the test to see whether democracy still stands across America.

But summer is coming, so don't stop planting because we need to feed each other. Let us cultivate the strength and vision of our communities.

Dr. Alan Betts of Atmospheric Research in Pittsford, Vermont is a leading climate scientist. Browse alanbetts.com.

Vermont Research Climate Change News

Trump, Ticks, and Wind

By Kirsti Blow, Center for Research on Vermont

June has thus far been a step backward for the nation—and for Vermont—in terms of combatting climate change.

President Trump announced on the first of the month that he plans to withdraw the United States from the Paris Agreement, the pact signed in 2015 by 195 nations that aimed to curb greenhouse gas emissions and promote environmental action in the face of rising waters and unpredictable weather patterns.

Image: RawStory

Led by the governors of California, New York and Washington, twelve states have formed the U.S. Climate Alliance to pledge their continued support for the Paris Agreement and its standards. Governor Phil Scott announced on June 2nd that Vermont will join the coalition and focus shared efforts with the government of Massachusetts to reduce regional emissions.

Although the accord states that no country can leave until November 4, 2020, the decisive speech—and the backlash that followed—marked the U.S. as a global outlier and reiterated Trump's promises to loosen domestic strictures on climate policy, most notably the Clean Power Plan.

Consistent with that trend, there have been a number of June obstacles regarding clean power. Wind energy has come under fire in Vermont after a string of noise complaints by residents situated near turbines. To address these grievances, the Public Service Board drew up guidelines that would enforce the lowest sound levels in the nation: 42 decibels during the day, and 39 at night.

These figures starkly contrast the average across the nation, which is roughly 45 decibels—for context, that produces sound quieter than a typical conversation.

Wind proponents refuted this proposal, arguing that development would be forced to cease, as wind towers would undoubtedly be unable to meet the stringent regulations. Those on the other side of the debate maintain that the guidelines are necessary to protect human health.

As of June 8, the Public Service Board opted to delay further decisions regarding implementation. The sound guidelines are set to be revisited on June 22 by the Legislative Committee on Administrative Rules.

Apart from political energy battles, the Vermont Fish and Wildlife Department is warning residents of a "particularly bad" season for ticks. Stemming from warming climatic changes—including the suburbanization of forest land—that have welcomed increasing numbers of white-tailed deer and the white-footed mouse, the state's tick population has surged.

The risk of a tick bite is exceptionally high this year largely due to a strong New York crop of red and white oaks, which produce acorns that white-footed mice feed on. The mouse population, which are known carriers of Lyme, naturally saw an increase, prompting ticks in the area to feed on the mice and become carriers themselves.

Vermont is now home to thirteen varieties of ticks, four of which carry diseases that may be transmitted to humans. Under these conditions, cases of Lyme disease have spiked from 60 in 2003 to 491 in 2015—with 219 additional suspected cases. These figures mark the highest rate of infection per capita in the U.S.

The risk won't discourage the adventurous from spending the summer in the woods—after venturing outdoors, Vermonters should just be sure to take the extra step of checking their clothing and person for ticks..

Kirsti Blow is a sophomore public communication major at University of Vermont. She writes the briefs for UVM's Vermont research newsletter published by the Center for Research on Vermont. Learn more at http://www.uvm.edu/~crvt/. Kirsti is also a local musician in the Burlington area.

Zero Energy Home Builders in New Hampshire

DEMONSTRATE MASTERY IN CONSTRUCTION AND EFFICIENCY

by Chris Gillespie

If you live in or near New Hampshire and are thinking about building a house, your most environmentally-friendly option is a zero-energy home.

Zero-energy homes, according to ZeroEnergyProject.org, are homes that produce as much renewable energy as they consume over the course of a year. Built using advanced design techniques, zero-energy homes save homeowners money on their energy bills while simultaneously eliminating the homes' operational carbon footprints by utilizing effective insulation and other energy efficient technology. Although zero-energy homes can be connected to standard power grids, they do not need to be.

Zero-energy homes are more affordable now than ever before and there are a number of intelligent and innovative New Hampshire-based builders who are ready to build one that's right for you. Below are examples of three such builders:

A BrightBuilt Home in Meriden, NH. This zero energy home was built by RH Irving. This south-facing side features Logic windows and doors and a solar array installed by Norwich Solar Technologies; inset: kitchen, as seen from the main entry. Photo courtesy of the homeowner.

RH Irving Homebuilders (Salisbury, NH)

Starting in the early seventies as a barn and home remodeling business, RH Irving Homebuilders found success in the late seventies and through the eighties building super-insulated timber frame houses, and has continued to follow their commitment to creating energy efficient houses, growing into one of the premiere zero energy builders in New England along the way.

A residence that RH Irving built earlier this year in Cornish, NH is a recent example of the ingenuity and attention to detail that the company puts into each one of their zero energy homes. Lit by 100% LED lights, the Cornish house is built to acquire its heat and energy from its high-quality wood stove, energy-saving air-source heat pump and heat recovery ventilator, as well as solar panels to be mounted on its standing seam roof. Once the house generates its heat and energy, it maintains them within its walls using its superinsulation and its Intus windows.

RH Irving's work also proves that you don't need to build a brand new house if you are interested in owning a zero energy home. Last year, RH Irving transformed a scenic house in Concord, NH that was originally built in 1962 into a greener, more energy efficient home using all-new triple-glazed casement windows, air-source heat pumps and modernized kitchen and bath equipment.

Kaplan Thompson Architects of Maine made custom designs for both of these RH Irving projects. Two of RH Irving's zero energy homes in Meriden, NH and Hollis, NH were designed by BrightBuilt Home, a Maine-based business that designs zero-energy homes and facilitates the process of building them from start to finish. Kaplan Thompson Architects founded BrightBuilt Home with the goal of providing more beautiful, healthy and low-energy homes for the American homebuyer.

The Meriden residence from RH Irving and BrightBuilt boasts a generous open-plan living space, as well as its own conservatory room and insulated woodshop above the garage. Its solar array was installed by Vermont-based solar electric system installer Norwich Solar Technologies. The house also passed a blower door test and proved that it meets its performance specifications, thanks to the help of its Logic windows and doors, which exude elegance and reliability all while offering excellent thermal and sound insulation and exceeding today's energy efficiency requirements. www.rhirvinghomebulders.com; BrightBuilt Home: www.brightbuilthome.com

Garland Mill Timberframes (Lancaster, NH)

Named after a water-powered sawmill in Lancaster, NH that has been in continuous operation since before the Civil War, Garland Mill Timberframes has been designing and building a variety of structures, from homes and barns to saunas and gazebos, for over twenty-five years. The Garland Mill itself has been a net energy producer since the early eighties and now the company that shares its name prides itself in building houses that are just as sustainable. Two of Garland Mill's most recent zero energy houses offer own-

Cont'd on p.27

Zero Energy Builders in N.H.

Cont'd from p.26

Carroll, NH zero energy home with 8kW solar PV array. Below: Dalton, NH zero-energy home using locally sourced and site - harvested timber. Both homes built by Garland Mill Timberframes. Photos courtesy Fletcher Manley.

ers excellent energy efficiency as well as priceless views of northern New Hampshire's scenic landscapes, such as the mountains of Carroll, NH and a lake in Dalton, NH.

Both homes make use of air tight (.45 ACH50), super-insulated thermal envelopes (R-38 wall, R-56 roof), with R-7 triple-glazed windows that keep interior surface temperatures stable while allowing solar gain from the sun to heat the home. Both homes use Fujitsu ducted "minisplit" heat pumps for heat and super-efficient Stiebel Eltron heat pump water heaters for hot water production. The Carroll home makes use of a heat pump dryer which is twice as efficient as conventional

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Zero Energy Builders in N.H. Cont'd from p.27

Zero-energy home built by Homes for a Lifetime, LLC with a 7kW solar PV array in Weare, New Hampshire. Photo courtesy Bruce Fillmore.

driers, and both homes supply residents with fresh air through a Venmar ERV ventilation system with heat recovery. These and other efficiency strategies and appliances allow the homes to be powered by solar arrays small enough to fit on their rooftops.

Both houses include foam core wall insulation, SIGA tapes and membrane sealants as well as solar panel arrays, ranging from 8 kW PV to 10 kW PV that, like The Garland Mill itself, produce more energy than they use on an annual basis. Given Garland Mill's history of sustainability and quality wood-harvesting, it should come as no surprise that their zero energy homes are made from locally sourced New Hampshire timber—in fact, both homes have site-harvested timber in their structures. www.garlandmill.com

Homes for a Lifetime LLC (Weare, NH)

Originally starting out in hopes of filling a niche in the industry over a decade ago, Homes for a Lifetime LLC has found that the demand for zero-energy homes is increasing and have since been striving as a company to make the construction and maintenance of zero energy homes as affordable as possible for consumers. Given the growing availability of the materials required for the construction of zero energy homes, Homes for a Lifetime believes that zero energy homes themselves can and will continue to become more and more affordable.

Homes for a Lifetime recently completed a home in Weare, NH that achieves its zero-energy status by utilizing solar panels, an electric heating system and an air-tight, draft-resistant infrastructure. The home even includes a garage and a basement, both of which are properly insulated and sealed as to prevent heat from escaping outside. LED lights and Energy Star appliances also help eliminate the home's carbon footprint. www.homesforalifetimenh.wixsite.com/home

For GET's previous coverage of another notable NH-based zero energy builder, Building Alternatives Inc., visit our website at http://bit.ly/2tew6v9

Ed: While this list features New Hampshire-based builders, Vermont, Massachusetts and New York are home to many other reputable zero-energy builder. Look for their information in the pages of Green Energy Times.

Chris Gillespie is a contributing writer for the Green Energy Times. *He can be reached at chris@greenenergytimes.org.*

Many thanks to our Sponsor:

HOMES FOR A LIFETIME
1225 River Road, Weare NH 03281

Saving 79% in Existing Homes – Vermont's Zero Energy Now Program

Vermont homeowners were offered a unique opportunity in 2016 to participate in a new program to save significant fossil fuels in existing homes, and the results are impressive; an average savings of 79% per home! This deep level of total energy savings was achieved through a comprehensive combination of home weatherization, heat pumps and solar PV. Compared to typical Home Performance with ENERGY STAR program savings of about 25%, these Zero Energy Now results are remarkable.

Green Mountain Power's (GMP) Community Energy & Efficiency Development (CEED) Program offered the funding opportunity to Vermont's trade association of home performance contractors, Building Performance Professionals Association (BPPA). In late 2015, BPPA applied for about $700,000 in funding to design, develop, deliver, track and report comprehensive deep energy retrofit projects in 2016. The funding was made available in February and projects had to be completed by December 31, 2016.

Despite the compact timeframe, BPPA designed and developed the Zero Energy Now program, recruited and trained contractors, hired and worked with a marketing firm and launched the program in early 2016. A press conference that included U.S. Representative Peter Welch, GMP executives, Vermont State administrators and others kicked off the program in June in Richmond, Vermont. BPPA Board members and subcontractors promoted and supported Zero Energy Now throughout the year and completed 22 deep energy savings projects.

These comprehensive Zero Energy Now projects included air sealing and insulation, added cold-climate heat pumps and heat pump water heaters, and installed solar photovoltaic (PV) systems to reduce total energy use by at least 50%. The savings came with a guarantee that if they did not show up, BPPA contractors would not only go back to fix any issues, but would also make up the cost difference. So far, no one has made a claim against the guarantee, so the savings projections likely are fairly accurate.

Customer economics were impressive. For the 22 homeowners, they collectively invested about $1.2 million in their projects, with a median project cost of about $45,000. These project costs ranged from $22,000 to $170,000, with the three most expensive projects all installing ground source heat pumps. After subtracting out the program incentives from Zero Energy Now and Efficiency Vermont, and considering the 30% Federal solar tax credit, total project costs came in at about $31,000. However, these investments yielded an impressive annual energy cost savings of almost $3,700! Total energy use dropped by 79%, a level unprecedented in existing homes programs at this level of investment. From the consumer's perspective, this investment yielded an 11.9% return on investment, which rivals the best returns from the stock market, but provides this return year-after-year, while weaning the customer of fossil fuels.

Program highlights are summarized in table above.

For 2017, BPPA is working with Efficiency Vermont to offer the "Solar Bonus" program. This scaled-down approach still targets 50% fossil fuel savings from weatherization, heat pumps and solar PV, and offers up to $3000 in total incentives (plus the 30% Federal tax credit for solar) for participants. For information on the Solar Bonus, see https://www.efficiencyvermont.com/solarbonus.

BPPA is still promoting the Zero Energy Now certification for individuals and communities interested in the deep comprehensive approach. The Zero Energy Standards include at least 10% savings from weatherization, 50% fossil fuel savings and 50% energy produced by renewables. Unfortunately, the $5000 incentive that drove the 2016 interest in this deep level of savings is not available at this time. But, up to $3,000 in incentives is available for the Solar Bonus program for 2017, so visit https://www.efficiencyvermont.com/solarbonus for more information.

The Zero Energy Now Program demonstrates that a comprehensive approach incorporating energy efficiency, heat pumps and solar photovoltaics can be a viable and cost-effective approach for achieving deep energy savings. With a sustained budget, consumer educating and marketing push, even greater participation and savings can be achieved.

For more information, see https://www.efficiencyvermont.com/solarbonus, http://zeroenergynowvt.com/ or contact: Richard Faesy, Energy Futures Group, rfaesy@energyfuturesgroup.com, 802-482-5001x2.

Zero Energy Now 2016 Summary Statistics	
Participants	22 Vermont existing homeowners
Customer investments	$1.2 million (split relatively evenly between efficiency and solar PV)
Median *total* project cost	$44,739 (ranging between $22,000 and $170,000)
Net customer project cost	$31,090 (after incentives from Zero Energy Now, Efficiency Vermont and 30% Federal tax credit)
Median energy cost savings	$3,692/year
Average annual energy savings	95 MMBtu (60 MMBtu from efficiency and 31 MMBtu from solar PV) from 120 MMBtu pre- to 25 MMBtu post-improvement
Customer return on investment	11.9%

Vermont Farm Cuts Fossil Fuel Use with Zero Energy Now

Zero Energy Now Participating Home in East Saint Johnsbury, Vermont

When the owners of a vegetable farm in East St. Johnsbury, Vt. wanted to reduce their use of fossil fuel, they turned to the Zero Energy Now program for help. Through Zero Energy Now they found a certified energy contractor (CEC) who put together a package for them that included insulating their century-old house, adding a cold climate heat pump, and installing a large photovoltaic system to generate electricity on the farm. The CEC served as a single point of contact for the owners and coordinated the work of other contractors on the project.

The certified energy contractor also helped arrange financing. With tax credits and incentives, the project cost about $30,000. The owners will begin saving money immediately by cutting their fossil fuel use from 1,200 gallons a year to 300 gallons annually. Once they finish paying their loan, they'll have almost no monthly energy costs.

For a short video of the project, see http://zeroenergynowvt.com/

Buildings Made of Sky

Sequestering Carbon in Buildings

By Ace McArleton

"The built environment can switch from being a problem to being a solution." Bruce King, The New Carbon Architecture (anticipated fall 2017).

Folks, let me introduce you to a new idea: buildings made of sky.

How can we, and indeed why should we, make buildings from sky? While the building industry has taken important strides to reduce our negative impacts, we can and must shift to creating positive impacts by pulling carbon from the atmosphere in the form of plant-based building materials, i.e. "make buildings out of sky."

We hear a lot about carbon these days and how to minimize its detrimental effects as a greenhouse gas through reducing fossil fuel emissions. Carbon dioxide (CO_2) concentration is currently at 400 parts per million (ppm), causing polar ice melt, sea-level rise, and erratic and destructive weather events, all of which have an impact on animal, plant, and human life. The building industry contributes roughly 39%-49% of CO_2 emissions globally due to construction and operational use (IPCC 2014, US EPA 2012).

The global carbon impact of building, and hence our responsibility, is massive. We have made great strides in green building in terms of addressing operational energy consumption (the energy that buildings use during their habitation), and we have learned much about how to design and build buildings that consume less energy. Some buildings even produce as much or more energy than they consume through the integration of on-site renewable energy sources; such buildings are called "net zero energy," and represent a huge step forward for our industry and societies.

However, we must go farther, faster. As Bruce King says in the introduction to his forthcoming book, The New Carbon Architecture: "We are in technological reach, within a generation, of a global construction industry that is not only 'net zero'...but in its materials pulls more carbon out of the air than it puts up. We can reverse the emissions engine."

Our current framework for "net zero energy" doesn't account for the carbon pollution created during the manufacturing and distribution of the materials. The term "embodied carbon" refers to the carbon or carbon-equivalent (the equivalent amount of carbon for other greenhouse gas chemicals) emissions produced as a result of the harvest or extraction, refinement, transport, production/manufacturing, and storage of a material. Many materials used for energy efficient buildings have high embodied carbon loads. It is common to justify these materials' use, such as foam, based on its "carbon payback time." Payback is the idea that over the life of the building more carbon will be saved by using the material than is embodied in it. Therefore, the argument goes, over decades of the building's use the embodied carbon of the material will be "offset" by the amount of operational carbon saved.

Many locally-sourced wood and other fiber materials were used to build this high-performance home. Builder: New Frameworks. Photo credit: Studio SB Photography, 2016.

We now know several things:

1. We don't have any more time to "offset" anything in this old way of thinking. We have surpassed, and are surpassing, the global atmospheric carbon levels that will maintain any semblance of Earth's habitable climate as we have known it for the last century. The game has changed, and we must adapt our strategy accordingly and rapidly.
2. It is absolutely possible to design, construct, repair, and maintain equally-high performing, energy efficient and durable buildings with not only low- or zero-embodied carbon materials, but with materials, that sequester – or store – carbon, giving that building a net-positive carbon footprint.
3. Our buildings then become tools in the project of global drawdown of CO_2; they become reservoirs for CO_2 and help to reduce and reverse climate change effects.

A gift from aging stars, carbon is the fourth most abundant element in the measurable Universe and the basis of life on Earth. The carbon cycle describes the movement of carbon, in its many forms, between the reservoirs that exist in the atmosphere, oceans, biosphere, and geosphere. Through mining oil and gas reserves, we extract reservoirs of stored carbon and we burn them for fuel. This action impacts the balance of the carbon cycle in a significant way: overloading CO_2 in the atmosphere, which warms the planet, and acidifying oceans, which kills ocean life. It is as if carbon sequestration and storage is Earth "inhaling," while carbon burning, decay, and release is "exhaling". Our activity has created a huge "exhale" that has gone on and on, overwhelming the cycle's "inhaling" reservoir capacities, that of the oceans, atmosphere, and biosphere.

Constructing buildings is an opportunity to increase the CO_2 sequestering reservoirs and to help bring greater balance to the carbon cycle. When we build with local, plant-based insulations, structural members, and finishes we are engaging in the carbon cycle (intentionally, this time) to reduce carbon in the atmosphere and therefore mitigate, or even reverse, global climate change.

Plants, an important part of the biosphere in the carbon cycle, pull CO_2 from the air and convert it into sugar for food. When a tree is harvested for timber, the CO_2 that tree absorbed in its lifetime is "fixed" or sequestered into the structure of that timber. As long as it is kept dry and does not rot or burn, that carbon will remain sequestered in that timber and in that building. Plants are the basis of our entire food chain, and they also can form the basis of a sequestration reservoir in our buildings.

There are many excellent examples of carbon-sequestering building materials choices on the market today, for both residential and commercial buildings:

- Straw walls: Insulated prefabricated wall panels or site-built wall structures
- Hempcrete walls: insulation, enclosure in-fill
- Timber and nominal wood framing for structure: CLT (cross-laminated timbers) and big timbers for large buildings, local lumber and timber for smaller buildings
- Sheathing: Insulating wood fiber-based sheathing (structural or non-structural)
- Wood for flooring, siding, shingles: regionally-milled solid wood hardwood flooring, softwood siding, cedar roofing
- Cellulose fiber insulation: Dense-pack or damp-spray for walls and roof slopes, loose-fill for flat-floor attics.

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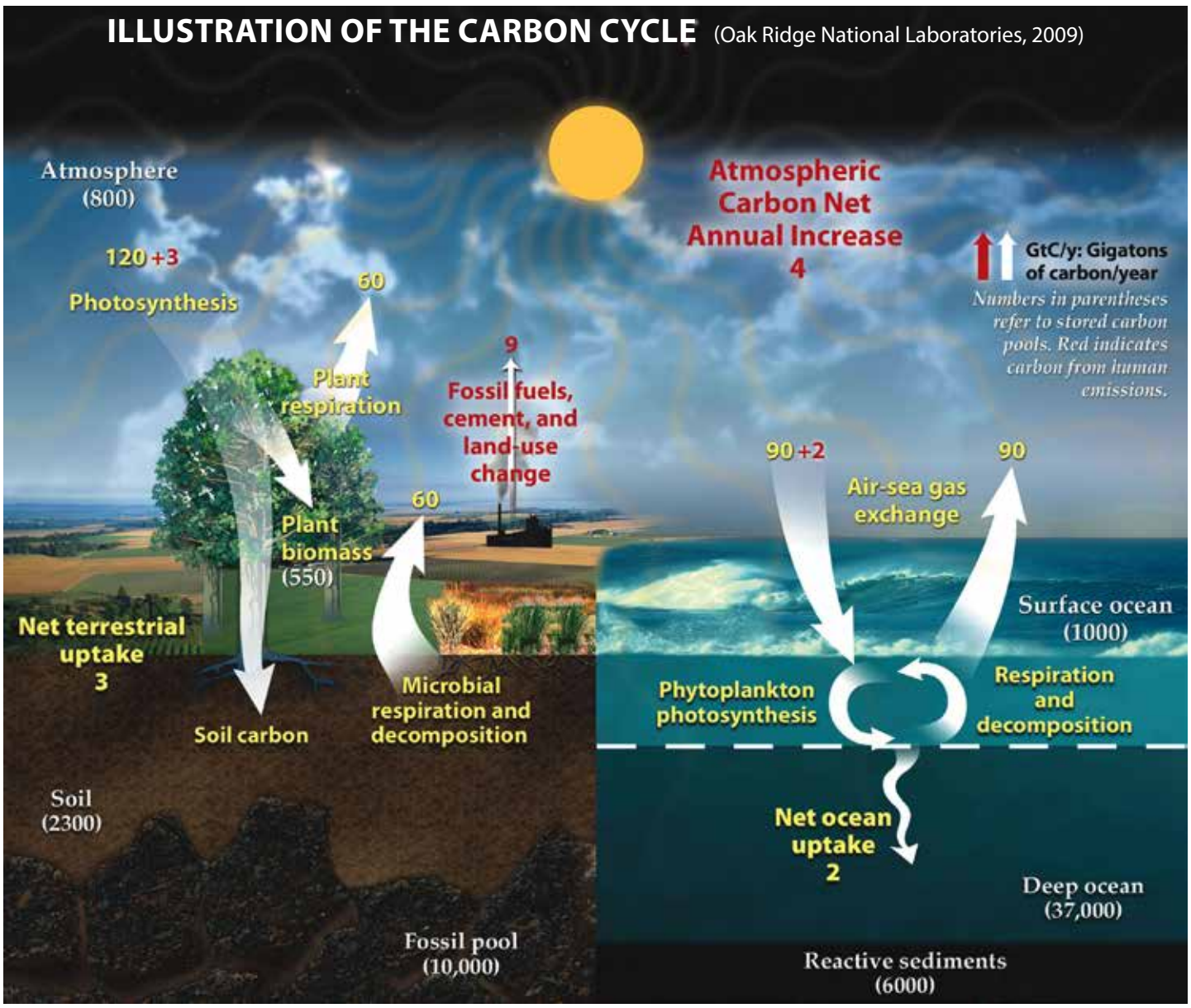
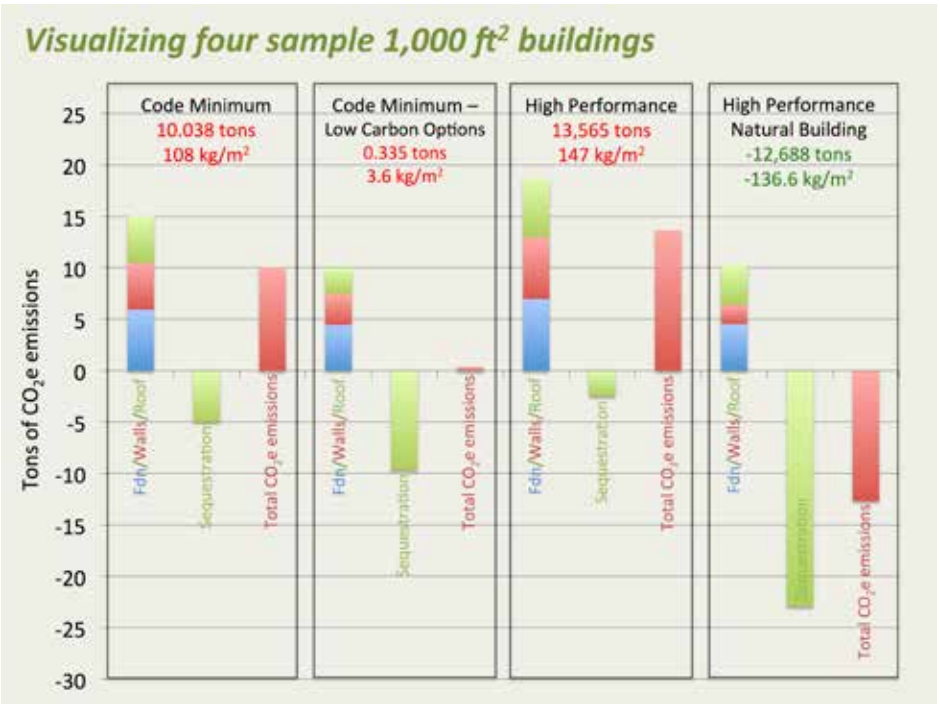


Sequestering Carbon in Buildings Cont'd from p.30



"Visualizing Four 1000 ft2 Buildings" slide extracted from "The Carbon Elephant in the Room," Chris Magwood (Endeavour Center) and Jacob Deva Racusin's (New Frameworks) research and bar graph comparing carbon emissions and sequestering potentials of various building methods, based on Inventory of Carbon and Energy database (ICE database), 2017.

Many of these materials have ASTM ratings, tested R-values, vapor-permeance values, structural and fire testing, strategies for air-tight installation and designs, and professionals to manufacture and install them. Plant-based building materials, the ancient choice for human habitation, have been brought up to stringent green building standards and have surpassed petrochemical-based materials such as foam and plastics on multiple fronts: excellent thermal performance and air-tight assemblies; low or no toxicity in production, use, and end of life; vapor permeability and moisture storage capacity (where appropriate); and excellent durability, fire resistance, air-tightness, and beauty. Most importantly to the evolving net positive building landscape, they offer terrific carbon sequestration value, "fixing" carbon into the building for generations.

This strategy of net-positive architecture also illuminates the connection between sustainable agriculture and sustainable silvicultural practices and construction. We in the design and build field who use straw for building stand alongside our siblings working on sustainable agricultural practices to re-build carbon in soils as a major sequestration reservoir (Eric Toensmeier and others). Reforestation and sustainable silvicultural practices are equally necessary for sustainable wood harvesting for construction.

Alongside biochar, reforestation, soil carbon building through sustainable agriculture, and other sequestration strategies, we practitioners of the new net positive architecture can learn to work with awareness and intention in the carbon cycle which is essential to all life on Earth. We can reverse the trajectory of atmospheric CO2 loading, emitted by centuries of burning fossil fuels, by making our buildings from the sky: choosing plant-based products for our building materials and designs.

Ace McArleton is a founding member of New Frameworks, a worker cooperative specializing in low impact, high performance design-build, is based in Vermont, and is a proud member of NESEA (North Eastern Sustainable Energy Association), BEBL (Building Energy Bottom Lines), and NBNE (Natural Builders North East). www.newframeworks.com.

THE FRAMEWORK BUILDING

By George Harvey

Rendering of the Framework Building. Courtesy image: Lever Architecture.

Officials in Portland, Oregon have approved what will be the tallest wooden building in the United States. The Framework building will have eleven stories.

Michael Green, an architect in Vancouver who has been pushing wooden construction for years, explained that part of the reason for using wood instead of steel and concrete is that wood has a much lower carbon footprint. In fact, according to Green, using wood lowers a building's carbon footprint by as much as 75 percent.

Wood also has a number of other advantages over building materials commonly used in the twentieth century. Wood sequesters carbon, where steel and concrete use massive amounts of energy. Wood is nearly as strong. Also, believe it or not, there are advantages to wood in fires; in a fire that chars wood, steel will fail altogether, because it can lose all of its structural integrity.

Another advantage to wood is that engineered lumber can be had just about any size and shape that can be transported.

Do Low Flow Showerheads Save Water?

by Bill Gauley and John Koeller

A low flow showerhead. Image: en.wikibooks.org

Did you know that, on average, people take 0.69 showers per day? Did you know that the average shower lasts 7.8 minutes? Did you know that showering uses a lot of water? Showering currently accounts for almost 20% of all indoor residential water demand!

There is no question that many people want to be environmentally responsible and use our natural resources—including water—more efficiently. But do low-flow showerheads actually save water? Or do lower flow rates simply mean people take longer showers—thus negating any potential water savings?

To answer this question, Bill Gauley and John Koeller analyzed data for more than 50,000 shower events[1] ! Shower volumes were determined by multiplying the flow rate by the duration. The results were very clear (see graph).

People do not significantly compensate for lower flow rates by increasing the length of their shower. For every 0.2 gallon per minute (gpm) decrease in flow rate, shower duration only increased by about five seconds.

Lower flow showerheads do result in a lower overall shower volume. For every 0.2 gpm decrease in flow rate, shower volume decreased by 1.34 gallons.

In fact, it seems that people tend to follow their own routine for showering regardless of the flow rate of the showerhead (at least for those showers between flow rates of 1.0 to 4.0 gpm). For example, if you take an eight-minute shower with a flow rate of 2.5 gpm (the current federal standard), then you are likely to take an eight-minute, 12-second shower with a flow rate of 2.0 gpm (the current U.S. EPA WaterSense® standard). But the total water used during your shower will decline from 20.0 gallons to only about 16.4 gallons!

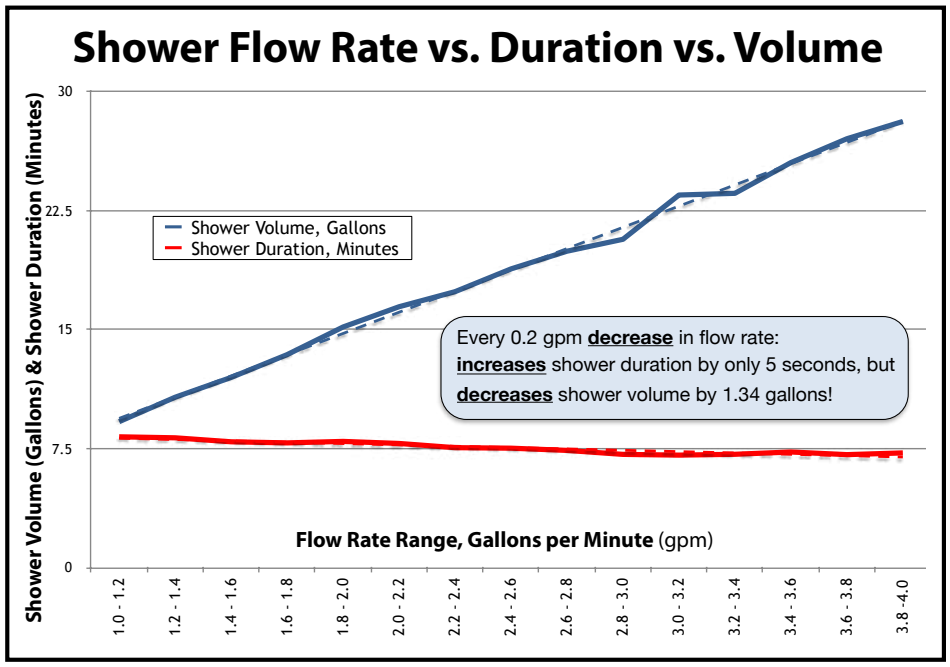
While studies have shown that people tend to prefer higher flow-rate showerheads[2], the results of this analysis clearly show that water savings can be achieved by using lower flow-rate showerheads. As a result, water and energy utilities interested in achieving higher levels of water savings are rebating high-performance, low flow rate showerheads.

The complete report can be at http://bit.ly/low_flow_showerhead.

The authors can be reached for questions at Bill Gauley, P Eng., Principal, Gauley Associates Ltd., bill@gauley.ca and John Koeller, P.E., Principal, Koeller & Company, koeller@earthlink.net.

[1] Data from 1999 and 2016 Residential End Uses of Water Studies (REUS1999 and REUS2016) completed by Aquacraft, Inc. Data provided by Co-Principal Investigator, Peter Mayer, P.E.

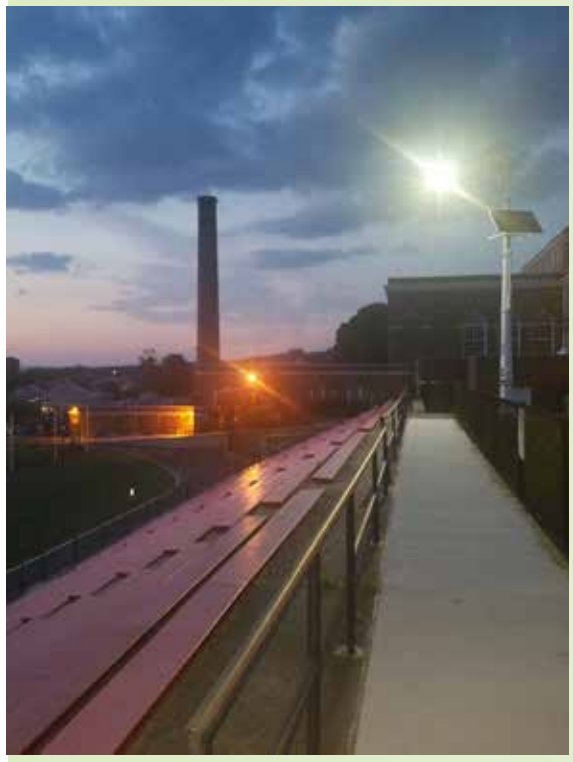
[2] High-Efficiency Showerhead Performance Study, 2009, Gauley, Robinson, Elton. Report can be found at http://bit.ly/showerhead_performance.



This article originally appeared in Home Energy magazine online at www.homeenergy.org on March 20, 2017. It is reprinted with permission.

Public Schools of the Tarrytowns Embrace Renewable and Resilient Energy

By Dan Connor



Nightfall at the Washington Irving school – lighting from renewable off-grid power. Photos: Aris Wind..

The Public Schools of the Tarrytowns, located about 25 miles north of Manhattan, maintain five campus sites to provide education to over 2,700 students.

The school district's sustainable goals include installing rooftop solar photovoltaic systems at two of its campuses. Beyond that, they installed two hybrid wind/solar powered streetlights to provide additional campus lighting that are both renewable and resilient. This lighting solution selected was the Renewable Power Unit (RPU) from Aris Wind of Mt. Vernon, NY.

The RPU contains a solar panel, a small duct augmented wind turbine, a LED light, large battery and a control system, a system that can generate enough energy to provide reliable and renewable lighting, as well as auxiliary power applications such as a self-powered internet connection and USB charging station.

RPU offers a complete lighting solution

Peter Quartironi, Director of Facilities at Tarrytown Schools District, first learned of the RPU and its potential when considering the installation of additional security lighting at its Washington Irving School facility's grounds. He commented: "Children's safety is of utmost importance to us, particularly when they are within the school grounds – a solution to enhance the lighting within the grounds was imperative."

The first RPU unit was installed at the Washington Irving School in December 2015, followed by an RPU installation at the Peabody Field site, an athletic field with no lighting at its entrance or in its park.

The installation of both units was faultless, according to Quartironi. "At our Washington Irving School, the building of a new walkway was already scheduled to take place, so when it came to installing the hybrid power unit, it was easily integrated into the building process of the walkway. At the Peabody Field site, the installation was stand-alone; a hole had to be dug, and the RPU was able to seamlessly drop in and the technology utilized almost immediately. Both installations went smoothly and, importantly, disruption to the school environment was minimal."

Reliable, secure lighting

At Washington Irving School and Peabody Field, the power generated is completely free from any external power source. Quartironi commented, "The RPU solution reduces the school district's reliance on the grid. Should there be a grid blackout, the RPU's will remain lit, increasing safety, security and reliability at all times. The RPU eliminated trenching and pulling electrical wires; an expensive, time-consuming and inconvenient process. With this solution, clean energy is generated to illuminate additional parts of the school grounds, without increasing the school's energy bills or carbon footprint." The RPU can also be specifically adapted to the location in which it is being installed. At a school such as Washington Irving, there is the ability to use the unit's functionality and remote data monitoring capabilities as a teaching tool to provide additional learning for pupils. Quartironi explains: "At our Washington Irving School we have a Science, Technology, Engineering and Math (STEM) program, and the installation of this renewable streetlight is providing valuable energy and lighting data to teach children about the benefits of renewable power."

An additional benefit of the RPU is that it will often generate more than enough energy to provide effective lighting, allowing any excess energy to be utilized. Quartironi commented: "At Peabody Field, excess energy can be used to power our public address system during events. At the Washington Irving site, USB/Ethernet charging ports were added to the unit, allowing the public service of charging mobile phones and laptops."

"A school has many people that it must please; the students, the parents, the teachers, the wider community – and importantly, the installation of the two RPU's have largely gone unnoticed, thanks to its swift installation and its aesthetically pleasing appearance. This is a solution which I would certainly recommend to my facility management peers," added Quartironi.

Aris Wind (www.ariswind.com) is working with their technology partner Airsynergy (www.airsynergy.ie) to utilize the RPU's ability to power internet connected devices, such as security cameras and sensors, to resiliently power tomorrow's "Smart Cities".

Dan Connors is co-founder and Chief Operating Officer at Aris Wind, LLC.

Solar power generation coupled with an advanced wind turbine trickle charge batteries day and night to reliably power lighting and auxiliary power loads.

A NEW SCHOOL FOR STUDENTS WITH DISABILITIES WILL BENEFIT FROM SOLAR ENERGY

Rendering of the Monarch School of New England. Image from DeStefano Architects.

The school with the solar arrays on the roofs, installed by Revision Energy of Brentwood, NH. Photo: Revision Energy.

With the installation of a rooftop solar array this month, a regional high school and vocational center under construction in Rochester has reached another milestone. The Monarch School of New England broke ground on the new school last summer. Monarch currently operates two campuses in Rochester, New Hampshire. The new school will replace a leased Gonic location and is expected to open in the summer of 2017. A gala event and grand opening will be held on September 7, 2017.

The day school serves students with significant physical, medical, developmental, behavioral and emotional disabilities. The new facility will allow the school to enhance its career and technical education for young adults by providing the necessary equipment and space to educate and train students for a wide variety of work options in the agriculture, hospitality, technology and service sectors.

ReVision Energy installed the 47.4-kilowatt solar array. The solar energy company owns the system through a Power Purchase Agreement (PPA), which allows the school to benefit from lower electric costs with no upfront installation cost. The PPA also includes a future option for the school to purchase the array at a significant discount.

The construction of the school is being funded by community support, a generous pool of corporate donors and a loan from the Bank of New Hampshire. An ongoing capital campaign seeks to raise $1.3M. Interested donors may contribute at: monarchschoolne.org.

Jewett Construction serves as the general contractor on the project, which was designed by DeStefano Architects. The 11,860 square foot facility will house a large, multipurpose room, a computer lab, a woodworking shop area, art and music room, a greenhouse, a kitchen for preparing student lunches and numerous classrooms and administrative offices. The exterior will include cementitious siding, an asphalt shingle roof and multiple cupolas. Plans also include a half-court basketball court for students.

The new facility is located at 13 Monarch Way in Rochester, NH.

RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: **http://350vermont.org**
American Council for an Energy-Efficient Economy: Consumer guide to home energy savings - **aceee.org/consumer**
American Solar Energy Society (ASES): www.ases.org
Backwoods Solar: Specialty: solar, off-grid - **www.backwoodssolar.com**
Buildings Energy Data Book: buildingsdatabook.eren.doe.gov
Carbon Tax: carbontax.org
Clean Power Estimator: www.consumerenergycenter.org/renewables/estimator
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: www.dsireusa.com Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.
Efficiency VT: This is a must-go-to site for immeasurable amounts of info. **www.efficiencyVT.com**
Energy Efficiency & R/E Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html
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/tax credits.
Federal Energy Regulatory Commission (FERC): www.ferc.gov
Federal Energy Regulatory Commission(FERC): www.ferc.gov
Find Solar: www.findsolar.com
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-**
Greywater Info: www.oasisdesign.net/greywater
Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - **hes.lbl.gov**
Home Power Magazine: www.homepower.com
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
National Solar Institute: www.nationalsolarinstitute.com
NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.org**
New Hampshire Sustainable Energy Assoc. NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. **www.nhsea.org**
New York Solar Energy Industries Association/NYSEIA www.nyseia.org
NFRC independent rating & labeling system for the windows, doors, skylights **www.nfrc.org**/
NH Office of Energy and Planning: www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.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 Living Source Book: realgoods.com/solar-living-sourcebook
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 Energy Grid: www.pvwatts.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**
Track the Stimulus Money: www.recovery.gov/Pages/home.aspx
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.
Vermont Tar Sands Action: Group working to stop the XL Pipeline and any other developments stemming from the Alberta Tar Sands. To join this group go to: **groups.google.com/group/vt-tar-sands-action**
VPIRG: understand the clean energy resources available to VT - **www.vpirg.org/cleanenergyguide**
VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - **www.veic.org**
Weatherization, Energy Star & Refrigerator Guide: www.waptac.org
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GENERAL MANAGER JOB

The Energy Co-op of Vermont is a full-service fuel dealer that helps its 2,000 members cut fossil fuel use and invest in efficiency and renewables. Our new General Manager will lead this work. RESPONSIBILITIES: Work with the Board of Directors to implement the Co-op's strategic plan; Lead financial management, planning, budgeting and marketing; Oversee the Co-op's management team; Lead the Co-op's business development initiatives in fuel deliveries, HVAC, energy efficiency and renewables. QUALIFICATIONS: Superb leadership and management skills with proven ability to motivate employees to reach common goals; Excellent written and verbal communications skills; At least five years experience in financial management, budgeting and planning; Ability to think strategically. Experience with high-level strategic planning; Knowledge of HVAC, fuel dealer, energy efficiency and renewables businesses, especially in Vermont.
For a full job description and to learn more about the Energy Co-op, visit www.ecvt.net/gm. To apply: Send resume and cover letter to: info@ecvt.net. Application Deadline: June 30, 2017..

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GUIDE TO ADVERTISERS

Ingredient of the Month

SCIENTIFIC METHOD AND GLOBAL WARMING

By Larry Plesent

I have a longtime friend who identifies himself as a scientist. One of his favorite sayings goes like this, "Most people that think science is a body of facts. It's not. Science is in reality a method of inquiry."

And he is absolutely correct.

Generally speaking, scientific method consists first of observation and measurement. This information is then used to formulate a hypothesis or "a good working guess based on the current available data."

The scientific community specializing in that particular field of inquiry then takes pot shots at the hypothesis in an attempt to blow holes in it through observation and experimentation. The hypothesis may then be modified, dropped or generally accepted as an understood fact.

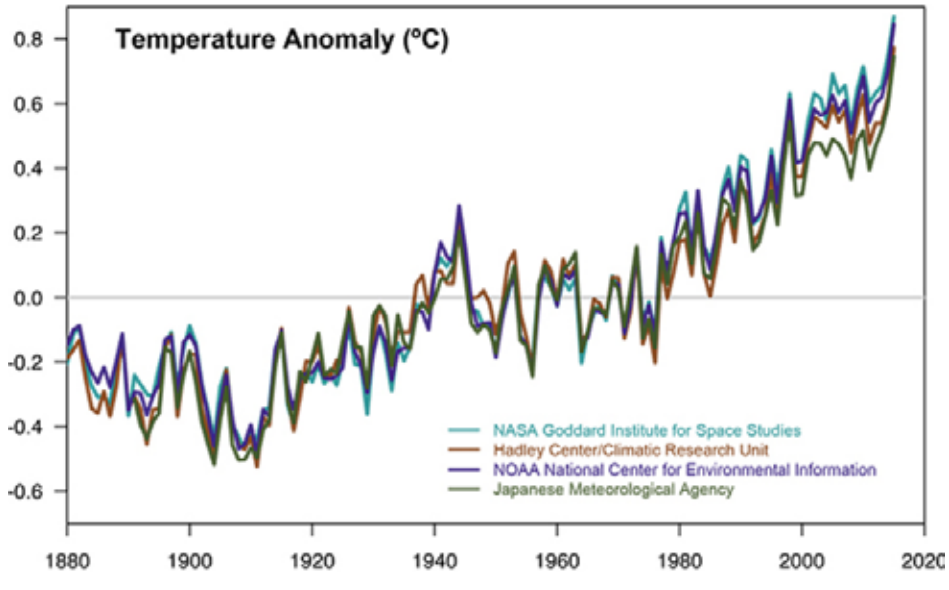
When a hypothesis stands the tests of time and repeated attempts at annihilation, it can become a theory, or an underlying explanation of the principles at work in the universe we live in.

Theories tend to stick around longer than hypotheses, being the basis of general scientific thought at the moment. But theories are often (and some would say will ALWAYS be) modified in the face of new data and new ways of interpreting the existing data.

In other words, our understanding of how the universe works and our place in it is evolutionary, growing and changing through time. Science is not a dusty old book of facts. It is a living process of inquiry, postulation, defense and destruction of ideas as older ways of seeing are replaced by newer understandings. Science is never 100% anything. There will always be skeptics trying to poke holes in the current theories. Fantastic! That is their job! This is what moves the big ball of understanding down the playing field of knowledge.

And that in fact is the job and fate of all thinking people; to move the big ball of understanding down the playing field of Life a couple of yards; where it will be picked up by the next generation whose turn it is to carry the ball farther.

The news media, like politicians, like to quote scientists in defense of their positions. This is a pretty good strategy, but as Heraclitus said circa 500BC, "All is in flux. Nothing is still." All that we have is our best guess based on current data and generally accepted interpretations of that data. And that's what we have. Those who insist on absolute certainty might better enjoy religion than the process of incremental understanding that we call science.



Temperature data from four international science institutions. All show rapid warming in the past few decades and that the last decade has been the warmest on record. Data sources: NASA's Goddard Institute for Space Studies, NOAA National Climatic Data Center, Met Office Hadley Centre/Climatic Research Unit and the Japanese Meteorological Agency.

All of this is of course leading up to a very brief discussion on global climate changes (aka global warming). Yes, there are indeed a handful of scientists and academics disputing this hypothesis. Thank goodness! That is scientific method in action.

However, and this is a big however; holding up meaningful action to remedy the global implications of the current climate change hypothesis until 100% of the experts agree is potentially civilization suicide. When approximately 97% the experts and hundreds of studies agree on something this important, even politicians have to take notice and begin the implementation of meaningful countermeasures. Right? Right? Hello…

This is the soapman and that's the way I see it from here in the valleys and hollows of central Vermont.

Troubled Waters for Lobsters

By George Harvey

With climate change, New England's ocean waters have been warming. Temperatures have been going up in the Gulf of Maine, off Maine, Massachusetts, and New Hampshire, about as fast as anywhere on Earth, and Long Island Sound is only slightly better. Climate change is beginning to take a toll on area fishing.

Recently, lobster fishing has been good in Maine, with record hauls, and that is partly because of the warming waters, which generally favor the adult animals. Warmer waters can lead to shell rot and other problems, but they are still generally good for big lobsters.

When things get just a bit too warm, however, things get much worse. Lobster fishing in Long Island Sound, which is just a little warmer than the Gulf of Maine, has fallen off so sharply that new regulations are being considered to limit catches.

Now, the problem is being seen in the northern New England waters. As adult populations of lobsters appear to be high, the juvenile populations appear to have crashed – and scientists are very puzzled about what is happening.

The problem might be that with warmer water, the juvenile lobster populations moved into places where scientists do not know to look for them. On the other hand, many fish, especially species that prefer warmer water, like eating the tiny lobsters, and the decline might be tied to a rise in populations of such fish.

If the juvenile population really has fallen, then the fisheries will not hold out for long. What is happening in Long Island Sound will probably also happen in Maine.

For those who really love a shore vacation dining on seafood, a crash in the lobster population could hardly come worse time. Many fishery species have already seen steep population declines that may be related to climate change. The species hit by the declines include cod, haddock, plaice, pollock, and redfish.

We can hold out hope. A friend returned from a long vacation in Thailand and told me they have one thing that is always delicious everywhere in the country, which could always be bought at a modest price, can be grown anywhere, and tastes a lot like shrimp. It is is fried crickets. Yum!For those who really love a shore vacation dining on seafood, a crash in the lobster population could hardly come at a worse time. Many fishery species have already d of mine returned from a long stay in Thailand and told me they have one thing that is always delicious everywhere in that country, which could always be bought at a modest price, and tastes very like shrimp. It is is fried crickets. Yum!

Research on Bovine Flatulence

Findings Are Promising to Reduce Methane Activity and Help Save the Planet

By George Harvey

Conventional wisdom on beef and dairy products is that they are responsible for a large part of our greenhouse gas emissions. The issue of how to deal with that is not without its controversies, and there is still a lot of work to be done on understanding the highly complex science involved. One thing that scientists agree on, however, is that cows belch up a lot of methane, typically 70 to 120 kilograms, 164 to 264 pounds, per year, each.

Please pardon little math. Methane is about 25 times as powerful as carbon dioxide in its greenhouse gas effects, so 264 pounds of methane is the equivalent of 6,600 pounds of CO2. That is the amount produced by burning 300 gallons of gasoline. So the annual production of greenhouse gas emissions from one heavily productive cow can be compared to driving 15,000 miles in a Prius that gets about 50 miles per gallon.

The problem is of methane emissions common to all ruminants, including cattle, goats, sheep, deer, and others. These animals have stomachs that are divided into four chambers. In the first of these chambers, microbes break down the cellulose in plants, which are otherwise largely indigestable, producing by-products that the animals can digest and use for food. The problem is that one important by-product has no use to the cow, and it is methane.

Recently, NBC released a video, "Cow farts and climate change" (http://bit.ly/bovine-gas). It tells the story of research done on the diets given to cows and how much methane is released. One statement in the video really caught our attention. It was, "Even small amounts of dried seaweed, introduced into a cow's diet, can cut methane gas by as much as 99%."

Cattle near Wantastiquet Mountain in southwestern New Hampshire (Redjar, Wikimedia Commons)

We called Dr. André Brito, Associate Professor of Dairy Cattle Nutrition and Management, at the University of New Hampshire, who had been interviewed for the video. He made it clear that, while the video was factual, it did not tell the whole story.

> An NBC video reported that "Even small amounts of dried seaweed, introduced into a cow's diet, can cut methane gas by as much as 99%."

Dried seaweed is commonly added to the diets of cattle for reasons that have nothing to do with methane emissions. The seaweed is beneficial to the health of the cattle. One survey Dr. Brito talked about had responses from about 30% of the 1000 farmers surveyed. Of these, upwards of half provided seaweed to the cattle.

Results from experiments looking at the effects of seaweed on methane emissions varied widely. One experiment done in New Hampshire, using the locally available algae fed to cattle, looked at the amount of methane produced, and did not find any reduction. A second experiment did find a small but significant reduction in the activity of methane-generating microbes.

Another study, done in Australia with a different species of algae, produced very different results. It used a species of red algae called Asparagopsis taxiformis for in vitro experiments to determine the effects of varying percentages in the feed on the amounts of methane emitted. It is from this study that the video got its information that a small amount of dried seaweed could cut methane production by 99%. We need to emphasize that this work was done in vitro, meaning "in glass" (e.g., in a test tube), and not in an actual cow.

We might note parenthetically that Asparagopsis taxiformis is a commonly-available seaweed in tropical areas and is used as part of a human diet. In fact, it is used as a condiment in Hawaiian cuisine, known as "limu kohu," which is Hawaiian for "pleasing seaweed."

The highly variable results of experiments can be attributed in part to the fact that research on how diet affects the methane production of cattle is just in its beginning stages. Clearly, it is possible that different species of algae will have very different effects on the amounts of methane produced. Just how effective mitigations can be, what species to use, what amounts to use are only parts of a larger puzzle whose answers are yet to come.

We do not have the final answers, and we can only leave finding them to science. We hope that science will produce valuable results.

Rotating More Crops Creates Sustainability for Large Farming Operations

By George Harvey

The Union of Concerned Scientists has released a report on crop rotation, "Rotating Crops, Turning Profits" (UCS report). It is available as a pdf file at http://bit.ly/UCS-crop-rotation. It has a lot to say about the agricultural and environmental advantages of crop rotation methods not currently in widespread use. Specifically, it looks at growing non-GMO crops in 25 counties in Iowa.

Bee visiting an alfalfa flower (Ivar Leidus, Wikimedia Commons)

Agricultural production in the Midwest is dominated by corn and soybeans. Together, they account for 70% of all crops. They are grown in a two-year rotation, in which land is devoted to each in alternating years. One result is that they get about the same amount of land from one year to the next.

There are a lot of problems with this approach to farming. One is that outside the growing season, which is only about five months per year, the land is bare. That fact, combined with the plowing that is done each year, creates erosion problems. Demands placed by corn on the soil are only partly met by nitrogen fixed by the soybeans, so the land is heavily fertilized, usually with chemicals. Pesticides are used to control weeds, insects, and fungi.

For seven months each year, the land is basically a desert, and during the other five months it is a desert that has been mono-cropped with corn or soybeans. With erosion and exposure of the land, the nitrogen compounds in the fertilizer escape into the air and water, as do the toxic pest controls. The problems arising from this had economic implications going into well over $100 million.

The UCS report gives results of studies into alternative systems of growing crops, comparing them with the standard two-year rotation. One of these is a three-year rotation, of corn, soybeans, and a crop combining clover with a small grain such as oats. The other is a rotation of corn, soybeans, alfalfa combined with a small grain combined, and then alfalfa alone. In both longer rotation systems, the second crop combined with small grain was plowed under to form "green manure."

The results of the studies were impressive. The farm profits of both new rotation systems were slightly higher than those of the current two-year system. Herbicide use is reduced by 25% to 50% under the new systems, and this led to reductions of 81% to 96% in those toxins in runoff water. Synthetic fertilizers were reduced even more, by 88% to 92%, with organic fertilizer use also reduced, by 43% to 57%. The no-till system used instead of plowing produced a 91% reduction in soil erosion.

All of these improvements produce economic benefits to the farmers. They also produce economic benefits to the communities in nearby areas, especially those that are downstream from the farms, which have reduced problems with pollution.

Not all land can be advantageously farmed by the specific methods used in the study. The scientists doing the study indicated that about 20% to 40% of the farmland in Iowa could benefit from the changes. Other places can also benefit, however, as the identical practice can be used to a greater or lesser degree in all of the states of the Midwest, and similar systems can be used elsewhere.

One of the most important aspects of this, however, is not included in the UCS report. It is the overarching question of how soil can be used and treated more thoughtfully. It happens that a discussion draft of a different, broader report, "re-Think Soil: a Roadmap for U. S. Soil Health," was released late last year by The Nature Conservancy. That report is available as a pdf file at http://bit.ly/TNC-rethink-soil.

Taken together, the broader message of these two reports is clear. It applies not only to Iowa or the Midwest, but to all farmland. We need to treat all soil with respect and understanding for our own sakes. The central issue is clearly stated in the executive summary of "reThink Soil". It says, "Healthy soil is the cornerstone of life on earth."

Elmore Roots' Permaculture Know-How

USING PERMACULTURE PLANTS TO REPEL INSECTS IN THE YARD AND GARDEN

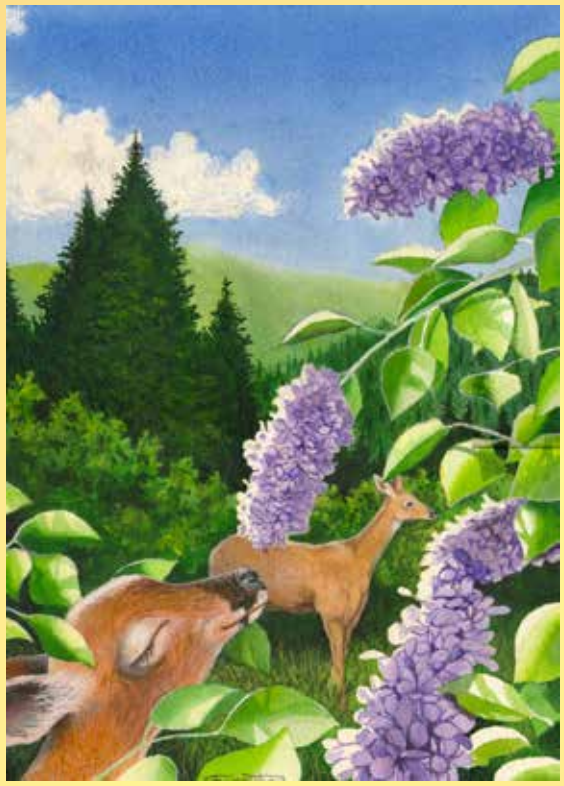
By David Fried

Sometimes what a cat likes, an insect hates.

Throughout time, people who have time outdoors have known what to plant to keep insects from biting them constantly. We seem to have forgotten some of these plants and their usefulness and ease of growing.

Many of our ancestors lived where rosemary can be grown year round. Rosemary is good at repelling fleas and ticks from the area it is planted in. As a cat or dog or person rubs against a rosemary bush, the oils from the plant rub off on their coats or on our clothes. This may have been the original bug repellant. For us in the north, we can bring a rosemary plant indoors in the winter and back out in the summer. If we rub against it on our way to the garden, we will be using our ancient wisdom, remembering what worked for those who came before us.

Catnip has been found by an Iowa State University study to be ten times more effective than deet. The essential oil contains nepetalactone and most insects cannot stand this. It is easy to grow, but you will want to plant it where you do not mind it spreading. Rub it between your fingers and hope there are no catamounts lurking. You can plant some along a cedar chip path to define your walkway and keep grass down, thus both repelling insects like ticks and mosquitos from the cedar mulch's qualities and confining the catnips' nature to spread where it is most useful.



Growing food without poisons. Painting by Gabriel Tempesta www.gabrieltempesta.com

Lemonbalm reminds me of citronella candles, and it also reminds bugs of them. Plant it where you do not mind it spreading or grow it in pots. Another advantage over the candles is that there is no smoke fumes. Mosquitos do not like to be around this plant and it is not a tick's favorite, either. Ticks prefer hanging out in the tall grasses where there is no lemonbalm, catnip or rosemary around. So it is a good idea to keep the grasses mowed low, at least in the pathways where you are walking to and fro.

Some people will burn a little sage and rosemary as the smoke is unpleasant to most insects. Thyme also discourages insects so planting a creeping thyme walkway is a good idea. Eating parsley can help us be healthy and along with eating garlic helps our sweat to be unattractive to mosquitos and other biters. The original line of Simon and Garfunkel's song was "parsley, sage, rosemary and thyme and garlic," but the record company thought it would sell better if they dropped one of the plants, and the rest is history.

It could be a good idea to repel deer from your living and gardening area, which also can help to keep the tick population down. Some plant sage, yarrow, oregano, lemonblam, and blackeyed susan as a border perimeter that some deer seem to not like browsing though. We have used laboratory-strength "garlic clips" attached to plants or bamboo stakes near plants to keep deer off of them. Reportedly, deer are forty times more sensitive than humans to smell, and most of them do not like the smell of garlic.

Catnip has been found by an Iowa State University study to be ten times more effective than deet.

Other plants have been used to keep insects at bay. Chives, dill, fennel, rue, pennyroyal, basil, marigolds, bee balm, scented geraniums, lavender, wormwood and tansy have been planted all over but obviously not enough. There are still a few annoying insect types lurking in the high grass. I recommend planting a few of these pest repelling plants along your walkways this summer and also near your home and along your garden borders. Hopefully the only scratching you will still be doing is of your head, in wonder, as you are saying, "Wow, this really helped!".

David Fried is the propagator, grower and writer at Elmore Roots Fruit Tree and Berry Nursery in Elmore, Vermont. He grows hundreds of useful plants at the nursery.

GMP and Tesla Batteries Lease one for $15 per month

Cont'd from p.9

two hours, but the battery will provide much more than that. We would advise anyone with a battery to try to find out how long any outage they may experience is expected to last, so they can ration their load appropriately, if that would be necessary.

The Tesla Powerwall 2 batteries can be set up to use on-site solar panels, in which case they offer the customer the additional advantage of having a certain amount of power even during very long grid outages. Solar power is not a necessary part of the system, but one way or the other, a grid connection is needed. This is so GMP can also use the batteries; without that ability, they have no economic reason to make such an offer.

Under the terms of the lease, GMP is allowed to draw from the battery during high demand times. This does not change the rate-payers bill directly, but indirectly it helps all of us. Having 2,000 Powerwall 2 batteries available will be the equivalent of taking 7,000 households off the grid during high demand times, and this can change the wholesale price of power significantly. Prices for wholesale power can spike to 60¢/kWh or higher in Vermont, but GMP has to sell it at the standard rate regardless of what they are paying, at times losing substantial amounts of money. Being able to reduce the peak demand prices for power creates a much more stable market, in which GMP can take fewer risks and spend less money on power while customers pay lower prices.

The Powerwall 2 batteries are expected to last for ten years, during which time they are under warranty. At the end of their lifetime, Tesla will take them back to recycle the materials in them. Green Mountain Power spokeswoman Kristin Carlson told us, however, that if they are still functioning well, there is no requirement that they be recycled at the end of the lease. In that case, the customer can still use them without paying the $15 per month rent until they are no longer useful. There is no option to buy at the end of the lease, because there is no advantage to the customer to do so.

Customer interest in the program is very high, and it is altogether possible that the batteries will all be spoken for when Green Energy Times goes to press. Customers are advised to sign up for the batteries anyway, because there will almost certainly be some who decide to opt out, and the batteries will go to whoever is next in line, on a first-come first-served basis.

For more information, please visit http://bit.ly/GMP-Tesla-offer.

New Hampshire Permaculture Day

By Marty Castriotta

Permaculture, at its core, is about the potential and techniques needed for humans to design their own environments with nature in mind. Using nature's own principles, permaculture offers the possibility to create food (and other production) systems that become virtually self-maintaining over time. But don't be fooled; these systems are not new. In fact, they are the very systems that maintained human life on this planet for millennia. The challenge (and great potential) now is to integrate indigenous methods and wisdom with newer techniques, technology and understanding to address issues concerning the modern world.

Permaculture is also about decolonizing our food production system now. Shifting the emphasis of land use from one of consumption to one of production puts the ownership of food, and in fact nutrition and health, back in the hands of everyone who can dig in the soil. This, and a regenerative approach to production, grows a fertile environment for a healthy and abundant future.

Seasoned practitioners and permaculture newcomers can learn more at the 2017 NH Permaculture Day which takes place at the Mt. Kearsarge Indian Museum in Warner, NH on Saturday, August 26th. Participants will learn about regeneration: of land, economy, community and culture. Workshop topics will include food production, edible landscape design, climate change, renewable energy, natural building, homesteading and beyond. Demonstrations, talks, and walks will also be part of this day. The theme of this year's event is "Connecting the Circle," specifically with the First Nation cultures who championed techniques of sustained, productive and climate resilient food production.

The NH Permaculture Day is an initiative of the NH Permaculture Guild. The first event took place in 2012. Early intentions of this event centered on sharing permaculture strategies and possibilities, networking with regional practitioners and sharing knowledge and practices.

For more information go to http://www.nhpermaculturday.org.

Marty Castriotta is a farmer and educator. He and his wife, Ellen run Village Roots Permaculture and CSA on the Orchard Hill Community in Alstead, NH, host of the 2016 NH Permaculture Day.

Lego Group Reaches 100% Renewable Energy Goal Ahead of Schedule

Green Energy Times staff article

A closeup of the Nacelle where you can see the lego pieces. Inset: The largest wind turbine ever built of LEGOs, and the technicians who built it. Images courtesy of LEGO.

On May 18 and 19, we learned that the Burbo Bank Extension Offshore Wind Farm, off the coast of England near Liverpool, had been completed and grid-tied. This is historic for two reasons.

It is the first use of the Vestas V164 8.0 megawatt wind turbines. These turbines are the largest ever installed for commercial use. They are 720 feet tall, and the rotor diameter is 538 feet. A prototype set a record when it ran for a complete day at full power, producing 192 megawatt hours of electricity.

The other historic event associated with Burbo Bank Extension results from the fact that it is 25% owned by Lego, the Danish toy company. With its opening, Lego is 100% powered by renewable sources, according to the company. By doing this, Lego has met an environmental goal of getting all of its electricity from renewable sources. That goal, which was announced in June of 2014, was reached three years ahead of schedule.

Lego has not stopped adding renewable resources, now that its goal has been met. On November 28, 2016, we learned that Lego's new huge factory in China, where 1200 people work, is to be powered entirely by solar power. Even having met its 100% renewable goal, however, it is still putting up solar arrays in China.

Lego is also still pursuing some environmental goals that are not directly related to energy. Since June of 2014, the company has been researching sustainable and environmentally sound replacements for the plastics it has used in its toys.