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Are You Scared Yet?

By George Harvey

Are you ready to watch the scariest movie plot ever produced play out? This one is especially scary because it is in full 3-D, accompanied by surround sound and real sensations ranging from the smells to the physical pains. It promises to give you a direct understanding of a wide variety of real, physical problems ranging from the fatigue of chronically wilting heat to disabling hunger and disease. But perhaps the scariest part of the show is that it will go on – whether you are prepared for it or not.

The good news is that we can, if we are

The Scream (1893, Edvard Munch).

lucky and act fast enough, prevent the worst scenes from the show from being acted out. The bad news is that we are not coming even close to doing that. In fact, we, as a society, are acting almost as though we want to see how bad it can get. We are acting as though we want to see "Mad Max" turn to reality.

This is the vision of the future in an article by David Wallace-Wells, "The Uninhabitable Earth" (UE) published in New York magazine (http://bit.ly/Uninhabitable-Earth). With that article came quite a lot of debate.

Certainly, some climate scientists reacted negatively to it, saying it was merely hyperbolic. The Australian website news.co.au had a post (http://bit.ly/uninhabitable-backlash) that said, "Mr Wallace-Wells' piece has been heavily criticized. But not by the climate skeptics – it's climate scientists who are up in arms, claiming it is 'irresponsible' and 'alarmist.'" Nevertheless, the same article went on to quote one scientist who said, "It's absolutely true these things could happen. … It's alarming but not alarmist."

There is a scientific view that agrees with UE, how-

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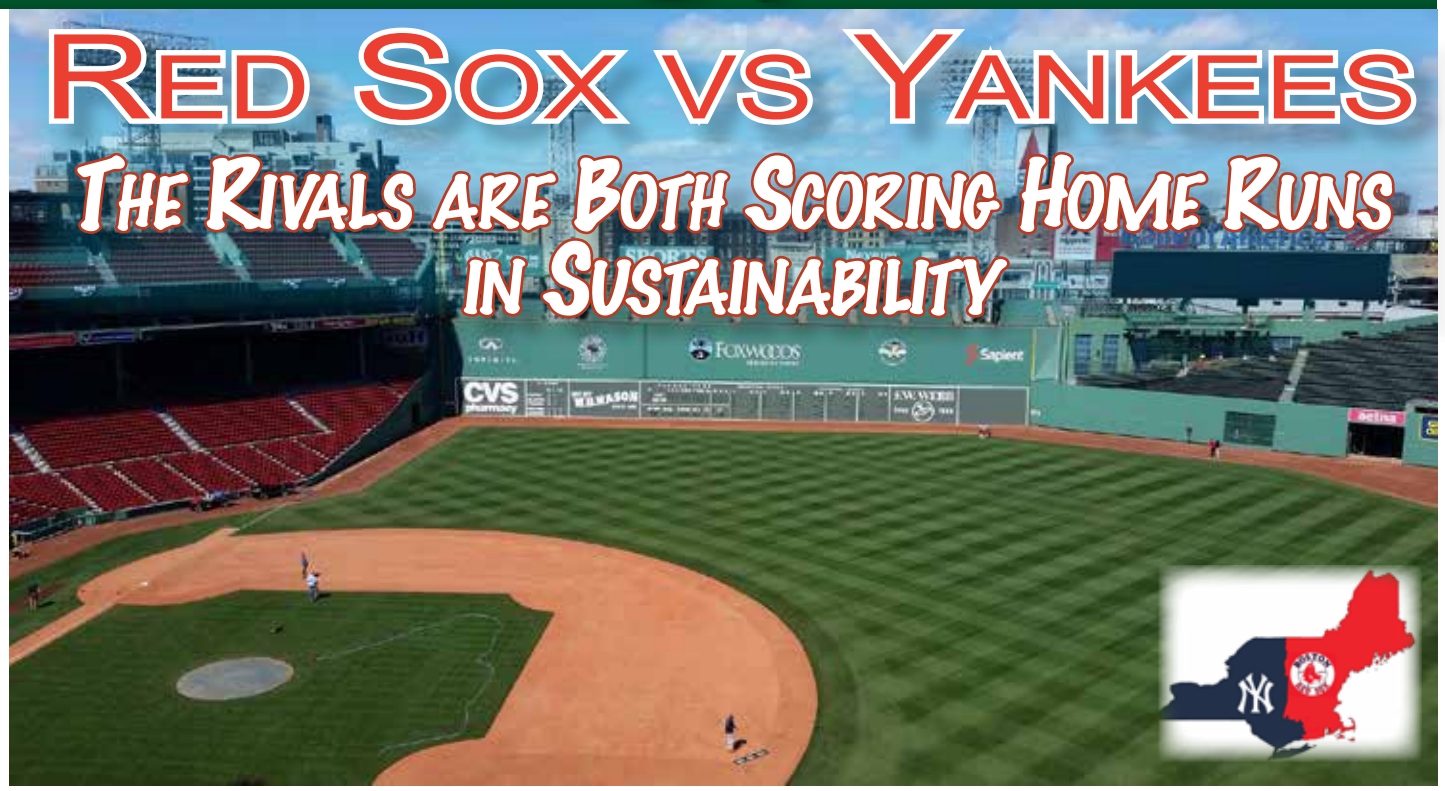
Red Sox vs Yankees

The Rivals are Both Scoring Home Runs in Sustainability



The famous "Green Monster" at Fenway Park in Boston, Pixabay.com user. Map: Ben Blatt/Harvard Sports Analysis Collective

By Chris Gillespie

Whether you're wearing Red Sox red or Yankees navy blue, if you're attending one of these teams' home games, you're really rooting for the green team. Both the historic Fenway Park in Boston and the recently-built Yankee Stadium in the Bronx have pretty great batting averages when it comes to sustainability.

FENWAY PARK

Red Sox fans might be surprised to learn that the Green Monster is not the only part of Fenway Park's iconic skyline that is green.

In 2008, the Red Sox installed twenty-eight solar hot water panels on the roof behind Fenway's home plate, becoming the first team in the history of Major League Baseball (MLB) to do so. According to the Red Sox's website, the panels help heat water used throughout the ballpark and replace 37% of the gas traditionally used in the process. Annually, the solar panels reduce Fenway Park's carbon emissions by 18 tons, which is the annual carbon sequestration of 15 acres of U.S. forests.

A nearby rooftop on Fenway's third base side is home to "Fenway Farms," a 5,000 square foot garden that grows herbs and vegetables to be used in the ballpark's various food offerings. A black rubber membrane roof until its "green-ification" in 2015, Fenway Farms can now yield roughly 4,000 pounds of produce a year. In addition to utilizing Fenway Farms' local produce, the kitchens in Fenway send excess food waste to local

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Plus: Super Bowl LII Goes Green! >>

Vermont Bans Food Waste From Landfills

Bulldozer at Coventry landfill. Photo: Jonny Finity.

By Clare Innes

Why does Vermont care what you do with your food scraps?

It all started about a jillion years ago, when cave-dwelling humans needed somewhere to dump their leftovers. They tossed their banana peels into a hole in the ground and called it "Landfill 1.0." Of course, whatever they tossed into it came directly from nature, so it broke down quickly. Plus, there was a lot of land zoned as "away," thus available for siting their refuse caches.

Flash forward to today. Entire civilizations, industries, and products for survival and flattery have come and gone, each iteration increasingly complex and synthetic. We've walked on the moon. We can hold most knowledge in the palm of our hands. We can harness laser beams to send cats flying about the room. One thing that never changed was our habit of digging holes in the ground to house our leftovers.

In the latter half of the 20th century, we realized our holes full of trash were polluting our waters and poisoning our land. So we passed legislation requiring that our trash holes be lined with plastic and regulated. Enter "Landfill 2.0." (Still essentially a hole in the ground.)

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GREEN ENERGY TIMES (G.E.T.)

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Our mission is to create Energy Awareness, Understanding and Independence - Socially Responsible Living.

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Letter to the editor:

Dear Nancy,

I'm a great fan of GREEN ENERGY TIMES. It all started when I discovered the availability of cold climate heat pumps from an article in G.E.T. This was the second winter after Hurricane Irene destroyed my oil heat system. Being determined not to install another fossil fuel system, I was burning cord wood and tripping over electric space heaters at the time. I've been telling everybody about heat pumps and G.E.T. ever since.

I'm writing today because I followed up on your review of CLIMATE OF HOPE, and I just finished reading it. What an eye-opener. Until now, I had been resigned to the sixth great extinction, believing our time was almost up. I had thought the main local issues were getting more electric cars on the road and stopping the Addison County Pipeline.

Now I see the bigger picture. All the interconnected issues that can be addressed to mitigate climate change, both by reducing greenhouse gases in the atmosphere and by increasing resiliency to the climate change that occurs. The result can be a healthier and more prosperous society.

Right here we can plant trees, keep food waste out of our landfills, use regenerative agriculture, restore watersheds, pay attention when net metering and wind farm regulations are revised in Montpelier.

So much food for thought . . . .

How governments subsidize the fossil fuel industry and ruinous agricultural practices – and how the highly publicized subsidies for renewable energy are so small in comparison.

The advantages of letting cities have more autonomy. Perhaps this is the basic reason that government is so unworkable. The boundaries of states and countries are arbitrary and artificial in comparison to a city, which is more of an "organic" entity.

How cost-effective and important it is to restore mangroves, the huge benefit if cleaner cooking methods were found for the developing world, the need to remove dams and levees for the health of river deltas and the cities on them, regulations and policies that need to be developed and enforced so that the projects that will stabilize the climate can be financed.

It was a comprehensive overview, and the authors make it sound do-able. I'm feeling a lot better. Thanks again, G.E.T.

-- Kathleen Daye of Waterbury, VT July 26, 2017

Late Breaking News You May Have Missed

By George Harvey

Much of the recent news arises out of the fact that President Donald Trump has been dismantling federal programs to protect the environment or stop climate change, but many other things have happened. Dates below are those at which links to the articles were posted on www.geoharvey.com.

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

June 30 – Grid-scale power storage costs are falling rapidly, according to an article in RenewEconomy.

July 1 – An article in Grist said the owners of Keystone XL are having a hard time finding customers who want to put oil through it.

July 2 – After spending $7.5 billion trying to prove coal could be used for clean power, Southern Company gave up, according to an article in CleanTechnica.

July 7 – The world's largest lithium-ion battery will be installed by Tesla in Queensland, Australia, according the the BBC.

July 13 – CNN published a list of cities in the United States that will probably not make it through the next 20, 50, or 80 years because of climate change.

July 18 – A CleanTechnica article said Green Mountain Power is providing a $10,000 rebate to its customers who buy electric cars.

July 21 – An article in Valley News said Vermont Governor Phil Scott reaffirmed Vermont's climate goals.

July 27 – Royal Dutch Shell is preparing for permanently low oil prices. The article appeared at Telegraph.co.uk.

July 30 – The Financial Times had a story saying the V. C. Summer nuclear project in Georgia had been canceled.

August 6 – An article in CleanTechnica said that a flash drought, partly due to climate change, has ruined half the wheat crop in the United States.

August 7 – An article in Gears of Biz told us that the United States wind industry added 50,000 jobs last year, a number than happens to equal the number of coal miners working in the country.

August 10 – Wildfires have been burning out of control on Greenland. The article appeared in CleanTechnica.

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VERMONT'S OPPORTUNITY TO ACT ON CLIMATE

New Climate Action Commission Creates Potential Venue for Real Progress

By Johanna Miller

Vermont state house. Photo: Amber Collett

In June, the Trump administration abdicated their responsibility to act on climate change when they withdrew the United States from the Paris Agreement. That left the U.S. in isolation from every other nation in the world who has committed to dramatically reducing greenhouse gas emissions, with the exception of war-torn Syria and Nicaragua, a clean-energy innovating nation which doesn't think the agreement goes far enough.

It's a stark and sobering picture. It puts an increasingly costly burden on young people and future generations. It also leaves the greatest job-creating, economic development opportunity this world has ever seen in the hands of global innovators who understand that the future – and financial prosperity for all – is in the clean energy sector.

The reality is that action on climate now lies squarely with the states.

Thankfully, on the heels of President Trump's shortsighted withdrawal from the Paris Agreement, there have been a several state-based efforts taking root.

In Vermont, Burlington Mayor Miro Weinberger brought together mayors from across the state, the Governor, the Lake Champlain Chamber of Commerce, the Vermont League of Cities and Towns and many others partners to cement Vermont's commitment to meeting not just the Paris Agreement, but our own statutory greenhouse gas reduction and Comprehensive Energy Plan goals. That effort – the Vermont Climate Pledge Coalition – intends to motivate as many Vermonters as possible to do their part in reducing the state's greenhouse gas emissions.

The Climate Pledge Coalition effort will also dovetail well with another new initiative: the Vermont Climate Action Commission (VCAC). In July, Governor Phil Scott, through Executive Order, established a 21-member commission and charged this diverse body with developing strategies the state can implement to meet Vermont's greenhouse gas emissions reduction, renewable energy, and economic development goals. He gave the Commission both a short- and longer-term charge. Short term, he asked for three specific strategies to consider by December 31, 2017 with the hope of making meaningful progress in the 2018 legislative session. Longer term, he charged the Commission with drafting and making recommendations in an action plan aimed at achieving the state's clean energy, climate, and economic development goals.

On August 15, 2017, the VCAC held its first meeting. VCAC co-chair, Agency of Natural Resources Deputy Secretary Peter Walke, made clear to the new Commissioners the importance of their work. Addressing the pressing challenge of climate change can, and should be, one of the greatest economic development opportunities Vermont has ever seen. In reducing our green house gas pollution, we can invest in the future of Vermont and, if done well, provide a pathway of opportunity for all Vermonters.

While the creation of this Commission is a hopeful first step, it must result in real action to cut emissions. Despite everything Vermont has done in the clean energy arena – which has helped keep our electric rates the second lowest in New England and spur our now fastest-growing job sector – we are still way off track in meeting our emissions-reduction goals.

At the VCAC's first meeting, Agency of Natural Resources Air Quality and Climate Division Planning Section Chief, Jeff Merrill, overviewed the state's latest carbon inventory report. The takeaway: Vermont's CO2 emissions are up four percent above 1990 levels (instead of down 25 percent by 2012, per our state's statutory goal). We're not moving forward. We are moving backward.

To make needed progress and to actually achieve dramatic greenhouse gas emissions reductions, substantive strategies, policies, and approaches will be required. That means all decisions must be premised upon the scientific consensus of human-induced climate change. It means identifying and supporting solutions commensurate with the challenge we face, including pricing carbon pollution. It means thinking and acting comprehensively across all sectors – heating, transportation and electricity.

It also means getting down to brass tacks; identifying a diverse portfolio of policy and programmatic solutions, putting real political muscle into advancing those solutions and ensuring all Vermonters can and do participate in this needed energy transformation.

Making progress won't be easy – but it is imperative to ensure the economic opportunity for all Vermonters today and in the future. Here's how you can help.

Show up at one of the public scoping sessions this fall to inform the Vermont Climate Action Commission's work or attend one of its meetings. Find out more about the Commission and find a public meeting near you at: http://anr.vermont.gov/vermont-climate-action-commission.

Let the Governor know where you stand. Call or email him and let him know you hope he will support the substantive solutions required to make real progress for Vermont, including policies like carbon pricing. Contact Governor Scott at: http://governor.vermont.gov/contact.

Show up and speak up at some important upcoming events on climate action (see the accompanying sidebar).

Meet with and ask your legislators and local officials to lead on the solutions necessary to turn this challenge into opportunity.

Johanna Miller is the Energy and Climate Program Director at the Vermont Natural Resources Council, as well as one of the members of the Vermont Climate Action Commission. Reach her at jmiller@vnrc.org or www.vnrc.org.

Events Focus on Climate Action's Economic Opportunity

While the new creation of the Vermont Climate Action Commission is an important step, it's not charting new territory. There has been needed, growing momentum for this type of challenge-to-opportunity response. Here are a few specific opportunities for you to learn more about and get engaged in two of those important efforts, including:

VCRD's "Catalysts of the Climate Economy" Summit – September 6 to 8 in Burlington

In 2015, the independent Vermont Council on Rural Development (VCRD) convened a diverse Climate Change Economy Council. Their work culminated in calls for substantive state action on climate change, including establishing comprehensive energy efficiency programs and approaches across the heating and transportation sectors, clean energy finance innovation and pricing carbon pollution. Find out more and register today at: www.ccecon17.com/

Everyone's Economic Opportunity in Climate Action – Panels and Conversations

Across Vermont this late summer and fall, Vermont Businesses for Social Responsibility and the Vermont Natural Resources Council, both active members of the Energy Independent Vermont coalition, are convening panel discussions and audience-engaged conversations about how Vermont can take real action on climate change – and benefit from it. Each event will highlight the current state of climate (in)action in Vermont, focus the conversation and recommended actions on the job-creating, beneficial opportunities for everyone in reducing greenhouse gas emissions and transitioning off fossil fuels. Attendees will have an opportunity to ask questions, offer ideas and find meaningful ways to engage.

The events are free and open to the public. Light refreshments will be provided. Find more information at http://bit.ly/EEOCA17. But, plan to attend one of the following events from 6:00 p.m.–8:00 pm:

- Norwich: Thursday, August 24th, Porter Community Room at Montshire Museum
- Brattleboro: Tuesday, September 12th, 118 Elliot
- Burlington: Monday, October 16th, Main Street Landing (Film House)
- Manchester: Thursday, October 19th, Northshire Bookstore
- Middlebury: Monday, October 30th, Danforth Pewter
- Barre: Date and location TBD; stay tuned!

Find far more details about these and other climate-action events at www.actonclimatevt.org.

Are We Choosing Doom?

By George Harvey

Climate change could be bad, but probably not be this bad. Photo credit www.progressive-charlestown.com

Dr. Joe J. Romm is one of our most important writers on climate change. The New York Times called him "one of the country's most influential writers on climate change," and he has been named one of Time Magazine's "Heroes of the Environment." He is a prolific writer, publishing very often at the climate blog, Climate Progress, which is part of the Think Progress website, thinkprogress.org.

In July, Romm posted an article titled, "We Aren't Doomed by Climate Change. Right Now We Are Choosing to Be Doomed." It was a response to the debate stirred by an article that appeared in New York Magazine, "The Uninhabitable Earth" (UE) by David Wallace-Wells. It is the same debate that we covered in our front page article, "Are You Scared Yet?"

Romm's post sees the debate from a somewhat different point of view than our article. We would like to publish it in its entirety, but it is so long that we did not have nearly enough room. Nevertheless, we want our readers, even those who do not read it online, to understand what it says.

New York Magazine's UE paints a very bleak picture of what the world could turn into with climate change. It is not easy reading, and the responses to it varied greatly. Romm wrote on it partly because it quoted him, and partly because he wanted to point out one important fault.

Romm has long maintained that we need to put more attention on worst case scenarios. UE was partly based on Romm's writings and reflects his viewpoint to a degree. In the fourth paragraph of his article, Romm said this of UE:

"What's clear from the article and the wave of reactions it triggered is that we need to be talking a lot more about climate change in general, and why this country in particular has embraced policies and politicians that—if they continue to prevail—will destroy America and modern civilization as we have come to know it."

Romm's reaction to UE describes some of the things that may go wrong because of climate

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Next Step for Colebrook's Green Grocer: Electric Vehicle Chargers

By Seth Wheeler, New Hampshire Electric Cooperative

A large swath of New Hampshire's North Country just became more accessible for drivers of electric vehicles (EV) with the opening this month of two new EV chargers at LaPerle's IGA in Colebrook.

The chargers are the northernmost publicly-available recharging point in the state and fill a critical gap in the EV charging infrastructure between the White Mountains and southern Quebec.

For Guy LaPerle, owner of LaPerle's IGA, the chargers are just the latest in a long list of renewable energy and energy efficiency projects he's undertaken at the supermarket. With guidance and incentives from New Hampshire Electric Cooperative (NHEC), LaPerle has installed a 35 kilowatt (kW) solar electric array and installed LED lighting that is saving the business over $1,000 per month in electric costs.

With the panels of his solar PV array in the background, Guy LaPerle, owner of LaPerle's IGA in Colebrook, marked the opening of New Hampshire's northernmost public charging station by topping off NHEC's all-electric Chevrolet Bolt.

LaPerle was among the first to take advantage of a new NHEC program that offers incentives of 50% of the installed cost up to $5,000 to commercial and municipal members who install EV chargers. LaPerle said he will not charge users for electricity consumed at the charging stations, but will install a donation box, the proceeds of which will be given to North Country charities.

"We're always looking to use renewable energy and make energy efficient choices as a way to use less fossil fuel, protect the environment and preserve our great nation," said LaPerle.

Installed in the market parking lot, the level 2 chargers supply 240 volts, similar to what an electric dryer or oven uses. Power goes through the EV charger and a cord that improves safety by waiting to send power to the plug until it's plugged into an EV. Level 2 chargers allow for a wide range of charging speeds, all the way up to 19.2 kilowatts (kW), or about 70 miles of range per hour of charging.

The number of EV chargers installed in southern and central parts of the state is growing quickly, according to PlugShare.com, a website that maps the state's charging locations. But publicly available Level 2 chargers are few and far between in the North Country, especially ones that remain open year-round. The installation of LaPerle's chargers will go a long way towards relieving the "range anxiety" of EV drivers who would otherwise avoid the North Country for fear of being stranded without a place to recharge. Recent advances in battery storage technology have significantly increased the range of most new EVs as well. The new Chevrolet Bolt, for instance, will go an average of 238 miles on a single charge. To encourage more widespread adoption of EV use, NHEC offers incentives up to $1,000 to residential members who purchase an EV in 2017, and up to $2,500 per charger to commercial members who install up to two level 2 EV chargers. Advance approval for incentives is required prior to installing the charging station.

To learn more, please visit www.nhec.com, or call an EV specialist at 1-800-698-2007.

Upper Valley Electric Vehicle Expo

By Karl Kemnitzer

Electric Vehicles (EVs) have been improving, and they now include some of the fastest and most comfortable cars made. But while a car that needs almost no maintenance, makes no noise, costs a third as much to fuel, and can be charged at home with renewable energy is very appealing, many people hesitate to buy one because they just don't know much about them.

Barbara Duncan checks out a Smart EV at the 2014 Montshire EV event. Photo: Dave Roberts.

The Electric Vehicle Demo and Forum at the Montshire Museum in 2014 gave many people an introduction to EVs. The cars have changed and it is time for another event. Our group from town energy committees, Vital Communities, and the Upper Valley Sierra Club has organized the Upper Valley Electric Vehicle Expo (www.uvevexpo.org) for Saturday, September 9, at the Dothan Brook School in Hartford, from noon to four (rain or shine).

Car owners have signed up to show their Chevy Bolts, Chevy Volts, Nissan Leafs, Smart cars, Teslas, a BMW i3, a Mitsubishi i-MiEV, and the Dartmouth Race Car. Some have offered to give short test rides. If you are interested in EVs, this is your chance to talk with EV owners who have driven 327,253 electric miles.

There will be many displays with additional information about EVs. Dave Roberts, head of Drive Electric Vermont, will give several short talks and take questions from 1 pm to 3 pm. He will introduce the basics and talk about the cars and incentives available here during "EVs 101", and then cover performance, clean emissions, and how Vermonters can save hundreds of millions of dollars on health care and fuel costs during "EVs for the Enthusiast".

Newport Chevrolet, Twin State Ford, and Nissan of Keene will be on hand with cars for you to check out. Electric bikes will be represented by Zoombikes, Omer and Bob's, Cyclewise, a Copenhagen wheel demo, and I'll be there with electric cargo bikes. Advance Transit will be showing one of their Hybrid Technology buses.

Six solar electric companies will also be there to talk about charging an EV with solar energy. They are Catamount Solar, Energy Emporium, Norwich Technologies, Solaflect Energy, SunCommon, and ReVision Energy. Vermont Clean Cities Coalition and Green Mountain Power (GMP) will have representatives who can provide answers on EV charging and other questions. GMP will also talk about the Nissan $10,000 incentive that they are offering. Additional support is provided by Building Energy and Lyme Green Heat (see ad in Heating section).

> The American Lung Association calculated that if two-thirds of the cars in Vermont were EVs, we would save $313 million a year on climate and health impacts and many hundreds of millions more on fuel.

Admission is free. Please visit www.uvevexpo.org to sign up to attend (you will automatically be entered into a raffle with prizes from sponsors), or if you would like to volunteer to help, or to show your EV.

This event is part of National Drive Electric Week, where owners showcase their cars at hundreds of events across the U.S., including ones in Plymouth, New Hampshire and Burlington, Vermont on September 14. More information can be found at http://bit.ly/EV-events.

Karl Kemnitzer is a member of the Upper Valley Sierra Club. National Drive Electric Week is sponsored by Plug In America, Sierra Club, and the Electric Automobile Association.

ALL-ELECTRIC. LONG RANGE. AFFORDABLE.

By David Roberts

Chevrolet's all electric Bolt. Photo courtesy of Chevrolet.

For the past five years of plug-in electric vehicle (EV) availability you could select from a multitude of EV models that covered two out of those three characteristics. Over the past six months a remarkable shift has begun that is getting automakers closer than ever to meeting this triumvirate of EV needs and getting more consumers seriously considering a switch to "driving electric."

The 200-plus-mile range now arriving in more affordable EV models is handy for long commutes, the occasional road trip and countering the coldest northeast winter conditions which can bring 20-40% EV range reductions in sub-zero temperatures.

The all-electric Chevrolet Bolt is now on dealer lots across the northeast. This award-winning vehicle offers 238 miles of range at a starting price just under $30,000 after a $7,500 federal tax credit. Feedback from early buyers of the Bolt is that range concerns are essentially a thing of the past. Buyers are pleased with the zippy performance and practical qualities of the surprisingly spacious hatchback design. Two optional equipment items are recommended for EV drivers in the northeast. The Comfort Package includes heated seats (great in winter).DC Fast Charging, which can speed your on-the-go charging from five hours to under an hour for an 80% charge in most conditions.

The Bolt is first out of the gate, but several more long range models similar in price are coming over the next few months. The Tesla Model 3 started early deliveries on July 28, 2017 with up to 310 miles of range and a starting price in the same neighborhood for the 220 mile version. Tesla reports delivery estimates of late 2018 if you haven't reserved one. More affordable Teslas are already available today through their selection of used vehicles. Used Tesla inventory is growing and includes vehicles in the range of $40,000. The second generation Nissan LEAF is another longer range option due to arrive this September. Many more models from other automakers will be following over the next few years, including options with all-wheel drive and increased ground clearance helpful in northeast winter conditions.

Drive Electric Vermont

Several states continue to offer incentives which can further reduce the price (see table). Leasing is a popular option for EVs as the federal tax credit is passed through as part of the lease. Leasing also allows consumers to trade up after a few years to more advanced vehicles with longer range

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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**

Volvo Announces an Historic End to Combustion Engines

By George Harvey

Nissan Leaf being charged. Photo: Jakob Härter, Wikimedia Commons.

Norway, India, and other countries begin to ban conventional vehicles.

It has actually been over a year since India, Norway, and the Netherlands started getting serious about banning vehicles that were entirely powered by gasoline or diesel oil. The Netherlands announced in December that all new cars would be zero-emission, and no new residential natural gas hookups would be allowed, starting in 2035. India followed by announcing in April that no new combustion vehicles would be allowed, starting in 2030. And Norway has multiplied the number of electric vehicles (EVs) by five in less than two years.

At the end of June and early July of 2017, however, there was a spate of positive news on electric vehicles.

On June 30th, Vermont electric utility Green Mountain Power announced record sales were being achieved through a $10,000 rebate program it was running for Nissan Leaf EVs purchased through Freedom Nissan in South Burlington. The program was extended through September 30th.

On July 5th, Volvo announced it would no longer be making cars powered by combustion-only engines, starting 2019.

At almost the same time, word came that the United States had seen EV sales, for those makers that report monthly, nearly double in the first six months of 2017 from what they were in 2016. Tesla's sales are not reported monthly, so they were not part of the record.

And at almost the same time, France announced plans to ban all combustion-powered cars by 2040; it also said it would ban the use of coal at the same time.

Not long after those developments, Royal Dutch Shell announced that it would spend $1 billion per year on its New Energies division, because it was seeing the movement away from oil and toward renewable power. This division deals with liquefied natural gas and other combustion fuels, which Shell says will be needed to power heavy transportation and air travel. Nevertheless, it is also looking into possibilities for hydrogen fuel cells and other alternative fuels.

On July 10th, Vermont's Washington Electric Co-op, a 100% renewable, 100% member-owned electric utility serving communities in north-central Vermont, announced a program very much like that of Green Mountain Power. Its members are eligible to receive incentives totaling $10,000 on the purchase of a new 2017 Nissan Leaf all-electric vehicle from Freedom Nissan in South Burlington.

On July 26th, the UK also announced a ban on new cars powered by gasoline and diesel oil. The complete change is effective in 2040.

Interestingly, the transportation company Lyft was inspired by President Donald Trump's withdrawal from the Paris Climate Agreement to set a goal of one billion rides shared per year. Less than two weeks before, Lyft had announced that its autonomous car program would run entirely on EVs.

Clearly, there is a fundamental shift in transportation underway and gaining momentum. It would probably be a good idea for anyone who is interested in buying a car to give thought to what fuel it will run on. In years to come, combustion fuels for transportation will almost certainly see unexpected changes in price and availability.

Late Breaking News *Cont'd from p.2*

August 13 – An article in domain-B stating records for renewable power production were being set in the UK. The UK has a goal of getting 30% of its electricity from renewable sources by 2020. It got 26.6% from renewables during the first six months of this year.

August 19 – Rocky Mountain Institute issued a report stating that a target for global warming of less than 1.5° Celsius is actually possible, and targets of less than 1.8° Celsius can be more easily achieved. See page 27 for an article on this, "Positive Disruption, Hope from RMI."

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

EVolution of the EV

By Greg and Barbara Whitchurch

Our previous article on electric vehicles (EVs) was "How Has Going Electric (car, not guitar) Changed Our Lifestyle?" (bit.do/Lifestyle-EV) in the April issue of Green Energy Times. In it, we shared our general lifestyle experiences with our "new" (used) 2015 Leaf. Here we dig a little deeper to help you dig a little deeper as well. This is not an "article" as such, but a compendium of annotated links which will concisely provide critical information to those of you who are interested.

We recommend that readers take a look at a brief history of the plug-in electric vehicle (EV): bit.do/History-EV.

Although that video only brings us up to about 2010, it is clear that the primary advantages of the internal combustion engine (ICE) car came from long range and fast refueling. The many disadvantages of ICE (wasted energy, noise, danger, pollution, etc.) were overcome by tolerance and an ignorance of the long-term side effects.

Even though typical daily car trips take people much farther than they used to, the new crop of EVs is able to provide most people with plenty of driving range and quick-enough charging to cover more than 95% of their desired driving requirements. In other words, there is probably an affordable EV which will not have an impact on your driving patterns or expectations for at least 95% of the driving you do. And, if you purchase a "charge card" -- pardon the double entendre -- you can fulfill all of your driving needs.

To the extent to which your driving expectations could be affected, perhaps those disappointments could be moderated by some combination of the major operational savings (gas, oil and filter changes, tune-ups, exhaust system replacement, etc.), your environmental concerns, the maintenance savings, avoiding adverse health effects, and EVs' inherent performance improvements (driving is smooth, the pick-up is amazing, the winter traction is outstanding). Again, Barb and I just charge our Leaf at home on a standard wall outlet, and we have a second car (Prius) for long trips. Often our Prius sits unused for two to three weeks.

Nissan Leaf charging. Photo: Wikimedia Commons.

Last month we took our Leaf to Burlington (50 miles) to attend our monthly Vermont Passive House meeting at the home of another member, who'd just bought an EV and had installed a high-power charging station in her garage. During the 75-minute meeting we picked up 50% of a full charge (about 50 miles). Our summer range is about 100 miles; winter about 75. There are more than 150 charging stations in Vermont already; some will provide an 80% charge within 30 minutes.

Let's take a look at the technology involved in current EVs. Although this next piece uses a Tesla for its model, the technology and design principles are the same for the Leaf and most other EVs: bit.do/Design-EV.

Now let's look at how each Leaf is built: bit.do/Assembly-2010Leaf. This approach is pretty similar to the Tesla production line.

The previous video covered the 2010 model; here are the 2013 upgrades: bit.do/Review-2013Leaf.

And here are the updates to the 2014 model: bit.do/Review-2014Leaf. (Ours is a 2015.) You can see that Nissan is serious about keeping up with the competition in all phases of car design. A major redesign of the Leaf for 2018 will appear on September 6th.

Keep in mind that there are tremendous deals on brand new Leafs (Leaves?) here: bit.do/2017LeafDeal. There are similar deals in OH, HI, CA, OK, and perhaps other states as well. More info on the Drive Electric VT support here, bit.do/2017DEV-Incentives.

We are not promoting Nissan or their Leaf - that's just the only EV we know. If you still have qualms or questions, we suggest you test-drive one or, better yet, rent one for a couple of days. National Drive Electric Week is coming up September 9-17 with events across the country including EV dealers, owners and advocates. These are a great way to learn more about your EV options: bit.do/2017Drive-Electric-Week.

We wish you luck with your expanding transportation choices!

Barb and Greg Whitchurch are board members of VT Passive House and owners of a net-zero passive house, a Leaf and a Prius in Middlesex, VT, http://bit.ly/2nRCdGL.

ALL-ELECTRIC. LONG RANGE. AFFORDABLE.

Cont'd from p.5

as they enter the marketplace.

Wondering where all these EVs are going to charge up? It can be as simple as plugging into a standard 120V outlet. That will provide about five miles of range per hour of charging. Those driving more than 50 miles per day will likely find investing in a 240V "Level 2" charger where they park overnight especially worthwhile. Charging availability at workplaces continues growing and public EV charging is getting better all the time. Tesla has a dedicated network of fast charging for long distance trips through their nationwide Supercharger network. Other automakers, charging network providers and electric utilities are making steady progress in building out EV fast charging along travel corridors and in metropolitan areas. A visit to Plugshare.com, often referred to as "Yelp for charging stations," will show charging available near your travel destinations and can help you plan out a route with stops for charging on longer trips.

Plug-in hybrid electric vehicles (PHEVs) remain a great option for many drivers who can take care of their daily transportation needs on 10 to 50 miles powered by the battery, and then fall back to gasoline anytime their travels take them farther afield. The Toyota Prius Prime, Chevrolet Volt and Ford CMax Energi are among the top selling models and have received recent updates with automakers offering competitive pricing compared to gasoline powered models.

Recent research from the Union of Concerned Scientists estimates plug-in vehicles traveling on electricity in the New England grid region achieve the greenhouse gas equivalent of a gasoline vehicle traveling 103 miles per gallon, and as more renewables and low carbon electricity get integrated into the grid these emissions will continue to go down.

This is a great time to go electric – you can save money, reduce carbon and worry less about maintenance and costs. A wealth of resources is available online for those wondering if a switch to an EV will work for them. You can start your journey at DriveElectricVT.com

David Roberts is the Drive Electric Vermont coordinator. He has driven an all-electric Nissan LEAF for the past five years and says "if you have to drive, drive electric."

STATE	ELECTRIC CAR INCENTIVE	WEBSITE
Connecticut	Up to $3,000	www.ct.gov/deep/CHEAPR
Maine	No consumer incentives available	www.gpcog.org/energy/maine-clean-communities/incentives/
Massachusetts	Up to $2,500	www.mor-ev.org
New Hampshire	No consumer incentives available	www.granitestatecleancities.nh.gov
New York	Up to $2,000	https://www.nyserda.ny.gov/Drive-Clean-Rebate
Vermont	Incentives offered through some electric utility providers	www.driveelectricvt.com/buying-guide/incentives

Are We Choosing Doom?

Cont'd from p.3

change. The list is long and frightening, including storm surges, like those that came with Hurricane Sandy, coming every other year, loss of agricultural land and coastal communities, famine, and displaced populations. Romm says, "The true worst-case scenario is so bad that scientists simply assume humanity is too rational and moral to let that happen."

We might ask why a group of people seeks no insurance against a disaster that many scientists not only say is unfolding, but insist may be the greatest danger ever to come before humanity. Part of the problem is that we, in a society guided by the leadership we have, are actively maintaining ignorance on the subject.

Nevertheless, Romm discourages a sense of hopelessness. With the decline in costs of renewable energy sources, mitigating factors are becoming increasingly clear. Tools that area already available to us can be used to avoid the worst case scenario. In fact, we are very likely to be able to do better than that.

Joe Romm includes this hopeful note in his article:

"So, to be clear, we are not doomed. If the nation and the world were to adopt a WWII-scale effort, we could certainly keep total global warming "well below 2°C" (3.6°F), which scientists—and the nations of the world—recognize as the threshold beyond which climate change rapidly moves from dangerous to catastrophic."

Romm urges everyone to read UE, which can be found at bit.ly/Uninhabitable-Earth. We urge everyone to read his article as well; it is at bit.ly/we-are-choosing-doom.

Financing For Solar Plus Storage

Solutions For Low-income Communities

By Todd Olinsky-Paul

The Capital Scan report by Lewis Milford and Robert Sanders details how to make renewable energy technologies like solar photovoltaics (PVs) and battery storage more accessible to low-income communities. It includes an extensive set of recommendations for investment strategies that foundations can use to benefit disadvantaged communities needing solar-plus-storage solutions for resilient power (RP).

According to report co-author Lew Milford, "More than 50 recommendations in the report create a philanthropic roadmap to moving past hurdles and integrating solar plus storage (SPS) projects throughout low- and middle-income (LMI) communities."

The report was commissioned by The Kresge Foundation, the Surdna Foundation and The JPB Foundation. It concludes that RP is rapidly becoming more affordable as costs are declining for both PVs and batteries and both are becoming more efficient. So far, RP technology has served mostly high-end commercial markets. But with reduced costs, it can help make electricity costs affordable in low-income communities, even as it reduces harmful emissions and strengthens resilience in the face of electric-grid disruptions.

- The report identifies five market barriers to integrating RP in low-income communities:
- The need for an integrated development finance model for under-served markets.
- Lack of internal capacity of stakeholders to develop RP projects.
- Insufficient energy data collection, policy research, and economic analysis to understand the development of SPS technology in low-income markets.
- Insufficient capacity of technical service providers, project developers, and nonprofit intermediaries to reach under-served communities.
- Inadequate market rules, incentives, and regulatory policies to advance new SPS technologies in low-income markets.

The report identifies more than 50 grant and investment opportunities that socially-minded investors can use to target those barriers. These are based on in-depth interviews with over 30 industry, non-governmental organization, and foundation leaders. With solar capacity outpacing the installation of fossil fuel generation, and the costs of battery storage expected to fall by half during the next four years, SPS represents a great opportunity for LMI communities. Interventions and incentives are needed.

Among the proposed interventions that foundations can undertake are:

- ***Support New Tax Credit Aggregation Entities.*** There is a need for the creation of new legal entities to aggregate multiple portfolio owners' solar and storage tax credits to create a scaled investment opportunity for investors.
- ***Provide Credit Enhancement for Performance Risk.*** There is a need for credit enhancement for investors and building owners to reduce technology and performance risk (e.g., "performance loss reserves" to reimburse monetary losses from unrealized economic benefits).
- ***Provide Working Capital.*** Fund predevelopment costs and bridge the payment of developers' fees that are often tied up in multiple projects.
- ***Provide Long-term Capital.*** Provide 10-year term capital to take out construction financing (preferably with a 15-year amortization) and as a capital source for on-bill payment programs.
- ***Fund Leadership Awards to Owners.*** Provide funding ("leadership awards") to portfolio owners through nonprofit intermediaries for offsetting the organizational costs and new predevelopment costs of first-time SPS projects (e.g., technical and legal review, doc prep, assembling additional development team members, compliance, etc.).
- ***Invest for LMI Expansion.*** Invest in existing companies active

Cont'd on p.29

Fore Street Garage Solar Canopy

By George Harvey

The Fore Street Garage (FSG) in downtown Portland, Maine, has a new solar canopy. It was built as a collaborative effort by ReVision Energy, Quest Renewables, and East Brown Cow, a management company.

In many ways, it is hard to imagine a better site for a solar array than the top floor of a parking garage. For starters, parking garages with elevated top floors have a good chance of getting full sun for most of the day. They often are taller than whatever trees are around.

Very often, a proposed rooftop system cannot be installed because the roof is not designed to take the extra weight a solar array puts on it. If that sounds odd because solar panels are light, remember that solar panels can catch the wind, and so they have to be secured. On a flat rooftop, this may mean that the panels need to be ballasted to hold them, and this adds weight. However, a parking garage, which is designed to take the weight of many vehicles, is not likely to have such a problem.

The list of advantages for installing on a parking garage goes on. There are very few people who would raise aesthetic objections to putting a solar array on a parking area. The array shields the cars that park beneath it from the sun and prevents them from overheating. And we have not even gotten to the electricity produced.

The FSG array is made up of 578 solar panels, each of 335 watts. This provides 193.63 kilowatts of capacity. Quest Renewables designed the array. It is provided with seven of their Quadpod

The 193 kW solar canopy at Fore Street Garage in downtown Portland, Maine is the first-of-its-kind in Maine, though solar canopies are common in other parts of the United States. The project is the result of a collaboration between ReVision Energy, East Brown Cow, and Quest Renewables. The clean electricity generated by the system will power the nearby Hyatt Place Hotel, and offset more than 20% of their electrical loads.. Photo: John Capron.

canopy systems. Each of these has its own inverter, which is grid-tied independently.

The Quadpod systems are interesting on their own. They are not assembled on the roof of the structure. Instead, they are largely assembled and wired, even to include most of the lighting, on the ground. Once the work that can be done on the ground is finished, they are hoisted to the top of the parking garage, and the installation is finished there. Two 270-ton cranes were used for the purpose at FSG.

There are numerous advantages to this approach. It means that workers spend more time on the ground, and this improves both productivity and safety. It can also make installation faster. Using the Quadpods shortened the work schedule, reducing down-time for the parking areas involved.

"Quest Renewables' innovative QuadPod solar canopy allowed us to meet a very aggressive schedule at a particularly challenging site, Fortunat Mueller, ReVision Energy's managing partner and one of its founders, said. He added, "The Quest team was terrific to work with from start to finish."

Eastern Brown Cow, which owns the FSG array, also owns the nearby Hyatt Place Portland-Old Port Hotel. Guests can park their cars on the top floor of the parking garage, where the array is installed. One advantage they have, in addition to parking in the shade of the solar array, is access to electric car chargers.

The FSG array is grid-tied, supplying power to the Hyatt Place Hotel. It is expected that the array will produce over 230 megawatt hours of electricity each year. This should offset at least 20% of the hotel's electric demand. When the array delivers more power than the hotel can use, the excess is sent to the grid.

The FSG array was built with support from the federal government. The cost of the system was offset 30% by tax credits.

The idea of a solar canopy on a parking garage is not new. It has been done many times in other places. Here in the Northeast, it has only slowly caught on, however, and this can be attributed in large part to the fact that the area has historically been less than ideal for solar power. In fact, the FSG array is the first of its kind in Maine.

With the rapid decline in the costs of solar systems, we can be sure to see more arrays of this type installed. And with the rapid decline in large storage batteries, the pace of solar installation can be expected to increase even more.

See more images on p. 11 of this issue of GET.

New York State's Solarize Campaign FOR MANUFACTURERS

By Green Energy Times Staff

Generating almost 1MW of power, this solar PV array will provide Dimension Fabricators all its electrical needs. Courtesy image: Dimension Fabricators, Inc.

The New York Energy Research and Development Authority (NYSERDA) and the Center for Economic Growth (CEG) announced SolarGEN, the first state-supported Solarize campaign aimed at helping manufacturers install solar systems. The announcement came during a ribbon-cutting ceremony at Dimension Fabricators, in Glenville, for a 942-kilowatt solar system. The system, also supported by the NY-Sun initiative, is big enough to provide for annual electricity needs of 150 homes.

Expanding manufacturers' use of solar energy is vitally important for New York's goal of getting 50% of its electricity from renewable sources by 2030. SolarGEN will enable solar customers in the Capital Region to get competitive pricing through joint purchasing arrangements.

CEG's SolarGEN campaign is receiving funds through the state's Solarize program, now in its third round which started last year. The earlier Solarize campaigns, not aimed specifically at manufacturers, have already proven successful in New York. According to Governor Andrew M. Cuomo, who spoke at a separate event on the same day SolarGEN was announced, the state's second Solarize round helped with installation of 850 projects and saved an average of $1,743 per installation.

Alicia Barton, President and CEO, NYSERDA, addressed the gathering at Dimension Fabricators. "Adopting solar energy is a smart way for large manufacturers to lower their energy costs and their carbon footprint at the same time," she said. "By expanding the Solarize campaign to the manufacturing sector participating companies will drive even more competitive pricing while helping to advance Governor Cuomo's nation-leading commitment to adoption of renewable energy across New York."

Congressman Paul Tonko also spoke, saying, "Efforts like this one not only strengthen our region's energy security and resiliency, they also bolster our long-term prospects for truly sustainable economic growth and job creation in the Capital Region and beyond."

CEG's SolarGEN Solarize campaign is designed to support manufacturers who want to install solar systems, but non-manufacturing commercial sites are also eligible. The Solarize campaign streamlines the process of preparing and installing systems, saving customers time and money.

Andrew Kennedy, CEG President and CEO, stressed the advantages to customers, saying, "CEG's SolarGEN campaign provides a one-stop resource for local manufacturing and commercial facilities to improve performance and maximize the benefits of renewable and alternative energy technologies."

Dimension Fabricators makes concrete reinforcing steel and related materials. Their new solar array, developed by EnterSolar, has 3,310 solar panels and covers the roof of one of the company's buildings. It got $369,636 in funding through NY-Sun and the payback for the $1.9-million system is expected within six years.

Scott Stevens, President of Dimension Fabricators, mentioned earlier environmentally-friendly work that his company had done, including installing LED lighting and other investments in efficiency. But, he said, "[This] array is a serious effort that will reduce our carbon footprint by 700 metric tons per year!" While pointing to the savings the company would get, he added that the installation was "just the right thing to do."

Paul Ahern, President of installer EnterSolar, added, "As the developer of this magnificent system at Dimension Fabricators, we are proud to be here to unveil this significant project for the capital region, and we thank Dimension Fabricators for their investment in solar and their community." It is not his company's first or largest installation. It has also done work for Stewart's Shops, Bloomberg, Cornell University, and Swiss Re.

NY-Sun is Governor Cuomo's $1 billion initiative to grow solar power and move the State closer to having a sustainable solar industry. Since 2011, solar in New York State has grown almost 800% and encouraged nearly $1.5 billion in private investments.

Renewables to Reach Con Edison's Low-Income Customers: *Shared Solar Pilot Program*

By George Harvey

Last October, New York utility, Consolidated Edison (Con Ed), made public the specifics of a plan to get electricity generated from solar photovoltaic (PV) systems to its low-income customers. The latest news on this is that the pilot program has been approved by the New York Public Service Commission (PSC).

Most low-income consumers have had little access to PVs because they nearly always rent and do not have property on which to put PV systems. Under Con Ed's proposal, some low-income customers will be able to use solar panels installed on Con Ed's property and buildings. The specific customers in the program will be chosen by lottery for a program, Shared Solar Pilot. The pilot program will be limited to three megawatts of capacity, which will supply power to between 800 and 1,600 customers. Con Ed said that it expects each customer to save about $5 per month on the program.

If the pilot program is successful, the PSC will allow Con Ed to provide eight additional megawatts, supplying up to 6,000 low-income customer. The PVs would still be sited on Con Ed's buildings and land.

Con Ed pointed out that when low-income people have access to PV systems, everyone benefits. The systems will increase public awareness of solar power specifically and renewable energy in general. They will also give people reasons to consider how they use energy, promoting energy efficiency.

Con Ed intends intends to promote other efficiency and renewable programs, making both itself and the state of New York leaders in renewable energy and sustainable living.

Congratulations to the Top Solar Installers in the Northeast

By Green Energy Times Staff

Solar Power World (SPW) recently posted a list of the 500 top U.S. solar contractors, ranked according to their influence on the solar industry. (bit.ly/top-500-solar-contractors) We at Green Energy Times (GET) were delighted to find a number of our friends on that list. These companies in the Northeast stand out among the best in the country. They are in an area that had long been regarded as marginal for developing solar systems, but things have changed. In fact, several of the top solar states in the country are in the Northeast, so it really should be no surprise that local installers are considered to be among the best.

UVM Redstone Lofts. Photo courtesy of Peck Electric

We will not hide the fact that we promote our own advertisers. Aside from the support they give us, there are a number of reasons to do this. We get information from them, interviewing them for articles with subjects ranging from their own businesses to solar power, renewable energy in general, and even agriculture and architecture. We know them, and in many cases we know their customers. In some cases, GET staff members actually are among their customers. We feel a large measure of confidence in them that we could not feel in those we do not know.

Our congratulations to all who listed among the top 500 installers in the country.

Peck Solar, which has its home in South Burlington, Vermont, placed highest among the 500 top installers that are in our distribution area. Peck Solar was listed as number 66 in the country. GET's editor, Nancy Rae Mallery, commented on this, "It is hardly a surprise that Peck Solar would be among the top installers in the United States. It has a great history, and it keeps getting better." According to the SPW article, Peck Solar has installed over 82 megawatts of solar capacity so far. Peck Solar, which is a division of Peck Electric, can be visited online at peckelectric.com. The number is 802-658-3378.

ReVision Energy collaborated on the Fore St. Garage solar array. Courtesy photos: John Capron. See more in the article on page 9.

ReVision Energy, one of the leading installers in New England, is number 131 of the 500 top installers. ReVision has offices in Maine, New Hampshire, and Massachusetts. ReVision has been prominent in many GET articles, most recently in "ReVision Energy is Solarizing the Mt. Washington Valley," in February of this year. Also of note is "Revision Energy Certified as a Business 'Force for Good,'" which appeared in July of 2015. There is also an article on the Fore St. Garage solar array on page 9 of this issue. We suggest calling the general number, 866-700-6065, to find the nearest ReVision Energy office, or visit ReVision Energy's website, at revisionenergy.com.

500kW Williston, VT solar array installed in 2017 by Aegis Renewable Energy. Photo: Aegis Renewable Energy.

Aegis Renewable, which is located not far from Montpelier, Vermont, made it to number 141 on the list of the 500 top installers in the country. Aegis has also been the subject of multiple articles in GET. The first of these, "Aegis Wind Spins off from Alteris Renewables, Brings New Opportunities to Vermont," appeared in March of 2012, as the company was created. One article, "Aegis Energy Helps Goats to Go Solar," covered the boost solar energy can give to animal husbandry in GET's February, 2015 issue. Aegis

Cont'd on p.36

NH Solar Shares

A New Program Being Launched to Benefit Families, the Environment and the Grid

Plymouth, NH: In partnership with the NH Electric Cooperative (NHEC), the Plymouth Area Renewable Energy Initiative (PAREI) is rolling out a new program called NH Solar Shares. NH Solar Shares will design and install solar photo-voltaic (PV) arrays for the purpose of sharing solar energy with low income families, increasing the portion of clean renewable energy on the grid and building healthier, more environmentally sustainable communities.

These small community-scale solar PV arrays will be built one community at a time, inspired by a task force of local volunteers and funded through charitable donations, grants, the state's solar incentive and a donated lease of land. The majority of the PV electricity will be credited directly to the electric bills of low income families living in the region of the solar PV array.

"We are excited to work with NH Solar Shares and support its effort to engage the community to make this concept a reality," said Steve Camerino, President of NHEC. "As an electric cooperative, we are committed to finding creative ways to serve the needs and interests of all of our members. The NH Solar Shares project will reduce the impact of electric consumption on the environment while also easing the financial burden faced by some of our members living on low or fixed incomes, who juggle covering the costs of many of their basic needs."

After the first array is built, NH Solar Shares will be recommended to households through established social service organizations and programs where income verification has already taken place. Solar Shares will be a voluntary program to which households will apply individually. In addition to wanting a portion of their power to be offset by solar energy, these households must also possess an interest in taking part in an energy education program.

Earlier this year, NH Solar Shares was chosen as a team in the national Community Solar Challenge being organized by the U.S. Department of Energy's Sun Shot Division. Solar Shares was awarded $10,000 in technical assistance to help get the new program off the ground. The goal of NH Solar Shares within the national challenge is to build three solar PV arrays ranging in size from 25 to 50kW in communities served by NHEC by October, 2018. If the goal is met, the program will be eligible for large cash prizes.

The inaugural Solar Shares array will be built in Plymouth, NH on land donated by The Common Man Family of Restaurants, next to the Frosty Scoops ice cream stand located in front of The Common Man Inn & Spa on Main Street. It will consist of three pole- mounted solar arrays serving as shade for the customers as well as a solar picnic pavilion. When the organizers shared the project idea with Alex Ray of The Common Man, he commented, "I love the idea, go for the gold, let's work together to make this happen!"

NH Solar Shares is quickly gaining a lot of early interest. "We enthusiastically support this effort", said Roger Larochelle, Executive Director of the Squam Lakes Conservation Society. "Helping local families with renewable electricity contributes to building a stronger and more sustainable community, which is also our goal with land conservation."

"Granite United Way supports this program and is excited to see it brought to the greater Plymouth area. We are thrilled to partner with PAREI and New Hampshire Electric Cooperative in this effort to increase the affordability of electric service for low-income families. Our Whole Village Family Resource Center in Plymouth will be working closely with social service programs to identify program participants

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NH Solar Rebate Programs Temporarily Closed

By Brianna Brand

The New Hampshire Public Utilities Commission (PUC) announced last month that they were temporarily closing the state's popular Residential and Commercial and Industrial Solar Rebate Programs.

These programs, managed by the PUC's Sustainable Energy Division, have been in place since 2008 and have been exponentially increasing in popularity over the past few years as solar installation costs have dropped dramatically. The programs offer one-time rebate payments to eligible recipients for installing solar photovoltaic systems, allowing NH residences and businesses to produce their own supply of local clean electricity. Even though rebate prices have dropped from a maximum of $6,000 at the onset of the residential program to a maximum of $2,500 at the start of the 2017 program, demand has remained steadily, if not at times overwhelmingly, high.

But sheer demand wasn't the monumental factor that caused the PUC to temporarily close the programs. Nor was it the $1,000,000 C&I program waitlist, or the $500,000 residential waitlist. Rather, an anticipated decrease in available funding was the main motivator behind the shutdown.

The rebate programs are funded by the Renewable Energy Fund (REF), a program under NH's Renewable Portfolio Standards (RPS). Under the RPS, if utilities cannot purchase enough Renewable Energy Credits (RECs, each represents one megawatt of eligible clean electricity generated) to fulfill their compliance obligations, they must pay Alternative Compliance Payments (ACPs). ACPs fund the Renewable Energy Fund, which also provides rebates for residential wind, biomass, and solar hot water installations.

ACP payments fluctuate from year-to-year, depending on the availability of RECs in the marketplace. In years where RECs are scare, utilities pay more ACPs, yielding higher rebate program budgets. In years where there are more RECs available to purchase, utilities don't pay as many ACPs into the REF rebate pool.

This year, ACP payments are expected to be less than in previous years. Estimates place the incoming ACP values at approximately $3.6 million, a shortfall compared to last year's approximately $4.2 million ACP revenues or 2015's $4.4 million.

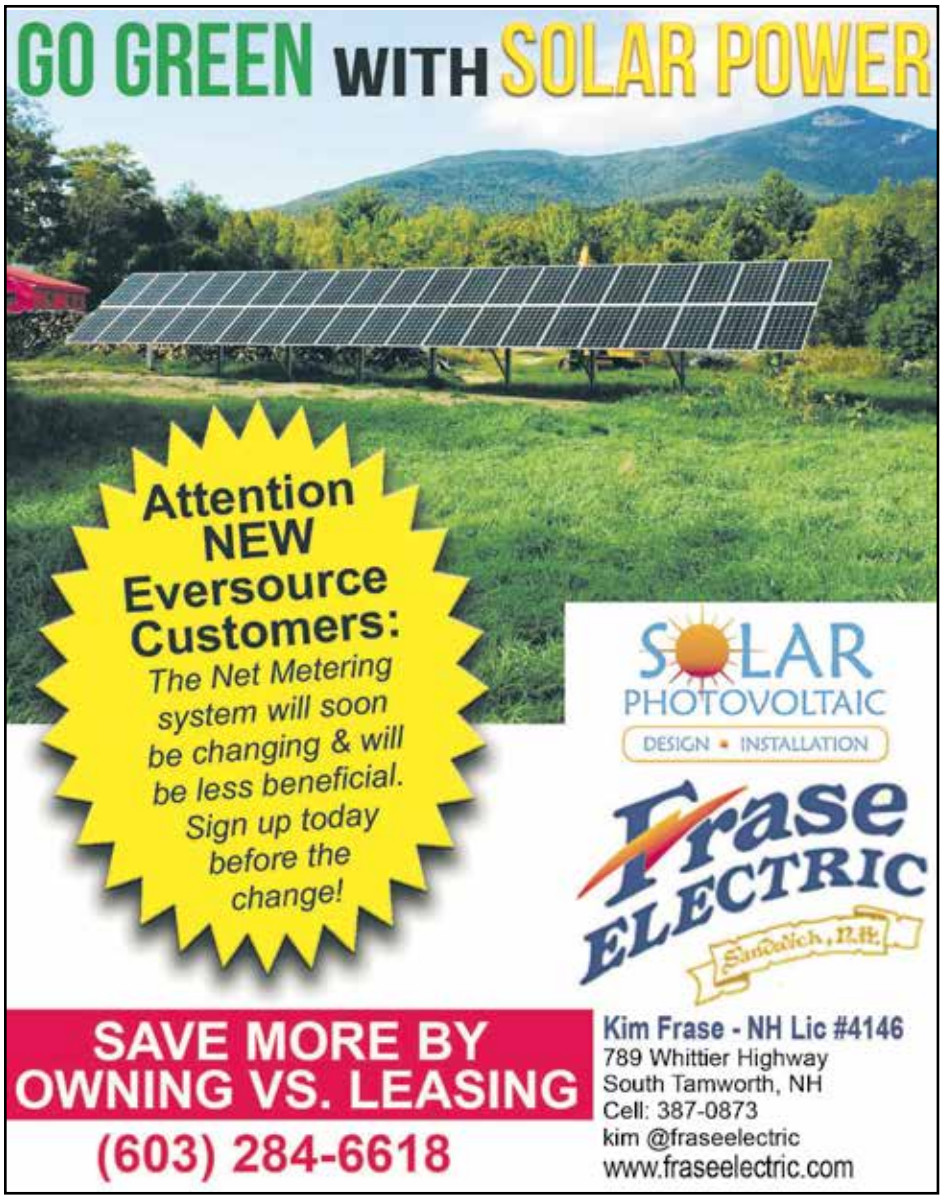
The PUC is currently in the process of reconciling incoming ACP payments and developing program budgets for the upcoming fiscal year. Programs will not re-open until after September 1, 2017.

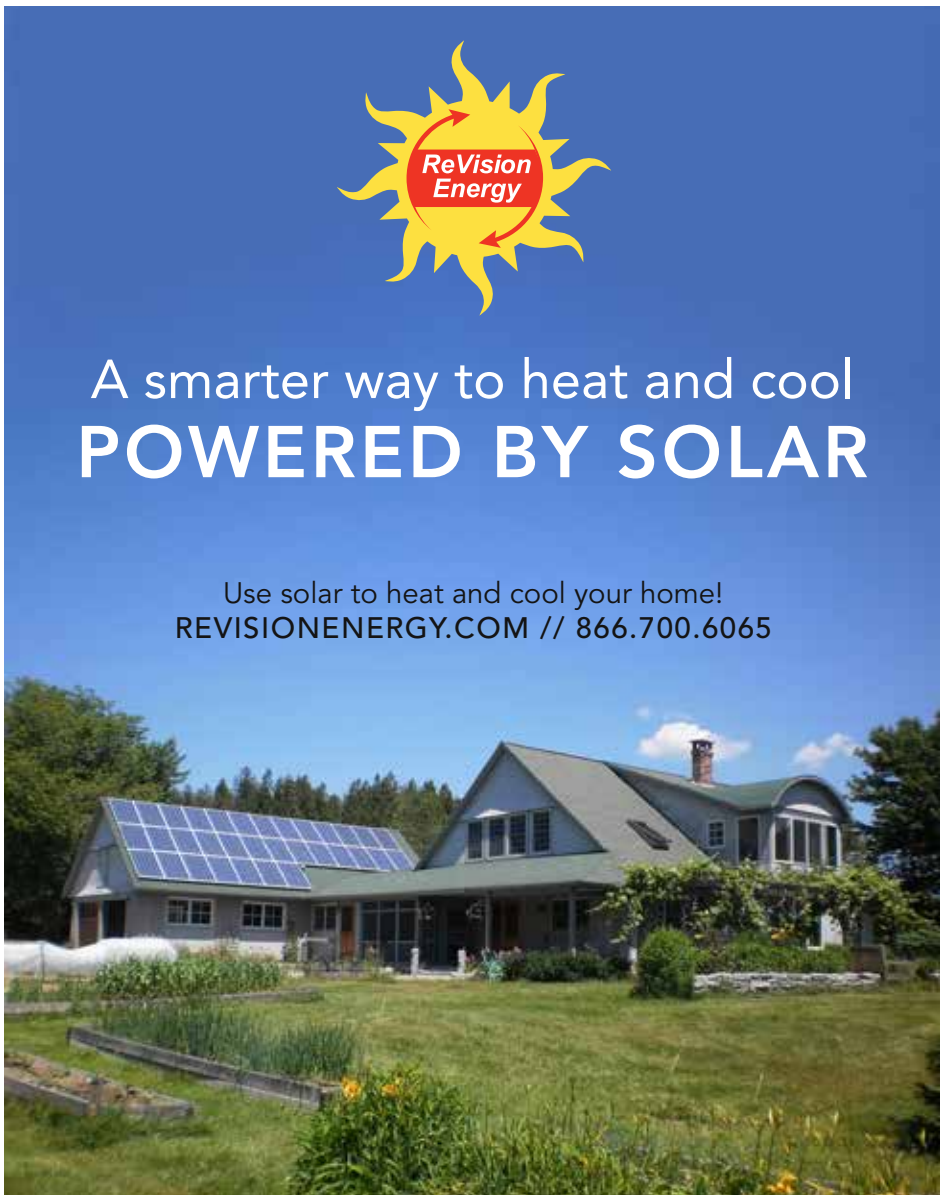
The rebate programs have experienced start-stop issues in the past, including the establishment of wait lists. Solar industry installers will likely work with their customers to determine appropriate pricing options and timelines. The solar industry in NH remains strong, supporting over 1200 well-paying jobs. Similarly, interest in solar PV systems remains high as more and more NH residents and businesses seek to increase their energy independence and lower electricity costs.

Going forward, an important issue that could continue to affect the rebate program funding levels is that per a NH Statute (RSA 362-F:6, II-a), utilities can add up all of the systems that net-meter and do NOT create RECs, then apply that total amount (in kW), using a 20% capacity factor, to reduce their RPS obligation. In effect, if a customer does not create RECs, the utilities get to net-out that customer's system's production from the compliance obligation, meaning utilities have to buy fewer RECs from other sources and fewer ACPs flow into the REF. The balance between the REC market and ACP payments will heavily influence the rebate programs in the future.

NHSEA has created a helpful REC guide and REC creation program to help system owners manage their RECs effectively to allow for the continued growth of solar in NH, available at https://www.nhsea.org/renewable-energy-credits-recs.

Brianna Brand is the Program Director of the New Hampshire Sustainable Energy Association (NHSEA).





We Don't Need Fossil Fuels!

By George Harvey

Beesley's Point Generating Station, New Jersey. Photo: Smallbones, Wikimedia Commons.

In May of 2015, at team from Stanford University led by Dr. Mark Z. Jacobson published a paper, "100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States" (Roadmaps). (http://bit.ly/stanford-fossil-free) The Roadmaps provide formulas for each state to get to 100% freedom from use of polluting energy sources using resources available to that state.

Jacobson's paper was especially notable for several reasons. While it provided a mix of WWS that would work for each state to get entirely off of fossil fuels, it went further, showing how to eliminate use of carbon-based combustion and nuclear fission altogether. Not only were coal and natural gas not to be used, regardless of carbon capture, but neither were bio-mass and bio-fuels.

The Roadmaps envision efficiency-driven reductions in energy demand among states by a mean of about 39.3% by 2050. All energy would be electric, with onshore wind providing about 30.9%, offshore wind about 19.1%, utility-scale photovoltaics (PV) about 30.7%, rooftop PVs about 7.3%, concentrating solar with storage about 1.25%, hydroelectric power about 3.01%, wave power about 0.37% and tidal power about 0.14%.

Batteries and hydrogen fuel cells are given as the preferred power technologies for most vehicles, with some powered by cryogenic hydrogen. Heating buildings and water, along with cooking, are to be from heat pumps, resistance heaters, and induction heaters. The paper says, "High-temperature industrial processes will be powered by electric arc furnaces, induction furnaces, dielectric heaters, and resistance heaters and some combusted electrolytic hydrogen."

The goal of Jacobson's paper is not merely to stop climate change caused by specific types of pollution. It is to reduce all pollution to a bare minimum, addressing not only climate problems, but those producing other issues for both our health and our environment. Dr. Jacobson told us, "Our goal is to solve the air pollution problem simultaneously with the climate problem and to minimize catastrophic risk at the same time."

The paper gives reasons for avoiding bio-fuels; the most important, that they actually do not reduce pollution. Similarly, nuclear power has environmental effects and dangers that have never been addressed, long-term waste storage being one example.

Though this paper is two years old, we are revisiting it because of attacks that have been mounted on it in the past several weeks. The first of these is an evaluation by Christopher Clack and a score of other scientists, "Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar" (Evaluation). (http://bit.ly/fossil-free-evaluation) It took issue with much of what was found in Jacobson's paper.

I found the "Evaluation" disturbing for what I see as sloppy unprofessionalism. For example, its abstract contains this sentence, supported by two references: "A number [sic] of studies, including a study by one of us, have concluded that an 80% decarbonization [sic] of the US electric grid could be achieved at reasonable cost." But the main body of the Evaluation contains this statement, without any citation to support it: "With all available technologies at our disposal, achieving an 80% reduction in GHG emissions from the electricity sector at reasonable costs is extremely challenging, even using a new continental-scale high-voltage transmission grid. Decarbonizing the last 20% of the electricity sector as well as decarbonizing the rest of the economy that is difficult to electrify (e.g., cement manufacture and aviation) are even more challenging."

Unfortunately, the Evaluation was taken by a segment of the press as a condemnation of the whole idea of getting to 100% renewable energy. The pro-fossil fuel press gave the impression that somehow the Evaluation was all the better because of the sheer number of scientists who were named as co-authors, despite the fact that some of them had no credentials in energy or climate science, or seemed to have conflicts of interest.

Dr. Jacobson responded to the Evaluation with a letter, "The United States can keep the grid stable a low cost with 100% clean, renewable energy in all sectors despite inaccurate claims," in the same publication that published both it and his original paper. (http://bit.ly/Jacobson-response-letter) He also gave us a detailed, line-by-line response. (http://bit.ly/jacobson-evaluation-line-by-line) In some ways, the line-by-line response is a very much more interesting read than the original paper. One way is that it evaluates objections that have arisen.

My own assessment of Dr. Jacobson's original paper is that, at the age of two years, it is a little out of date, because of steep declines in solar power and, more to the point, battery storage since it was published.

In addition, I think that it does not address the possibilities of bio-digesters, which the National Renewable Energy Laboratory said, in 2013, could replace 40% of our demand for natural gas. The waste producing the gas has to be dealt with one way or another, and, in keeping with Dr. Jacobson's standards, could be used in fuel cells. (It could also be used as a replacement for some fossil fuels as a feedstock for other chemicals.)

Another minor issue I would mention is that ammonia, which is carbon-free, can be used as a fuel. A number of technologies have been developed for clean manufacture of ammonia. While ammonia can be burned directly, and has been used in the past to power buses with internal combustion engines, it also has the advantage that it can be used as a fuel for fuel cells, because it can be used to store much larger quantities of hydrogen than can be kept as a gas in tanks of the same volume.

A recent article of mine, listing alternative sources of energy, was published at CleanTechnica.com, "Getting the Last 20% Of Our Energy from Renewables." (http://bit.ly/getting-the-last-20) In it, I listed a number of technologies that could fill in for fossil fuels in what are currently difficult places.

Given two years' hindsight, I would argue that Roadmaps was, if anything, a bit too conservative. I think we have made scientific and technological progress Dr. Jacobson did not envision.

In his email, Dr. Jacobson also said, "We have a paper for 139 country roadmaps … coming out the first week of August in the journal, Joule." We might all look forward to seeing that.

Problems with the Addison Natural Gas Project

By George Harvey

Ever since it was first proposed, the Addison Natural Gas Project (ANGP) has been drawing opposition. For example, 305.org, after listing a series of environmental and safety issues, concluded, "It will also lock Vermont into fossil fuel use for the foreseeable future–the pipeline isn't a bridge to a livable future; it's a gangplank to climate catastrophe."

The project is not really very big, compared to other pipelines. Its core is a 41-mile long tube running through Addison County, where it will supply natural gas to residential and business customers.

Part of the opposition by environmentalists relates to the fact that Vermont Gas (VG), the organization that built ANGP, had underestimated the cost. That might not sound like much more than a pardonable error, but one factor represents a problem. When VG discovered the error, it failed to report it to the Public Service Board (PSB), now the Public Utility Commission (PUC). This is more than a minor error; it is an offense the PSB could, and did, take action on. It resulted in VG having to pay a fine of $100,000. It also made VG appear untrustworthy to some people.

Natural gas pipeline being buried. Image: geography.org.uk

The other issue for environmentalists, and by far the greater one, is that natural gas poses environmental threats. These threats are very significant and would produce opposition to ANGP in any event.

Methane, the most important ingredient in natural gas, burns to carbon dioxide, the primary greenhouse gas. But unburnt methane, which is a far more powerful greenhouse gas than carbon dioxide, leaks from gas wells and pipelines. Estimates suggest that the methane lost from leaks produces more climate change than the carbon dioxide from the methane that is burned. Many scientists conclude that natural gas is a worse fuel for climate change than coal.

Natural gas pipelines and installations also have other safety issues. For example, the leaks occasionally result in explosions that do extensive damage.

Most natural gas extracted in the United States is now from the fracking fields, and this probably includes the gas delivered by ANGP. There are fracking fields in Vermont or New York, and they are illegal in both states, but they are extensive elsewhere. The process of fracking is the source of extensive environmental destruction.

Some dangers of fracking are not immediately obvious. For example, the waste water from the process is disposed of underground, and this creates earthquakes. Oklahoma which used to have one earthquake about every ten months, now has about three each day. The waste water also has contaminated wells and caused other damage.

A marker for a buried natural gas pipeline. Image: theconversation.com

Now, with ANGP completed and delivering gas, the safety issue has arisen again. It has been found that the pipeline was not properly buried. The standards in Vermont say it had to be at least four feet below grade, and at a depth of at least seven feet where the pipeline crossed streams. What has emerged is that the pipeline was buried to

Cont'd on p.15

U.S. Mayors Commit to Renewable Energy

By Rick Wackernagel

Mayors for 100% Clean Energy (www.mayors4cleanenergy.org), an initiative of the Sierra Club's "Ready for 100" campaign, zoomed past a milestone last month. In the lead-up to the annual meeting of the U.S. Conference of Mayors, more than 120 mayors endorsed the initiative, well beyond the goal of 100. These mayors – Republican, Democrat and Independent – say that a transition to 100% clean, i.e. carbon-free, energy will be good for their communities. They will "work with all stakeholders to transition away from dirty energy and implement local, affordable solutions like energy efficiency, solar [energy], wind [energy] and pollution-free electric transportation." The campaign collected these endorsements in just 10 weeks.

The mayors are going beyond signing the endorsement. Mayors from Columbia, South Carolina, San Diego, Pittsburgh and many other places are speaking out, saying that we need a just and equitable transition to 100% renewable energy.

Columbia Mayor Steve Benjamin said, "It's up to us as leaders to creatively implement clean-energy solutions for our cities across the nation. It's not merely an option now; it's imperative. Cities and mayors can lead the transition away from fossil fuels to 100% clean and renewable energy."

San Diego Mayor Kevin Faulconer said, "Clean energy isn't just the right thing to do, it's the smart thing to do. In San Diego, we brought business and environmental groups together to advance a goal of 100% renewable energy. Since then, San Diego has become the nation's top-ranking city in solar-energy capacity. We're going green not only because it supports clean air and water, but because it supports our 21st century economy. It makes sense for mayors across the country to work together, because when we talk about the future of our planet, we're talking about the future of our communities. As a city known around the world for its beautiful environment, we look forward to showing the world how to protect it."

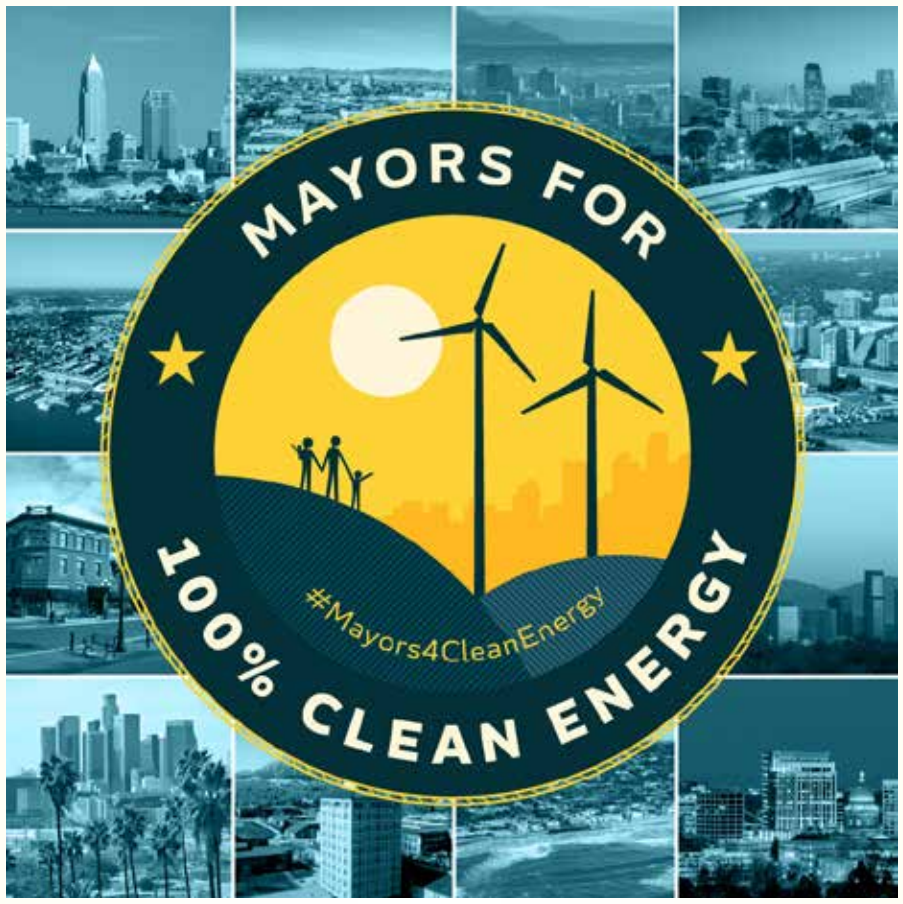


Image courtesy of the Sierra Club

When President Trump announced that he was withdrawing the U.S. from the Paris Climate Agreement, Pittsburgh's Mayor, Bill Peduto, made 100% clean energy a goal in his city.

Salt Lake City's Climate Positive 2040 plan identifies steps and policies it will take to get all of its electricity from renewable sources by 2032.

Three U.S. cities, Aspen, Colorado, Burlington, Vermont and Palo Alto, California, already obtain all of their electricity from renewable sources.

Preparing for the annual meeting of the Conference of Mayors, the largest non-partisan organization of cities in the U.S., Mayors Steve Benjamin, of Columbia, and Jackie Biskupski of Salt Lake City, worked on a resolution supporting the goal of obtaining 100% of our energy from clean and renewable sources by 2035. It was passed unanimously at the meeting. Given the bipartisan support and logic of mayors such as Kevin Faulconer, that's not surprising. Prior to the meeting, the Sierra Club released an analysis based on data from the National Renewable Energy Laboratory and Energy Information Administration showing that transitioning the 1,481 Conference-member cities to 100% renewable electricity could shift 42% of U.S. electricity to renewable sources. If completed by 2025, that would bring the U.S. close to its pre-Trump contribution to cutting greenhouse-gas emissions in the Paris Climate Agreement.

U.S mayors are, indeed, ready to work for a clean, renewable-energy future.

Meanwhile, the Sierra Club Vermont Chapter is exploring a campaign to move Vermont through its goal of 90% renewable energy by 2050 to 100% renewable energy. If you are Ready for 100 in Vermont, please email Robb Kidd at Robb.Kidd@SierraClub.Org. If you're interested in Ready for 100 in another Northeast state, contact Ally Samuel at Allyson.Samuell@SierraClub.Org.

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

Addison Gas Project *Cont'd from p.14*

shallower depths in at least some places, three feet in residential areas and five feet under streams.

Acting on a request from Jim Dumont, an attorney in Bristol, Vermont, who represents pipeline opponents, the PUC has now opened an investigation into the burial depth of the pipeline at eighteen locations. The investigation should tell whether the difference actually is insubstantial, as VG claims.

VG does not dispute that the pipeline is not as deep as required. In fact, it has filed a request asking the PUC for a retroactive amendment to the pipeline permit. It claims that the discrepancy in the burial depth was an insubstantial change from the original terms of the permit. In other words, it claims that three feet is close enough to four, and five feet is close enough to seven. VG asserts that the pipeline burial is safe, and makes note of the fact that federal guidelines call for a depth of only three feet.

Dumont has filed a second petition with the PUC. He said he now has evidence that there are many more places where the pipeline trench was too shallow. These will probably also be investigated.

The PUC could find that the pipeline depth is acceptable, as VG asserts it to be. On the other hand, the PUC could levy fines. In a worst case, from VG's point of view, it would require that the pipeline be reburied.

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/furnace

• Custom Rebate $1.25/ft2 of heated space, $25,000 max ($20,000 max for heating system and $5,000 additional incentive if system includes thermal storage, $10/kBtu thermal capacity).

• **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

• Residential PV & wind program and C&I solar program (which includes solar thermal) are closed at least until September 1st.

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 ENERGY STAR guidelines. Incentives include

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.

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 on certain ENERGY STAR- certified LED light bulbs purchased through participating NH retailers, and instant or mail-in rebates available on ENERGY STAR certified light fixtures (varies by retailer, see store associate or rebate form for details).

• Visit www.NHSaves.com/ lighting for more information and rebate form.

PAREI

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

• www.nhsaves.com

NHSAVES Online Store

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

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

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.

STATE CLEAN ENERGY FUNDS

A Driving Force in Renewables Deployment for Over a Decade

By Dana Drugmand

Long before the current emphasis on sub-national leadership in advancing clean energy, some states had created funds dedicated to supporting energy efficiency and renewable energy development. In 2002, a new national nonprofit organization emerged to coordinate and assist these clean energy funds. That organization – the Clean Energy States Alliance (CESA) – works to promote clean energy technologies and markets by bringing together stakeholders and offering technical assistance, information sharing, partnership development and other services.

Now, fifteen years later, CESA remains an influential national, nonprofit member-based organization working to advance clean energy at the state level. It currently consists of 30 member organizations. The following is a brief look at some of the Northeast members.

NEW YORK

Through innovative programs and policies, the State of New York is driving a fundamental shift in its energy system. "Our goal is to build an energy system that's clean, reliable, and affordable," said Janet Joseph, vice president for innovation and strategy at the New York State Energy Research and Development Authority (NYSERDA). The big-picture strategy behind this goal is an initiative called Reforming the Energy Vision (REV). "It is a very substantial transformation of our energy policy framework and our programmatic approach in New York State," Joseph explained.

NYSERDA has been with the Clean Energy States Alliance since the coalition's inception. Like other original members, NYSERDA managed a clean energy fund, created through a ratepayer-supported system benefits charge – a small surcharge on customers' electric bills that goes toward clean energy programs. This surcharge continues to fund the majority of NYSERDA's programs.

These programs cover a wide range of services, technologies, funding mechanisms and research development. Some highlights over the years include a Clean Energy Business Incubator Program, a comprehensive solar initiative called NY Sun that aims to reach over three gigawatts of installed solar capacity in the state by 2023, and Renewable Heat NY that provides incentives for the installment of high-efficiency, low-emission wood heating systems. According to Joseph, current areas of focus include solar, offshore wind, energy storage, and community microgrids.

Joseph, who serves on the CESA board, commended the organization for its role in facilitating informational exchanges between members. "CESA provides a great opportunity to learn from other states and see what's emerging as best practices across the country."

MASSACHUSETTS

Also an original CESA member, Massachusetts is another state making considerable progress in the clean energy transition. Over 100,000 Bay State residents now work in the clean energy sector. The state ranks in the top ten nationwide for installed solar capacity and is first in energy efficiency.

The Massachusetts Clean Energy Center (MassCEC) is at the heart of the renewable energy boom in the Commonwealth. Funding for MassCEC comes from the Renewable Energy Trust Fund, established by the state legislature in 1997. Electric ratepayers support the fund through a system benefit charge.

Over the years, MassCEC has helped support over 1600 MW of clean energy capacity installed through various programs such as renewable heating and cooling, hydropower, Commonwealth Wind, Solarize Mass., and more. Emerging focus areas include offshore wind, energy storage, energy resilience and microgrids, and clean transportation. As MassCEC looks to continue advancing clean energy markets, it also wants to expand the markets' reach. "We want to make sure that as we grow these markets, access to clean energy is not just for the well-off," said Andrew Belden, renewable energy generation senior director.

Belden is also a CESA board member and said he values the collaborative nature of the organization. "Really the value for us is the network, the community of other states," he said.

The Massachusetts Clean Energy Center's Solarize Mass program encourages small-scale solar energy through a group-purchasing system. Photo courtesy of Dana Drugmand.

VERMONT AND NEW HAMPSHIRE

Vermont, through its Clean Energy Development Fund (CEDF), and New Hampshire, through its Renewable Energy Fund, are working to shift to cleaner electricity and heating sources. The New Hampshire fund was established in 2007 with enactment of renewable portfolio standard (RPS) legislation, which requires a specified share of the state's electricity to come from renewable energy sources. The fund offers rebates and grants for renewable thermal and electric technologies. The Vermont Clean Energy Development Fund was created in 2005 and is managed by the Vermont Public Service Department. In the past, CEDF has offered loans supporting various projects ranging from rooftop solar panels, biomass district heating, and anaerobic digesters to small hydropower and 100-kilowatt wind turbines.

Now both funds are focusing heavily on supporting renewable thermal technologies. Vermont's CEDF currently offers rebates for advanced wood pellet boilers and solar hot water systems through its Small-Scale Renewable Energy Incentive Program. New Hampshire's Renewable Energy Fund helped establish a first-in-the-nation rebate program for residential wood pellet heating systems, and the state has added a renewable thermal carve-out to its RPS.

Dana Drugmand is a freelance journalist and environmental advocate. She has worked with Clean Energy States Alliance as a Research Assistant and recently graduated from Vermont Law School with a Master's degree in Environmental Law & Policy.

Utility Programs Can Help Low-Income Customers

Utility programs can help low income customers keep the lights on, but some do better than others

By Ariel Drehobl

The following is an excerpt from an ACEEE blog post, which can be found at http://bit.ly/utilities-helping:

As households ramp up air conditioners to stay cool this summer, many will find themselves with higher energy bills. Paying these bills will be easier for some than for others. Low-income households, who spend on average three times more of their income on energy bills than other households, will undoubtedly find it more difficult to adjust to higher bills in both the summer and winter months.

Many households can address high energy burdens by taking advantage of energy efficiency programs run by their utilities. These programs provide multiple benefits beyond energy and bill savings, such as fewer shut offs, healthier homes, less outdoor pollution, and more local jobs.

To better understand the scope and reach of low-income energy efficiency programs, ACEEE completed a new baseline assessment of the electric and natural gas programs that specifically target low-income households in the largest US cities. The assessment complements previous ACEEE research that explored best practice elements for low-income utility programs. This paper examines total investments in these programs, energy savings impacts, customer participation, and utilization of best practices for more than 70 utilities low-income programs. The paper also includes data tables that chronicle this information for each utility…

To read the report, "Low-Income Energy Efficiency Programs: A Baseline Assessment of Programs Serving the 51 Largest Cities," please visit bit.ly/aceee-baseline.

Ariel Drehobl, Research Analyst, Local Policy, for the American Council for an Energy-Efficient Economy. For information about ACEEE and its programs, publications, and conferences, visit aceee.org

NEW HAMPSHIRE SMALL BUSINESS Energy Audit Fund Grants

By Green Energy Times Staff

The New Hampshire Community Development Finance Authority (CDFA) has announced creation of the Small Business Energy Audit Fund. Most agricultural producers and small businesses in New Hampshire will be eligible for a 75% reduction in the cost of energy audits.

A participant will get a comprehensive energy audit of an existing building. The audit will identify projects that can reduce operating costs or increase productivity, while adding to comfort and safety of those in the building. It will include an estimate of implementation costs, potential energy savings, and expected financial savings, along with return on investment information.

The funds for the energy audits come from the United States Department of Agriculture Rural Energy for America Program (REAP). They are only available to agricultural producers and businesses in communities in rural areas. Rural areas, however, are those that are not in communities with populations over 50,000 or urbanized areas adjacent to such communities. This means that the great majority of areas in New Hampshire are considered rural, for the purposes of the program.

According to the CDFA, a typical audit of the type conducted under the program would cost about $1,000 to $2,000. The typical energy savings for those who have audits done and implement its suggestions is 15% to 50% of costs.

The audits are offered on a non-competitive basis. Applications have to be filled out to make sure those who apply to participate are qualified. The applications usually take only 30 to 45 minutes to fill out, but do require documentation of energy use over a period of one to two years.

It is suggested that those interested talk to both CDFA and an energy auditor to determine the suitability of an audit before going ahead with one. For more information, contact Joe Harrison, Director of Clean Energy Finance at CDFA by phone at (603)717-9123, or by email at jharrison@nhcdfa.org.

The Rivals are Both Scoring Home Runs in Sustainability

Solar hot water system on the roof behind Fenway's home plate at Fenway Stadium in Boston, MA. Photo courtesy of JJ Miller/Boston Red Sox.

Cont'd from p.1

Massachusetts farms where it can be used as high-quality compost.

On the ground level, Fenway is home to single-stream recycling containers, which makes it easy for park guests to recycle. The perimeter surrounding Fenway is lined with Big Belly Solar Trash and Recycling Stations, which are innovative public trash cans that are specifically designed to hold a high amount of waste and consequently reduce the frequent need of fuel-guzzling trash collection vehicles.

You don't have to be a professional athlete or a team owner to be a green energy all-star. Keep exploring this edition of Green Energy Times or visit greenenergytimes.org for more tips on how to make your "home base" more sustainable and efficient.

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

Produce from Fenway Farms is harvested before Red Sox games. Photo courtesy of Erin Kirkland/Boston Red Sox.

Yankee Stadium

An entrance to Yankee Stadium's Great Hall. Photo: public domain.

Not to be outdone by their rivals to the north, the New York Yankees recognized the importance and power of thinking sustainably when building their new stadium in 2009. The team's official website reports that, during the stadium's construction, 75% of the construction waste was diverted from landfills. In terms of architecture, the stadium's Great Hall entranceway utilizes gigantic open-air archways that eliminate the need for air conditioning by facilitating air circulation and natural cooling.

Similar to the Red Sox, the Yankees have adapted their food service practices to make less of an impact on the environment. All disposable cutlery and food-service packaging in Yankee Stadium are made of compostable materials rather than petroleum-based plastics. Over the course of a typical season, Yankee Stadium's kitchens also collect more than 20,000 gallons of cooking oil and recycle it into almost 19,000 gallons of biodiesel fuel.

In 2016, the Yankees made history by becoming just the second team in MLB to install super-efficient LED field lighting in their home ballpark. The LED lighting system saves enough energy to power about 45 homes every day. Overall, Yankee Stadium is considered a "low-carbon-impact-venue" due to its participation in Hess Energy's C-Neutral carbon offsetting program, in which the Yankees compensate for their stadium's greenhouse gas emissions by investing in national and international sustainability projects.

U.S. Bank Stadium: A Touchdown of Sustainable Engineering

West view of U.S. Bank Stadium, home of the Minnesota Vikings. Image from wikipedia.org.

Although it is far too soon for anyone to know which NFL teams will compete in Super Bowl LII, football fans can get psyched up knowing that the upcoming showdown will take place in one of the most sustainable, state-of-the-art, domed stadiums in the country. Opened in 2016, U.S. Bank Stadium in Minneapolis, Minnesota, not only looks futuristic—it also boasts an assortment of green-minded designs and sustainable technology befitting of the twenty-first century.

As reported on the Minnesota Vikings' website, U.S. Bank Stadium is the first NFL venue to be built with an advanced LED lighting system that allows for instant on-and-off capabilities while using 75% less energy compared to metal halide lights.

Although the LED lighting system is impressive, the Vikings plan on minimizing its use by taking advantage of the immense amount of natural lighting that the facility's extraordinary roof provides. More than half of U.S. Bank Stadium's roof covering is made of a clear, plastic-like material called ethylene tetrafluoroethylene (ETFE), which facilitates the use of sunlight as a free year-round source of natural heat and light for the stadium. By using a lightweight building material such as ETFE instead of conventional steel, the Vikings were able to significantly reduce the carbon footprint of the stadium's construction process.

Generally, stadiums built in areas with snowy winters require a lot of steel to support their roofs, however, the shape of U.S. Bank Stadium's roof made it possible to forgo an estimated 2,000 tons of steel. The steep, asymmetrical design allows snow to quickly roll down the roof and into a giant, heated snow gutter that brings the water straight to the stadium's storm water control system.

Low-flow plumbing technology is expected to reduce the U.S. Bank Stadium's water usage by 5.67 million gallons annually.

A Late Summer Variety Pack:

SUSTAINABILITY COMES IN MANY FLAVORS FOR LOCAL BREWERIES, DISTILLERIES AND WINERIES

By Chris Gillespie

The Flying Goose Brew Pub & Grille is NH's first solar-powered brewery. Courtesy photo.

Inspired by some of our favorite summer beverages, we at Green Energy Times decided to put together our own "seasonal sampler" to showcase how different craft brewers and distillers in our own backyard are having success going green. The production of alcoholic beverages presents many opportunities to use and benefit from renewable energy and sustainable methods and, as we found, many local owners are doing just that, each with his or her own unique approach. Cheers!

NEW HAMPSHIRE

Elm City Restaurant & Brewery: Supporting Local Farms and Implementing Responsible Environmental Practices

Located in the Colony Mill in Keene, Elm City Brewing Company has been brewing their award winning beers and serving freshly prepared lunch and dinner since 1995. Commitment to buying local, supporting local farms and caring for the environment plays a major role in the daily operations at the brewpub. The restaurant uses local eggs, milk, produce, meats & cheeses and maple syrup. The coffee is roasted locally at Keene's Prime Roast.

The brewpub reduces waste by limiting packaging in their purchases, composting the preparation food waste, repurposing and recycling. Elm City filters their drinking water and does not sell bottled water. Manning Hill Farm drops off milk in refillable milk jugs. The same goes for the maple syrup containers from Maple Homestead Farms. The malts for the brewing process come in 50 pound grain sacks. The sacks are given to Stonewall Farm for reuse to package its compost. Used fry oil is picked up by a local family to fuel their cars. Elm City uses biodegradable to-go containers and paper bags.

There is no waste, transportation or packaging with the brewery. The beer is made and sold at the brewpub. Beer can be purchased in half gallon refillable containers called Growlers. The left over grain used in the brewing process is picked up by Manning Hill Farm when they deliver their milk and pick up the used milk bottles. They use the nutritious grain to feed their livestock.

Elm City purchases power from renewable resources to further its commitment to sustainability.

www.elmcitybrewing.com

Flag Hill: Using Less to Gain More

For Flag Hill in Lee, New Hampshire, implementing sustainable practices "just makes sense," according to Flag Hill owner Brian Ferguson.

Flag Hill is home to a vineyard, winery and distillery, as well as function halls. As Ferguson explained in a recent interview with Green Energy Times, a focus on sustainability has allowed him to keep his costs down as a small business owner. As they have found at Flag Hill, byproducts of one of their processes can actually be used to benefit a separate process.

For instance, Flag Hill grows their own grain, a practice that allows them to maintain high-quality product while eliminating additional transportation and energy costs. Once the locally sourced grain has been processed through the distillery, the team at Flag Hills uses the byproduct to feed their farm animals and for composting.

In addition to serving as a central point of their business, Flag Hill's distillery also plays a significant role in how the facility is heated. Using a computerized heat recovery system, Flag Hill recaptures the heat that is created during the distillation process and redirects it to the domestic hot water tank, where the hot water can be used in their kitchen's dishwasher. By recovering the heat in this way, Flag Hill reduces the amount of oil that they burn and the amount of water that they pull out of the ground, all while minimizing costs.

Since 2013, Flag Hill has also offered a "Bottle Buy-Back" program, which encourages patrons to return their empty Flag Hill liquor bottles to Flag Hill's headquarters in exchange for store credit.

www.flaghill.wine

Flying Goose Brew Pub & Grille: Making History and Brews

The Flying Goose Brew Pub & Grille in New London, NH offers over seventeen handcrafted beers and a wide variety of family-friendly meals, all served in a rustic, yet energy efficient homestead that overlooks rolling green hills and The Flying Goose's shimmering 41.4 kW solar photovoltaic array.

Founded in 1993 as a restaurant, the Flying Goose opened its brewery in 1996. In 2011, The Flying Goose made history by becoming the first brewery in the state of New Hampshire to utilize solar power and earned the town of New London's Sustainable Business of the Year award. The array itself yields approximately a third of the Flying Goose's energy needs.

In addition to the array, the Flying Goose also has 500 square feet of solar panels attached to the pub's roof that generate enough energy to heat nearly half of the restaurant and brewery's combined hot water needs. The rooftop array works in conjunction with a fully automatic wood pellet boiler that generates heat during the times when the solar energy is not enough.

"Even when the sun's not producing, we're still producing carbon-free energy," Flying Goose owner Tom Mills recently told GET, adding that the carbon footprint of the wood pellet system is equal to that of a single tree decomposing in the woods.

As a small business owner, Mills has described Flying Goose's switch to renewable energy as "a no-brainer," citing the relatively quick return on investment and the various environmental benefits. He says that the Flying Goose is also looking into how to use the wastewater from their brewery to irrigate their hop garden. They are also exploring the idea of installing a wind turbine on the property.

www.flyinggoose.com

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MASSACHUSETTS

Barrington Brewery Celebrates a Decade of Solar Power with More Solar Power

Barrington Brewery's new solar PV system will produce 168,000 kilowatt hours annually. The 144kW PV system consists of 480 panels. Courtesy photo.

In 2007, Barrington Brewery & Restaurant of Great Barrington, Massachusetts installed a 30-panel, solar hot water system on their roof and decreased their use of natural gas by 50%. The system meets the hot water needs of the brewery, as well as the demands of the sinks and dishwashers in both the restaurant and their banquet facility, Crissey Farm Banquet House.

On the ten year anniversary of this achievement, Barrington Brewery is significantly increasing their commitment to renewable energy with what co-owner Gary Happ describes as "the crown jewel of our greenness": a 480-panel, 144 kW photovoltaic system.

As announced in a press release from this spring, Barrington Brewery's new system will produce 168,000 kilowatt hours annually, providing 85% of both facilities' energy needs. Based on data compiled by international solar energy advocates Solarplaza in November 2016, Barrington Brewery's immense utilization of solar energy places them alongside the Top 20 Most Solar-Powered Breweries in the world. Guests stopping by to try one or more of Barrington Brewery's twenty-plus homemade beers can view the photovoltaic array on the north side of the restaurant's parking lot.

"We are on the front lines of environmental stewardship and [the] forefront of sustainable brewery initiatives," said Barrington Brewery co-owner Andrew Mankin in the press release.

According to their website, in addition to their great success with solar power, Barrington Brewery also embraces sustainability by using the brewery's spent grain to feed local cows and recycling all of their paper, cardboard, cans and glass.

www.barringtonbrewery.net

Bicycles and Brews at The People's Pint

At The People's Pint in Greenfield, Massachusetts, riding your bike to dinner has two meanings.

Since 2003, The People's Pint has offered their Bike to Live program, which encourages patrons to ride their bikes instead of driving vehicles when possible. Participants in the program must log the miles that they commute on their bikes and, after their first 100 miles, they receive a $25 gift card to The People's Pint's restaurant. After that, participants receive a one dollar credit for every 20 miles that they forgo their cars. As noted on The People's Pint's website, Bike to Live's members have traveled over 63,000 miles on their bicycles.

Along with Bike to Live, The People's Pint also advocates for reducing transportation-related carbon emissions through their partnership with MassBike, an organization that works to make bicycling more accessible and prevalent in Bay State communities. A percentage of The People's Pint's sales from their American Session Ale called Training Wheels go directly to MassBike.

In addition to their love of bicycles, The People's Pint is equally passionate about reducing the amount of waste that they produce. In fact, according to their website, even on their busiest nights, they do not dispose of more than one barrel of trash. The team accomplishes this by only using a minimum of paper products, composting all kitchen and dining room food scraps and recycling all plastic, cardboard, paper, glass and metal.

www.thepeoplespint.com

VERMONT

PurposeEnergy Helps South Burlington Brewery Do Magic

For nearly two years, PurposeEnergy from Woburn, Massachusetts has helped Magic Hat Brewing Company in South Burlington, VT reduce its energy consumption and purify their wastewater using their signature Tribrid Bioreactor.

As reported in the October 2015 edition of Green Energy Times, Magic Hat yields between nine and 150 gallons of byproduct wastewater for each barrel of beer they produce. PurposeEnergy's Tribrid Bioreactor takes all of this wastewater and removes the pollutants and organic waste from it and then turns that organic waste into biogas-derived electricity and high-nutrient fertilizer. Magic Hat then uses the bio-gas-derived electricity to satisfy between 30 and 40% of the brewery's electricity requirements while local farmers use the fertilizer to grow corn and beans. The newly-cleaned water leaves the facility and returns to the Lake Champlain watershed with significantly fewer pollutants, all thanks to the magic of PurposeEnergy's Tribrid Bioreactor.

www.purposeenergy.com

Rock Art Brewery Goes Solar

Rock Art Brewery became VT's first 100% solar-powered brewery in 2017. Courtesy photo.

Rock Art Brewery in Morrisville, VT made state history this year when it became the first brewery in Vermont to switch to one hundred percent solar energy. Starting this summer, all of the beer that the 20 year-old, family-owned brewery produces will be powered by a 200 panel, 67 kW solar grid. Rock Art is celebrating the occasion with a new, limited edition IPA called SunRocked.

"Beer brewing and packaging uses a lot of energy," said Rock Art Brewery co-owner Matt Nadeau in a recent press release. "We're always looking for ways to reduce our environmental impact and solar was a perfect fit. We can run our machinery on the sun—why not?"

Rock Art's commitment to renewable energy has gained them statewide attention, including from Melissa Corbin, the Executive Director of the Vermont Brewers Association, who has

Cont'd on p.35

David vs. Goliath: Radiant vs. Forced Air Heating

By Steve Swanson

Currently in the U.S., 95% of all new homes are built with forced-air heating systems (the other 5% are built with hydronic heating or electric heat). This is a classic David and Goliath situation. Now, just from the numbers, you would think forced air is a superior or better method for conditioning a home. Maybe not though. A brief history of heating may help.

Our country started heating its homes with wood, wood fireplaces in particular. In 1741, Benjamin Franklin invented the Franklin Stove that surrounded the fire with cast iron that greatly increased the heat output and reduced the smoke that came into the home. It also stopped many homes from spontaneously combusting which greatly helped our country grow in numbers. New designs followed that added a cook stove to the fireplace, so now people could heat their homes and cook their meals all in one unit. Clever.

By the second half of the 1800s, cast iron radiators showed up on the scene with boilers in the basement fueled by coal and, for the first time, coal surpassed wood as the fuel of choice. Unfortunately, the boilers didn't have the safety features that today's equipment has and they had the peculiar habit of relocating themselves due to boiler explosions — meaning perhaps to the opposite side of the city. Occasionally, in the late 1800s, you would be walking down the sidewalk minding your own business and you might see a boiler launch out of a house and relocate itself to another community. Not good for business.

Then along came Dave Lennox in 1885 who invented the first coal-fired furnace that used coal as a heat source. They didn't have fans, because they didn't have electricity, so the first furnaces relied on convection heat through gigantic ducts to carry heat around the house. The ducts often took as much space as the house itself. But, at least the furnaces stayed in the house.

In the 1930s, furnaces began incorporating electric fans which greatly reduced duct sizing and improved efficiency. Oil and gas-fired furnaces replaced coal because nobody wanted to go down into the coal bin in the middle of the night to shovel half a ton of coal into the coal feeder. This, in turn, resulted in a significant decrease in the divorce rate around the U.S. and all hailed it as a marvel of engineering, which brings us to today.

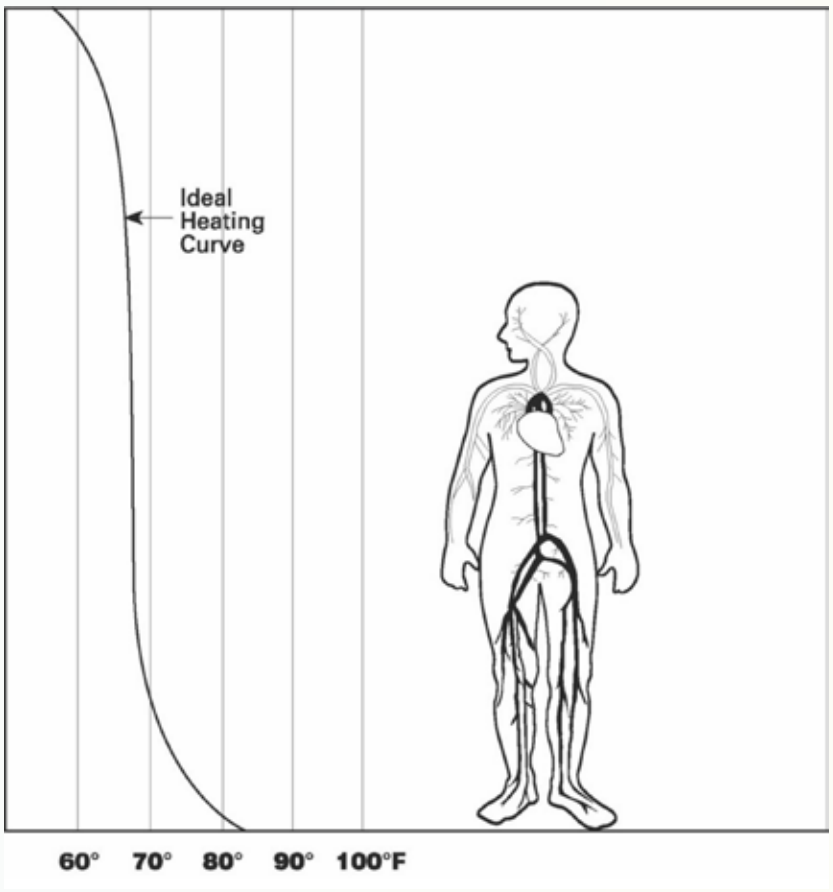

Figure 1: Ideal Comfort Curve

The problem with forced air is that it is "forced" air. The name itself should be a tipoff that something isn't right. And it's true. Air is a horrible conductor of heat. Water can carry 3,500 times more energy than the same amount of air. In an age of sustainability and concern for energy usage, using air to move heat is like picking up your groceries with a semi-truck. And that isn't even the whole issue.

Air, when you heat it, has a tendency to rise. Up to the ceiling. Terrific. Now my ceiling is toasty and my toes are frosty. This is the story of forced-air homes. Every forced air home I have ever been in has one thing in common: a blanket on the couch. Why? Because hot air rises and cold air sinks. Your couch is sitting in the sink area and you feel colder. So you put on a blanket.

Now why in the world would you need a blanket to keep you warm in your own living room? Isn't that the job of the furnace and the thermostat? Which reminds me. Where is the thermostat anyway? Oh, that's right. It's in the hallway. Where no one lives. Our houses have one thermostat and my car has three. One for the driver, one for the passenger and one for the back seat. Go figure. Let me show you something else.

Way back in the 1940s, the Bell & Gossett Company studied thousands of people to determine what made them comfortable (not counting two weeks in Hawaii). From that came what we know today as the ideal comfort curve (see Figure 1). This is the temperature comfort curve for more than 95% of people.

As you can see from the graph, if our feet were at about 73°F and our head was at about 68°F, 95% of most people would be comfortable. (The other 5% are like my Aunt Lucy who just like to complain.)

Now if we compare the ideal comfort curve to the heat output of both a forced-air system and a radiant system, we will see something very revealing (see Figure 2).

The ideal comfort curve

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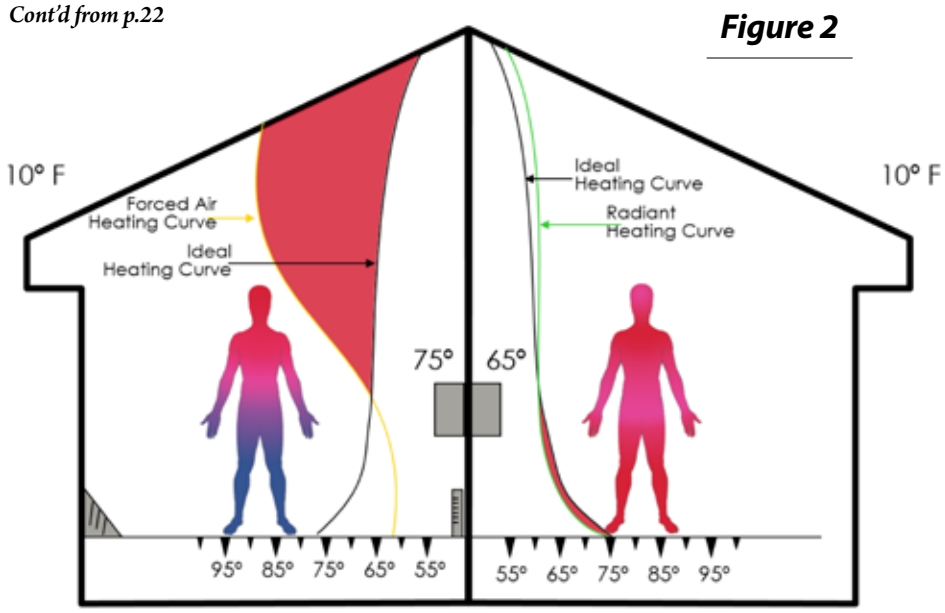
Figure 2



Ideal Comfort Curve Forced-air Versus Radiant Comparison

would like my toes to be at 73°F and my head to be at 68°F. Instead, with forced-air heat, my feet are at 63°F and my head is exploding. Forced-air heat provides not enough heat where I need it and too much where I don't need it. So, to compensate, people put carpet on the floor and ceiling fans on the ceiling.

Wherever the real curve is outside of the ideal curve you are wasting energy and you feel less comfortable. The wider the difference, the worse it is. And yet radiant heat is almost identical to the ideal comfort curve!

Now, you're probably saying to yourself, "What about the extra cost of installing radiant heating and what about air conditioning?" Well, one way or another, you are going to pay for a radiant heating system. You are either going to pay for it up front and enjoy the enormous comfort difference, or you are going to pay for it later due to higher energy bills. It's that simple. And as for air conditioning, I'll save that one for another day.

Happy heating!

Steve Swanson is the national trainer at Uponor Academy. He actively welcomes readers' comments and can be reached at steve.swanson@uponor.com.

NH Solar Shares

Cont'd from p.12

and maximize this opportunity," said Patrick Tufts, President and CEO of Granite United Way.

"NH Solar Shares is seeking pioneer donors and volunteers who will get behind this new concept and get involved with the effort," said Sandra Jones, Co-Director of PAREI and Interim Manager of NH Solar Shares. "A donation to this cause is a 'power full' one, it helps the environment, it increases the percentage of renewable energy on our local electrical grid and it produces a gift to our local families every hour the sun shines for the next 25 years!"

NH Solar Shares was recently awarded a $75,000 CDFA Business Tax Credit Grant. This means NH businesses can donate to NH Solar Shares and receive a tax credit (ie: business enterprise tax) equal to 75% of their contribution. Businesses can pledge their support directly at www.nhcdfa.org/taxcredits/current-projects

Interested donors, volunteers or community groups wanting to assist with fundraising and hosting solar arrays are encouraged to contact Sandra Jones, NH Solar Shares, PO Box 753 79 Highland Street Plymouth, NH 03264; 603-536-5030 sandra@plymouthenergy.org NH Solar Shares LLC is a wholly owned subsidiary of the Plymouth Area Renewable Energy Initiative - a 501(C)3 not-for-profit tax-exempt charitable organization.

Solar Shares recently launched a Go Fund Me site at http://bit.ly/2wwPvfF. For more information visit www.nhsolar-shares.org

NH Solar Shares

Ticks, Diseases, and Climate Change

By George Harvey

I spent an appreciable part of my childhood at a house in the southwest corner of New Hampshire. In those days, sixty years ago, we had a lot of mosquitoes. In fact, we could not go out in good weather without having two or three buzzing about our heads. We often had bug repellent on us, though it did not seem all that effective.

We also had swallows, which made their living by eating the mosquitoes. Their flocks settled at certain times of day on the telephone wires in front of the house. We could easily see four telephone poles in front of the house, and the swallows covered the wires, about six inches apart, over the lengths of wire running from one to the next.

There were other things we did not have. They included ticks, Lyme disease, and mosquito-born illness.

By the time my children lived in that same house, we had noticeably fewer swallows. But we did have ticks in the area.

By the time I moved to Vermont, in 2004, there were nearly no swallows left at the old family home. But with the ticks, people were getting tick-borne illnesses. In addition to Lyme disease, there is babesiosis, which mimics malaria pretty well, among others. We also increasingly see mosquito-borne diseases, including eastern equine encephalitis and West Nile virus, which had not been here. Arguably, all of these are impelled by climate change.

These are anecdotal evidence of climate change. We have many others. But in 2003, compelling scientific evidence of climate change arrived with a new hardiness zone map.

Hardiness zone maps divide the country into zones according to the coldest normal winter temperatures. All locations with their coldest nights normally in the range of -20° F to -30° F are in zone 4; those whose coldest nights are normally in the range of -10° F to -20° F are in zone 5, and so on.

It happens that the coldest night of the year is the very time most sensitive to climate change. An increase of one degree in the average temperature through the year can be reflected by an increase of five degrees in the temperature of the coldest night.

Perhaps this is the real cause of Lyme disease. Photo: downtowngal, Wikimedia Commons.

In 2003, the American Horticultural Society produced a draft hardiness zone map for the United States Department of Agriculture (USDA). When the 2003 draft map was compared to the 1990 map then in use, it quickly became clear that the zones had all moved north. In fact, nearly half the country was in the next warmer zone than it had been. The change implied that the coldest nights of winters were generally nearly 5° F warmer than they had been only thirteen years earlier.

Nevertheless, the Department of Agriculture, which had commissioned the new map, decided to continue using the old one.

Now, in 2017, warming has continued. In some states, nearly all locations are in the next warmer zone than they had been in 1990. Almost all of Kentucky has changed, but Vermont is not far behind. Maps showing the changes up to 2015 can be found at bit.ly/arborday-zone-changes.

The maps are published for landscapers, gardeners, and farmers to help them decide what perennial plants to plant. But their data can also be used to tell us what pests will survive the winter and what diseases plants and animals, including human beings, are likely to get.

According to "Lyme On The Rise: A Look At The Numbers," a story published in 2014 by VPR, there were a total of 94 confirmed cases of Lyme disease in Maine, New Hampshire, and Vermont in 1999. (bit.ly/VPR-Lyme-disease). The number rose to 2,273 confirmed cases in 2012. Some public health experts believe only about 10% of the cases of Lyme disease are reported. That could be a major problem, because the disease can be a chronic challenge unless it is treated properly.

The list of diseases on the move is not limited to Lyme disease, babesiosis, West Nile virus, and eastern equine encephalitis. Other are moving north with warmer temperatures.

This year is expected to be one of the worst on record for Lyme disease in parts of New England. It would be wise to continue caution on Lyme disease even after cold weather arrives. While the rate of infection of many diseases declines, it is still possible to get Lyme disease in the winter. It is important with Lyme disease, and with the other diseases, to get proper treatment.

One thing that is often forgotten is that in this public health problem, an underlying cause is climate change. And this is caused by the over-use of fossil fuels. Do you want to slow the progress of Lyme disease and other health problems? You might start by looking at your consumption of fossil fuels.

Climate Change and the Water Cycle *E-BOOK BY CLIMATE REALITY PROJECT*

By Rick Wackernagel

The Climate Reality Project recently released an e-book "Climate Change and the Water Cycle: Four Big Questions Answered." In writing this e-book, the author shows good instincts but falls short in executing some of them.

The e-book proposes to explain the sometimes counter-intuitive impacts of global warming on Earth's water cycle. This is a worthy goal. We don't have a brief, simple and accurate explanation.

The four questions posed are good, seeking explanations for increases in rainfall, drought, extreme weather and wildfires.

The e-book appropriately ends with a call to action, and recognition that we can manage climate change and ease its effects.

While the overall organization is good, some of the individual sections are poorly organized. They digress, and sometimes are hard to follow.

Answering the question, "What does climate change have to do with hurricanes and typhoons?", the e-book jumps from storms picking up more energy, from warmer oceans, to storms having intense winds and very heavy rainfall, without saying that more energy produces stronger winds. After identifying effects of stronger storms and expectations for the future, the book explains that hurricanes and typhoons are both strong tropical cyclones fed by heat from the ocean. This explanation would have helped readers more if it had preceded the statement about storms picking up more energy from warmer oceans. The book then jumps into sea-level rise and its potential impacts on coastal areas, in which the world's largest cities are concentrated. It doesn't mention that more water in the oceans and less in glaciers represents a change in Earth's water cycle.

Cyclone Catarina, from the International Space Station on March 26, 2004. This was the first hurricane ever observed on the South Atlantic Ocean. The climate is changing. NASA image

A good infographic summarizes some effects of climate change on the water cycle. It is not explained, however, so does less to improve readers' understanding than it could.

The e-book more often describes what changes occur than how or why the changes occur. For example, it does not explain why, with increased moisture in Earth's atmosphere, rains become less frequent but heavier.

The primary explanation given for drought is that rain will be heavier and less frequent. In heavy-rainfall events, rain will fall faster than it can infiltrate into the soil, so more will run off rather than recharging soil moisture. The impact of global warming on the distribution of rainfall is not mentioned, however. Atmospheric circulation has been transporting moisture from the subtropics into middle-latitude regions. Global warming will displace this circulation pattern poleward, expanding the subtropical area from which moisture is drawn. Warmer temperatures will increase evaporation in these subtropical areas, making them more droughty.

Other sources provide better, though more technical, explanations of changes in the water cycle. "Will the Wet Get Wetter and the Dry Drier?", from the Geophysical Fluid Dynamics Laboratory, outlines projected changes in precipitation through the rest of the century, as well as explaining why the changes occur. "Water Cycles and Climate Change," by Kevin Trenberth says that global warming will increase the moisture-holding capacity of the atmosphere more than it increases evaporation. This imbalance leads to less frequent and heavier rain and snowfall events.

Climate change will indeed have important impacts on Earth's water cycle. Heavy rainfall events and sea-level rise will cause more flooding, destroying crops, other property and infrastructure. Drier droughts over larger areas will wreak their havoc with agriculture. People will respond by migrating to moister areas. All these impacts can be lessened by reducing greenhouse-gas emissions. Expanding understanding of the water cycle will help us make this a goal and achieve it.

Rick Wachemagel is an itinerant climate activist and former extension farm-management specialist from Burlington, VT.

Be Grateful for Global Society

Climate Forecast:
"Expect temperatures above average into fall."

By Dr. Alan K. Betts

Our cool season garden has grown well in June and July with so much rain. By the summer solstice, the last of the head lettuce that had wintered over was gone, but many more rows planted this spring headed up as the weather warmed. By late June we were eating broccoli every night and then peas; delicious with chard and shiitake mushrooms from the Rutland Farmers Market. It has been very satisfying to localize our food supply in the past ten years and to share some of what we grow with others.

This past week, I have been at the European Weather Centre in England, discussing the improvements they have made with their global forecast model and strategizing on the next developments. I have been working with them for thirty years, and it is always a delight to come to an international institution with clear goals that is run by scientists with little political interference. Not surprisingly, their forecasts have been the best in the world for decades. They are systematically taking on the responsibility of analyzing all the global environmental data, identifying weather extremes as they occur daily, forecasting floods on a global scale and calculating the sources, sinks and transports of CO2 around the globe.

On July 1, Vermont had major flooding once again, while Maine experienced five tornadoes.

Here in the U.S., NOAA struggles with political interference, which has often squeezed budgets and personnel. A few weeks ago, I read about a threat to cut funding for hurricane forecasting. Perhaps the supreme leader is dreaming of building a Great Wall to keep hurricanes out? Our current administration is of course annoyed that NOAA's climate simulations don't support their "alternative facts." The new EPA administrator, Scott Pruitt, living in a dream world, says that he "does not agree that carbon dioxide is the primary driver of global warming." I doubt he has looked at the science that shows that if you remove all that pesky carbon dioxide from climate models, the Earth quickly freezes over! Fortunately, hurricane forecasts from the European Centre model are steadily improving, as they couple atmosphere and oceans more tightly on ever finer scales.

Of course, this administration came in with the confused notion of demolishing as much of the federal government as possible, and they are succeeding by making it simply dysfunctional. This is a pathetic reminder of how doctrinal interference with science weakened the Soviet Union fifty years ago. There is nothing here that will make America great again: it will simply speed up the coming implosion, unless we the people wake up and act soon.

Fortunately, this is happening across America as cities and states are taking responsibility for climate change and the transformation of our energy system. Fourteen states, including Vermont, have joined the U.S. Climate Alliance to uphold the commitments of the 2015 Paris agreement. In New England, we have a good chance to address together the issues of sustainability and social justice, and implement useful long-term strategies. But it will require a lot of effort.

The people will have to lead, because the national Republican and Democratic parties are too mired in past doctrine and indebted to wealthy interests. Pay attention to the radical change that just happened in France. There a democratic revolution replaced the old left and right political parties in a single year with a new visionary political party and president. If climate scientists are fired in the United States, France has offered them jobs!

We live in a global world where we can be grateful that others take their responsibilities seriously. The new global analysis from the European Centre, which goes back forty years, will be freely available to all scientists to help us understand our changing climate. We need to understand how and why heavy rain, flash flooding and more severe storms are becoming more frequent as the climate changes. On July 1st, Vermont had major flooding once again, while Maine experienced five tornados. The good Vermont news was that the recently finished flood diversion culvert under U.S. Route 7 built to protect Brandon, VT after Irene saved the town from another disastrous flood. Across the U.S., however, extreme weather and climate disasters caused $53 billion in economic damage in 2016.

But despite all our rain this summer, my year's supply of garlic is harvested and dry. When I get home, there are potatoes to be dug, and no doubt prolific squash and tomatoes..

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

Vermont Research Climate Change News

VT Climate Action Commission, Outbreak of Tent Caterpillars, and Rediscovery of Winged Loosestrife

By Kirsti Blow, Center for Research on Vermont

Following 14 states' creation of the U.S. Climate Alliance in a vow to uphold the 2015 Paris Agreement, Governor Phil Scott has established a Vermont offshoot—the Vermont Climate Action Commission.

Composed of 21 members, four of whom work for Scott—and none of whom were on former Governor Shumlin's previous climate cabinet—the commission's main objectives will likely be to enforce tax credits or sales tax exemptions on electric and hybrid vehicles.

Scott vehemently rejects carbon taxes and the expansion of wind energy, instead prioritizing affordability and growing Vermont's economy and businesses. Still, he has expressed a desire to maintain Shumlin's lofty goal of running the state on 90 percent renewable energy by 2050.

A crucial component of the state's economy, however, is currently under siege—an outbreak of forest tent caterpillars is ravaging northeastern Vermont's sugar maples. The caterpillars feast on the leaves, reducing tree growth and affecting maple tapping—an $140-million-dollar industry each year.

Sugar-makers emphasize the fiscal importance of a healthy stock of sugar maples. Every lost tree represents a lost tap, which spells doom for annual revenue in years to come.

Last year, the caterpillars defoliated 25,000 acres of Vermont's forests. Most trees can survive defoliation, even through repeated attacks—but an exceptionally persistent outbreak could leave trees at risk of mortality.

Because forest tent caterpillars are a native species, forests are able to naturally regulate populations in a cyclical fashion, threatening them with virus, fungus, and a "friendly fly" species that preys on the caterpillars.

If old patterns remain true, the population surge should recede within a year or two, but not before temporarily increasing in magnitude.

Above: Forest tent caterpillar. wikipedia.org; below: Winged loosestrife. Wikimedia Commons.

Landowners in northeastern and north-central Vermont treated roughly 3,600 acres of forest in mid-May to early June, while the caterpillars were feeding, as a precautionary measure. It remains to be seen whether their efforts paid off.

All is not lost for the state's plants, though—in fact, a recent rediscovery of winged loosestrife in Monkton has ignited hope for an improving ecosystem.

Winged loosestrife was considered to be extirpated in the state due to unfit climatic conditions until two botanists stumbled upon it while hiking in the Raven Ridge Natural Area. The plant, a cousin of the more common purple loosestrife, had not been witnessed in Vermont since 1979. Before that, it had only been spotted eight times on record.

Nectar-collecting insects, especially bumblebees, can benefit from its return to the ecosystem, with the plant's multiple flowering stems providing a valuable source. Considering rusty patched bumblebees' perilous status as an endangered species, the presence of nectar-rich plants is more important than ever.

As the summer comes to a close and the vibrant plants dotting the landscape fade and morph with the seasons, micro-ecosystems will undergo nearly imperceptible changes in response. Time will tell whether the state's sugar maples will explode into their typical fiery foliage, and whether winged loosestrife will make its comeback in other corners of Vermont.

Kirsti Blow is a junior 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 musician in the Burlington area.

Are You Scared Yet?

Cont'd from p.1

City Climate Change, photo by kwest. Image: Shutterstock.com

ever. One place it is expressed is an article in *Slate* (http://bit.ly/not-alarmed-enough). It projected a truly dire future, saying, "New York Magazine's global-warming horror story isn't too scary. It's not scary enough."

Of course, the question is what to believe. Perhaps the first thing is to look at the claims in the original article.

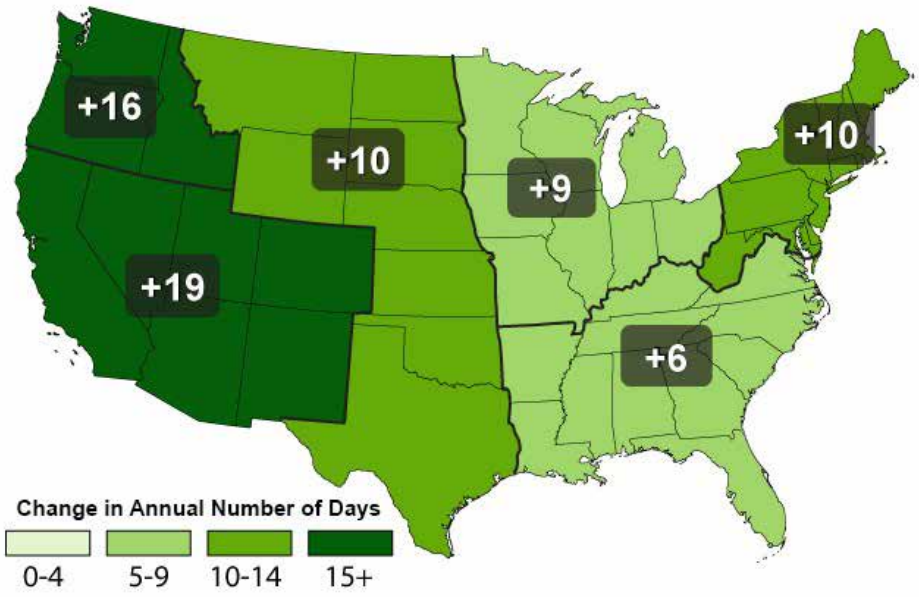
We should start by noting that the overwhelming majority of climate and weather scientists agree not only that climate change is happening, but that it will continue for decades after we stop emitting carbon dioxide. While they disagree on how many decades, estimates range from over two to over ten. So as bad as things are getting (on which, more later) they will continue to get worse for over twenty years from the time we stop burning fossil fuels. That will be twenty to over a hundred years of damage we cannot prevent and do not know how to undo.

One thing that the UE points out, and this is quite certainly true, is that while the Earth has warmed and cooled many times before, the highest temperature ranges on the planet are already high enough to kill people. Since climate change is expected to increase the areas subjected to such heat, the numbers of people at risk will probably increase dramatically. How dramatically? Possibly climate change will put half of all people at risk of death from heat alone. UE says this:

"Since 1980, the planet has experienced a 50-fold increase in the number of places experiencing dangerous or extreme heat; a bigger increase is to come. The five warmest summers in Europe since 1500 have all occurred since 2002, and soon, the [Intergovernmental Panel on Climate Change] warns, simply being outdoors that time of year will be unhealthy for much of the globe."

The current age is referred to as the "sixth extinction" or "Anthropocene extinction." Though it is driven in part by a broad range of things, its greatest impulse comes from pollution in general and specifically greenhouse gas pollution driving climate change.

This extinction is already far worse than most people realize. The Royal Society for the Protection of Birds did a study that found a 70% decline in seabird populations had already taken place over a sixty year period. The World Wildlife Fund (WWF) did a study of all wildlife, worldwide, and found that the populations had already declined by 60% over the last forty years.



Regional average length of frost-free season for 1991-2012 compared to 1900-1960. Adapted from Melillo et al. (2014), Climate Change Impacts in the United States.

I called the WWF on their study, because I wanted to know what types of species they were evaluating as wildlife. I was told it was all vertebrates; so 60% of all fish, amphibians, reptiles, birds, and mammals that we had forty years ago are gone. I also asked about numbers they had provided on extinction of species, and a scientist told me that we are losing another species about every ten minutes.

UE has this to say about extinction events, with a special mention of the Permian-Triassic extinction event, to which it compares the present age:

"The most notorious was 252 million years ago; it began when carbon warmed the planet by five degrees, accelerated when that warming triggered the release of methane in the Arctic, and ended with 97 percent of all life on Earth dead."

If the author is correct that we are headed toward a similar extinction, and many scientists believe he is, we could be facing the loss of a wide array of animals we prize. They include not only the American Bald Eagle and Baltimore oriole, which the Audubon Society has long warned could be put at risk, but just about any other species you might want to see survive, including human beings. Yes, it is even our own survival that is at stake.

There are scientists who say the age we are in will not be so devastating as the Permian-Triassic event. On the other hand, the change in temperature that we are experiencing is many times as fast as the one that precipitated that event.

The UE article said, "The mass extinction we are now living through has only just begun; so much more dying is coming." Perhaps we should look at where we are, though as we do, we should understand that nearly all scientists agree that things will almost certainly get worse. These are things that we can see, but which the UE article did not focus on.

One of the most interesting evidences of climate change is a map produced by the Environmental Protection Agency showing changes in the lengths of growing seasons in the last 120 years. With the exceptions of six states in the Southeast, every state has a longer growing season by ten to forty days. In New England and New York, the growing season was ten days longer in 2012 than it was in 1991. Its length has continued to increase.

That might seem like good news. But, as the growing season has lengthened, so have the active seasons of pests, including disease vectors. Two such vectors are white-footed mice and deer ticks which carry Lyme disease, babesiosis, and other diseases. The Center for Disease Control did a study of 100 ticks found in New Jersey and found 55% were carrying at least one disease. Mosquitoes are also important vectors that are already bringing other diseases to regions of the Northeast.

Vermont is reporting hundreds of new cases of Lyme disease each year, with an estimate that only 10% are reported. There are also regular reports of eastern equine encephalitis and West Nile virus. None of these was being reported only thirty years ago, and all appear to be impelled by climate change.

Moose, whose ranges never had ticks in it and who never had a reason to develop an instinct to groom for them, are now being bled to death by tick infestations. The WWF is worried that moose might be extirpated, rendered locally extinct, in Vermont.

It is not just animals, but also plants that are at risk. A set of infestations of insects, fungi, viruses, and other pathogens put nearly all of the Northeast's favorite species habitats at risk, with pressure on nearly all species we see in the woods now, including all of those that give us fall colors. The Vermont Agency of Natural Resources has proposed identifying refugia for some habitats. In the case of mountain ridgelines, this would entail identifying mountains high enough that climate change will not soon push upland species off as deciduous woods encroach on them, in the hope that someday we can set things straight again.

The damage that is being done by climate change is already happening. It is costing people in our country a great deal of money. Flood insurance costs have risen about seven times as fast as we would expect, unless we factor in climate change. Droughts, tornadoes, hurricanes, other wind storms, ice storms (which can, in fact, be caused by climate change), and wild fires, are all costing more at extraordinary rates each year.

How bad can it be? Some scientists' warnings go far beyond having to spend billions of dollars protecting coastal cities. The last time the Earth was four degrees warmer than it is, ocean levels were hundreds of feet higher than they are. At that rate, not only would Miami be lost, but so would the rest of Florida and so would nearly all coastal cities. Even many inland cities would be untenable. Agricultural regions would be useless for their current crops.

The good news is that we have every resource we need to replace fossil fuels with more environmentally-friendly sources of power, stopping climate change. The good news includes the fact that if we do so, it will save human lives that are being lost to outdoor pollution about every ten seconds. But in order to get to the good news, we have to act. Passivity will certainly destroy us.

As pessimistic sounding as it is, even the UE article has good news. After detailing so much that can go wrong, it says:

"But climate scientists have a strange kind of faith: We will find a way to forestall radical warming, they say, because we must."

We can supply the scary movie with an alternate plot ending. And when we see that, we are all in this together, we shall, I believe, do so.

For a more hopeful view of climate change, please see the article "Positive Disruption – Hope from RMI," on page 27 of this issue of Green Energy Times.

Audubon's oriole, photo by Don Faulkner, Wikimedia Commons

OK, US Government – See You in Court

By James Hansen and Sophie Kivlehan

Dr. James Hansen. Image: Flickr

We are a 76-year-old grandfather and his oldest grandchild, who just graduated from high school in Pennsylvania. We are among 22 plaintiffs in a lawsuit filed by Our Children's Trust on behalf of young people and future generations against the federal government.

The suit willl show that the government, by authorizing and subsidizing production, transport, and burning of fossil fuels, is substantially responsible for growing climate disruptions that could lead to irreparable harm to young people. These federal actions, we assert, violate young people's constitutional rights to life, liberty, property, and equal protection of the law.

The reality and intergenerational nature of human-made climate change are undeniable. It takes decades and centuries for the ocean to warm and ice sheets to melt in response to changes of atmospheric composition. Benefits of burning fossil fuels occur today, but the principal climate effects will be felt by young people and their offspring.

If high fossil fuel emissions continue, eventual effects include loss of coastal cities on time scales as short as 50 to 150 years. (bit.ly/losing-cities) Regional climate extremes are already increasing. Growing numbers of climate refugees are a harbinger of the future, if we let low latitudes become too hot for outdoor activity.

We expect to win the lawsuit, but that will not be enough. We could win the battle in court, but lose the war. Indeed, unless the public understands the situation, and asserts its potential to use the democratic process, young people will be consigned to diminishing prospects for their future.

Civil rights provide a relevant example. The Supreme Court ruled in 1954, in Brown v. Board of Education, that segregation was unconstitutional. Yet the government dithered. Only with public outrage in the 1960s did the civil rights war begin to be won.

A similar delay in the climate case would be deadly. Continued high emissions for decades will lock in a warmer ocean, likely pushing the system beyond a point of no return, as the warmer ocean melts the ice shelves around Antarctica and Greenland. Loss of coastal cities would become likely. Other climate disruptions would be magnified.

Our well-oiled, coal-fired Congress and president, predictably, will try to dither. The court may require "all deliberate speed," as it did with civil rights, but it cannot usurp roles of the executive and legislative branches. It may even require the president to report on progress in reducing emissions. But that guarantees almost nothing about solving the global climate problem.

The fundamental fact is that as long as fossil fuels are cheap, as long as they are not required to pay their costs to society, somebody will burn them. The United States alone has the leverage to address the global issue, but the court cannot order that.

The economics is not rocket science. The price of fossil fuels should be made to rise steadily by collecting a rising carbon fee from fossil fuel companies at the domestic mine or port of entry. All of the funds should be distributed equally to all legal residents. Economic studies show that this would spur the economy, increase gross national product, and create millions of jobs.

The United States burned five billion tons of fossil fuel CO2 last year. A carbon fee of $55 per ton yields $275 billion, or $1,000 for each adult, $3,000 to a family with two or more children, if children get half a share, for up to two per family. This market-based approach provides incentives for the public and businesses, rapidly phasing down fossil fuel use and modernizing infrastructure. (A you-tube video explains the math – please see bit.ly/carbon-fee-economics-video)

The United States would quickly make the carbon fee near-global by imposing a border duty on products from countries that did not have an equivalent carbon fee or tax. Most countries would prefer to have their own fee, rather than let us collect the money at the border.

The best thing citizens can do is join the Citizens Climate Lobby, even start a local chapter. There are 425 chapters with over 78,000 members in the United States, and chapters in 30 other countries. The members write op-eds and visit lawmakers, being polite but persistent.

Senators Barbara Boxer and Bernie Sanders adopted the carbon fee-and-dividend idea, but their Senate bill would grab 40 percent of the money for the government. In that case, it won't work — it becomes a tax that depresses the economy. Most people would lose money. The public would not allow the fee to rise.

James A. Baker III, George P. Shultz, and leading conservative economists have come out in favor of a carbon fee with 100 percent dividend, exactly as we propose. (bit.ly/call-for-carbon-tax) Unfortunately, Republicans are afraid that they will be challenged in their primaries if they appear to admit that climate change is real.

Citizens Climate Lobby needs to grow bigger and stronger, so that, when we win the court case, politicians and the public are aware of the centrist political compromise that would work. Incidentally, it would restore America's leadership and address domestic economic issues.

Why are we confident of winning our lawsuit, which surely would need to survive scrutiny by a conservative Supreme Court? Our case is based on the rock-solid foundation of our Constitution.

Thomas Jefferson, in correspondence with James Madison in 1789 about the proposed Bill of Rights, wrote, "The question whether one generation of men has a right to bind another . . . is a question of such consequences as not only to merit decision, but place also among the fundamental principles of every government. . . . I set out on this ground, which I suppose to be self-evident, 'that the earth belongs in usufruct to the living.'" (bit.ly/letter-to-madison)

Jefferson was saying that the present generation can enjoy the fruits of the land, but with an obligation to leave comparable conditions for the next generation. A reasonably stable seashore, our nation's Founders would agree, is an asset that should not be stolen from young people.

The young plaintiffs, and all youth today, confront a gathering storm. They have at their command considerable determination, a dog-eared copy of our beleaguered Constitution, and rigorously developed science. The courts will decide if that is enough.

James Hansen, former director of the NASA Goddard Institute for Space Studies, is director of the Climate Science, Awareness and Solutions program at the Columbia University Earth Institute. Sophie Kivlehan will be a freshman at Dickinson College in Carlisle, Pa., this fall.

Sophie Kivlehan. Image is a snapshot from link: bit.ly/carbon-fee-economics-video

Positive Disruption – Hope from Rocky Mtn. Institute

By George Harvey

Recent news on climate change has looked rather dismal. For those who feel dismayed, I have some good news. A report was issued by the Rocky Mountain Institute (RMI), just as Green Energy Times is going to press. It is full of hope. The report, "Positive Disruption" (PD), is available on-line at bit.ly/Positive-Disruption. (Please note that the URL is case-sensitive.)

I would not want to deceive you. It does not say things will be easy. What it does say, however, is that the climate goals we have set out are not only achievable but can be met without super-heroic efforts. The report says that with reasonable application, we will keep the rise in temperature to below 2° C. In fact, it says that with careful and concerted effort, we can still keep it to below 1.5° C.

PD stands in contrast to numerous other reports published recently. And in fact, PD's business-as-usual (BAU) scenario is quite similar to projections of other organizations. The problem is that the BAU scenario is very likely wrong, because it projects linear growth for industries that historically have grown exponentially.

The International Energy Agency and the Energy Information Administration have produced linear projections for the growth of solar photovoltaics, wind power, and batteries. They have persisted in doing this year after year, despite the fact that the projections fail badly every year.

By contrast, RMI uses a relationship, Wright's Law, to describe growth in PD. In a way, Wright's Law is similar to the better known Moore's Law, which has been used to describe growth of power in microprocessors, and is actually a rule of thumb, rather than a law. But Wright's Law, which was first proposed in 1936, is more broadly applicable.

Wright's Law is also better supported than Moore's Law. Wright's Law was tested at the Santa Fe Institute as it applied to technologies as wide-ranging as aircraft manufacture and beer production. It was found a useful tool, for reasons that can be understood.

Wright's Law says that production efficiency in an industry is a function of the cumulative production of the industry. In other words, as more microprocessors, solar cells, wind turbines, or widgets are produced, the production efficiency increases by a predictable amount. As a corollary, as the number of a product that has been installed increases, the cost of the item declines in a predictable manner, assuming all else is equal.

The important implication of Wright's Law is that it is possible to forecast non-linear progress. This applies to the growth of the solar photovoltaic industry, for example, as it has historically been exponential, rather than linear. Organizations, such as the Energy Information Admin-

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The "Greenest Building" In Portland, Maine

By Barbara and Greg Whitchurch

Bayside Anchor apartments includes 167 rooftop solar panels to produce 70,000 kWh of clean electricity. Photo: Matthew Drost, courtesy of Avesta Housing.

It might very well be downtown Portland's greenest building -- especially the exterior, which is painted various shades of bright green. But what's going on beneath its surface and inside its walls is what makes this building truly green.

Bayside Anchor is Portland's first multifamily affordable housing apartment building to be rated by the Passive House Institute US (PHIUS) as PHIUS+ certified. The 38,000 square-foot structure contains 45 housing units (36 affordable, 9 market rate), a common room, library, and a laundry room. It brings 45 new affordable homes to the city of Portland at a time when high rents and 1% vacancy rates are leading to a city-wide housing crisis.

The Portland Housing Authority (PHA) has various sites in Portland with underutilized land and parking lots, and the Bayside Anchor site was just such a parking lot. Bayside Anchor was created through a unique partnership between nonprofit Avesta Housing and the PHA. They envisioned this project as a catalyst for future redevelopment and reimagining of hundreds of units of public housing in East Bayside.

Bayside Anchor was designed by Kaplan Thompson Architects and built by Wright-Ryan Construction. The project was built to the Passive House standard, specifically to the PHIUS+ low-energy standard, which is the highest energy standard applicable to new construction. Bayside Anchor is also socially innovative, providing a hub for services for low-income residents in East Bayside and giving the project its name as a stabilizing "anchor" for the community. This was accomplished by integrating a Head Start classroom, Housing Authority offices and a community police station on the ground floor, making it a true "anchor" of the neighborhood.

A bit of history about the collaboration. In 2013, Kaplan Thompson Architects partnered with the PHA, Avesta Housing, and Wright-Ryan Construction to win the "Lowering the Cost of Housing" national design competition, sponsored by Deutsche Bank and Enterprise Community Partners. Ultimately, the project was funded by loans and subsidies from various sources, and the City of Portland. It is the first new building commissioned by the PHA in over 40 years.

The team is very proud of the fact that they were able to complete this project to this extremely high standard for only $142 per square foot -- about 20% less than typical construction costs for apartment buildings of this type in downtown Portland. The building thus achieved the maximum affordability "points" under the current Maine State Housing Authority scoring system.

Details for the Nerdy Among Us

The building is wood-framed throughout, with cellulose wall insulation, sheathed with Advantech high-performance exterior sheathing. Meticulous air-sealing achieved 0.05CFM50/square foot (or 0.37ACH50, which slightly exceeds the PHIUS+ standard), compared to the more typical 0.25CFM50/square foot. This superior air-tightness is balanced by the installation of a continuously operating, fresh-air heat recovery ventilation system to all rooms. The system used was from Renewaire. This leak-free building enclosure will ensure that the building will offer long-term affordability by incurring minuscule heating bills. Other sustainable features include storm water collection and a community garden.

On top of all that (literally) is a 56-kilowatt rooftop solar PV array, consisting of 167 solar panels installed on ballasted rack mounts by ReVision Energy, based in Portland.

Combining the very low cost target with the ambitious goal of Passive House certification

Cont'd on p.29

Upper "water garden" stage of the multi-level storm water drainage system. Courtesy photos.

"Greenest Building" in Portland

Cont'd from p.28

drove the development team to design a highly organized construction management process. The architects/builders collaborated at every stage of this construction -- a procedure that has proved essential over the last few years in constructing highly energy-efficient buildings.

How do Greg and I know all this? We attended the NESEA (Northeast Sustainable Energy Association) Pro Tour of Bayside Anchor on April 7, 2017. (It is part of their series of Building Energy Pro Tours.) If you ever want to learn how to conduct a really organized, informative and fun tour, we suggest you attend one of their Pro Tours! It began with refreshments and an introductory overview, presented by Bayside Anchor co-developer Jay Waterman (Portland Housing Authority), and architect Jesse Thompson (Kaplan Thompson Architects).

We then traveled by bus to the project site, where we were divided into groups and rotated through five content-specific stations, each with its own expert presenter. This smoothly-engineered tour allowed for close-up viewing with no crowding, presentations by experts who were involved in the actual planning and construction, and plenty of time for Q and A after each mini-presentation.

At the end, we were bussed back to the host site, where we were fed a lovely lunch, followed by coffee, dessert, and more opportunities for networking with the team. All in all, it put our clumsily-designed tours that we have offered of our own Passive House (tinyurl.com/PHIUSCottagePage) pretty much to shame. The series continues across New England into the fall of 2017. More information on this Pro Tour series is available at nesea.org/2017-pro-tour-series. The November tour is ten miles up the road from our house: www.nesea.org/11-17-17.

Barb and Greg Whitchurch are board members of VT Passive House and owners of a net-zero passive house, a Leaf & a Prius in Middlesex, VT, http://bit.ly/2nRCdGL

Financing For Low-income Communities

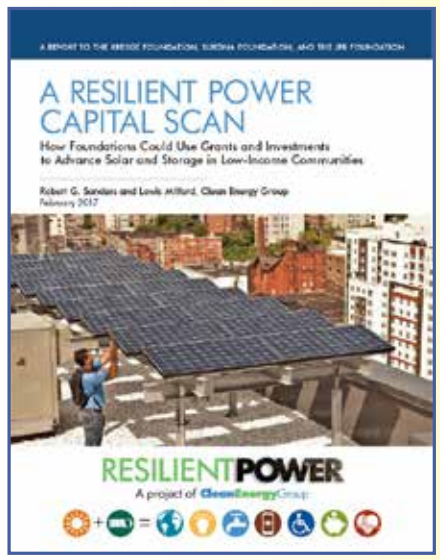
Cont'd from p.8

in SPS development in the commercial space to expand reach into low-income markets.

- ***Fund LMI Advocates.*** Support advocacy organizations to provide information and training to LMI residents on issues regarding resilient SPS benefits with the goal of increasing LMI participation in policy discussions.

"This is a critical time for philanthropy to support community energy resilience in ways that harness market forces while acknowledging the market's limitations," said Clean Energy Group Senior Finance Director and report co-author Robert Sanders. "Risk-reducing capital investments and market-enabling grants form a powerful stimulus that's essential for growing SPS in low-income communities."

Read full report at http://bit.ly/Comm-solar-storage. Learn more about the Clean Energy Group at www.cleanegroup.org and www.resilient-power.org.



Todd Olinsky-Paul serves as project director for both Clean Energy Group and Clean Energy States Alliance (CESA). As a Project Director for Clean Energy Group, Todd works on the Resilient Power Project (www.resilient-power.org), which supports deployment of clean distributed technologies such as solar+storage at critical facilities to enable the provision of essential services during grid outages. Todd also serves as a CESA Project Director for the Energy Storage and Technology Advancement Partnership (ESTAP), a federal-state funding and information sharing project that aims to accelerate the deployment of electrical energy storage technologies in the U.S. (http://bit.ly/CESA-ESTAP).

Designing Solar for High Density Areas

By Steven Winter Associates staff

The Solar Settlement with the Sun Ship in the background: two PlusEnergy projects in Freiburg, Germany. Photo: Wikimedi.org

Hear the term "solar energy" and you're likely to think of vast fields of glistening panels and hillsides transformed into disco balls. Hear the term "solar energy" and you might picture suburban McMansions with roofs that reflect the sky. Hear the term "solar energy" and you envision… skyscrapers? Affordable housing units? Clusters of panels lurking in the crevices of a city skyline?

By 2050, solar energy is projected to be the world's largest source of electricity, and it would hardly be reasonable to do so by means of blanketing entire stretches of usable or natural lands with sheets of silicon. Instead, part of the solution lies in the use of high density solar, which is quickly becoming the backbone of the solar boom, providing access to, and availability of, solar energy in densely populated areas.

At the end of 2015, twenty U.S. cities accounted for six percent of the country's solar photovoltaic (PV) capacity. This is particularly impressive, given that these cities combined account for merely 0.1% of U.S. land area. According to "Shining Cities 2016," Environment America's report regarding the status of solar power in United States, sixty-four of America's cities have installed over 1,700 MW of cumulative solar PV capacity – almost as much as the entire country had installed by the end of 2010.

How are these cities doing it?

Though the addition of solar PV usually offsets only the common area loads of a large building, not tenant loads, it is an attractive solution for infrastructure upgrades that are inherently more difficult to install in areas of high density. Distributed energy resources, such as solar PV, help defer upgrades to the distribution grid by supplying electricity closer to the load. Thus, even while additional energy sources are often required, many newly constructed and renovated city buildings are opting for solar power.

In addition to its practical advantages, the success of solar PV in America's cities is due to both the improvement of the energy's economies and the availability of state and federal incentives for solar investors.

First, system costs across all sectors are rapidly decreasing due to technological advances in modules and growing demand. This has resulted in a lower wholesale price for units and panels, making PV more practical not only individuals, but also municipal and public facilities. For example, in Las Vegas, 37 public buildings have reached a solar capacity of 6.2 MW. This includes fire stations, community centers, and parks, as well as a 3.3 MW generating station at the city's wastewater treatment plant. Tampa, Raleigh, New York City, and Atlanta are also at the forefront of incorporating solar power in their respective government and public facilities.

In addition to the reduced costs and increased supply of solar PV, demand is being bolstered by the availability of incentives. The Federal Investment Tax Credit offers up to a 30% rebate for installation costs through 2019, and continues the offer at regularly diminishing levels through 2022. Local, state, and federal programs across the country offer similar rebates, tax credits, and tax deductions that not only improve the affordability of solar installation, but also drastically shorten the payback period.

So, as the market for solar continues to improve – and access becomes more widespread – how can the design and construction industries promote the continued installation of urban solar?

The most immediate solution would be to update state and local building codes to require solar-ready roofs and incorporate other sustainable best practices. For instance, Cambridge, MA requires all new construction or existing building rehab projects over 25,000 SF to meet at least LEED© Certified or LEED Silver standards – for which solar is a popular contributing factor.

Additionally, while state and federal incentives are widely available now, they are slated to decline over the next five to 10 years. Local incentives will then become the key that emboldens building owners and residents to take part in community solar efforts. "Solarize" campaigns are locally organized community outreach efforts that leverage group purchasing power to encourage homes and businesses to go solar over an established period of time. Solarize NYC, one of the largest and most successful campaigns of its type, is aimed at energizing citizens to take personal responsibility in the city's goal to reduce greenhouse gas emissions 80% by 2050.

As U.S. citizens and local governments take the reins in the country's commitment to a clean energy future, solutions such as high density solar are important industry advancements that provide more accessible and widespread opportunity for change.

Steven Winter Associates, Inc. provides energy, sustainability and accessibility consulting as well as certification, research and development and compliance services. Learn more at http://www.swinter.com/

Local Innovation — Recycling Fiberglass Insulation

By George Harvey

Machine used to shred fiberglass batts, so they would work well in machines used for blowing insulation. Courtesy photos.

Jamie Myers, who operates J. Myers Builders in Lisbon, New Hampshire, has been interested in the environment and recycling for a long time. Years ago, he did research to find out what uses there were for old fiberglass batts that were removed from buildings that were given retrofits. It was something that required research – not many people were trying to find ways to recycle fiberglass, but there are no good ways to dispose of it.

"It was a product we do not want in our dumps," Myers said. "It doesn't break down and lasts forever."

He found that a company in Colorado had once made a machine that could shred the batts. That was years ago, however, and when he learned more, he found that the machine did not do well enough to stay in production. About thirty units had been made before the whole project had been given up.

Nevertheless, the idea of a process for reuse of insulation stuck with Myers. It was filed away as a reference in his mind, to be brought back to his attention at the proper time.

Myers seems to be a person who is interested in a wide variety of things and does not mind learning new skills. He even has been known to invest a few dollars on some piece of equipment that has an immediate need not usually thought of as related to his building business, provided that it can pay for itself. After doing its work, such a machine, could be sold, but it could also be relegated storage, from which it could be retrieved, if the need arose. Such a storage place might be considered a physical analogy to the corner in his mind where the results of research into recycling batts was stored. Sometimes, such a thing can have unexpected value.

The time came when he became active in a project headed by H. P. Cummings, a contractor in Woodsville, New Hampshire. The project engaged Myers to provide new insulation for four buildings in Bradford, Vermont. The old insulation, fiberglass batts, had to be removed, and new insulation was to be installed in its place.

The fiberglass batts removed from a building had to be disposed of, and the only option still seemed to be to send them to a landfill. But landfills are rapidly filling and space in them is not free. In fact, the dump fees for the four buildings' in Bradford would run $5,000 to $6,000. That is an expense, and an additional environmental cost, worth considering.

When Myers' mind focused on the problem of what to do with old insulation, the old research and the old machine soon looked like a match made in Serendipity. That old machine, it turned out, could shred fiberglass batts so they would work well in the machines J. Myers Builders used for blowing in insulation.

The old fiberglass batts in the four buildings were ground up and reused to insulate the building's attics for the retrofit. Not only was there enough for the project at hand, to provide the specified R-value, there was even a little extra, which was used to increase that value. The job wound up reducing the customer's costs, and while the reduction was slight, there was added benefit to the rest of the world that the waste did not have to go to a landfill, and that is worth considering. So 100% of the attic insulation was recycled locally, no new product had to be purchased for insulating the attics, product transportation was reduced, and the local work added to local employment and the local economy.

Since that small success, Myers has provided the same service elsewhere.

Fiberglass batts shredded and reused to insulate the attics for the buildings' retrofits.

One building in Barre, Vermont, got the same treatment with very much the same outcome.

"We want to really set the standard for recycling and offering this helps set that standard," Myers said of the process he developed. "And it looks good if you can say that you have recycled something that would otherwise end up in the dump."

We agree. It looks good.

J. Myers Builders' website can be found at www.wesprayfoam.net. The phone number is 603-838-5112.

THE 2017 HOUSING INNOVATION AWARDS

DOE Office of Energy Efficiency & Renewable Energy (DOE)

This Zero Energy Ready Home was assembled in one day, with the homeowners moving in three months later. The ZERH standards help Garden State Modular Homes provide efficiency and a more robust home that can stand up to humid and stormy conditions at the Jersey Shore. Photo courtesy of Garden State Modular Homes, LLC.

Each year, the Housing Innovation Awards honor the top builders in the country who are leading the Zero Energy Ready Home (ZERH) movement. It's an exciting time for us not only because we get to pay homage to some of the best ZERH partners across the country, but also because it marks a time where we can look back and see how far we have come. So, let's take a brief trip down memory lane…

2013—The inaugural Housing Innovation Awards were held at the U.S. Department of Energy's (DOE's) Solar Decathlon in Irvine, California. The first year featured 21 winners and four grand winners across four categories (Affordable, Custom, Systems, and Production). The awards were also held in conjunction with annual awards from Home Performance with ENERGY STAR and Building America Top Innovations.

2014—The second year of the Housing Innovation Awards also marked the first of four consecutive years (including 2017) of partnering with the Energy and Environmental Building Alliance's (EEBA's) annual conference. Held in St. Louis, Missouri, the awards ceremony again featured both DOE ZERH builders and Home Performance with ENERGY STAR builders. DOE honored 23 ZERH builders, presented the first ever "Most Homes Certified" award, and gave an honorary "Lifetime Achievement Award" to Jerry Wade (Artistic Homes) from Albuquerque, New Mexico.

2015—With significant growth of the DOE ZERH program, both in the number of builders involved and the number of homes being certified, the 2015 Housing Innovation Awards were solely focused on DOE ZERH builders. At the EEBA conference in Denver, Colorado, the 2015 awards honored 24 ZERH builders. An exciting addition to the 2015 awards was that each of the award-winning homes was featured on the new DOE Tour of Zero, a virtual tour that makes it easy for consumers to get a look inside the homes to see what makes them so special. The event also included a "Legacy Award" presented to John Wesley Miller from Tucson, Arizona. 2015 also marked the introduction of a new "Multifamily" award category.

2016—Held for the third year in a row at EEBA's annual conference, the 2016 awards took place in Dallas, Texas. This year also featured the introduction of another new award category, splitting the "Custom" category into "Custom Spec" and "Custom Buyer." 2016 saw the highest number of applicants in the history of the Housing Innovation Awards, a testament to how far the program had come since 2013. Overall, DOE honored 34 builders across five different categories (Affordable, Custom Buyer, Custom Spec, Multifamily, and Production). In 2016, the ZERH program also launched a consumer-oriented video, "The Home of the Future…Today."

As you can see, as the program has continued to grow, so have these special awards. Each year, the competition gets tougher and tougher, and our judges are forced to make incredibly difficult decisions. Competing against the best of the best isn't easy, but it also makes the Housing Innovation Awards mean that much more. The 2017 Housing Innovation Awards featured the highest number of applicants in the history of the program, and as a result, this year's awards competition includes "Honorable Mention" homes, to be included on the DOE Tour of Zero along with the award winners.

The 2017 Housing Innovation Awards will honor 24 builders from across the country along with grand winners in each of the five categories (Affordable, Custom Buyer, Custom Spec, Multifamily, and Production). Check out who the winners are by visiting the http://bit.ly/housing_awards where you can also access the official DOE Press Release. Grand winners will not be announced until the awards ceremony, which will be held at the EEBA High Performance Home Summit on October 11th in Atlanta, Georgia.

For registration information, please visit http://summit.eeba.org/.

Editor's note: It sure would be great to see an award given to one of the impressive High Performance homes that are built in the area Green Energy Times reaches out to. Please let us know if your company is entering this, so that we can share your story with our readers!

The Northeast is Home to Some of the Greenest Universities in the Country

By Chris Gillespie

University of Vermont in Burlington, VT. Photo: Pixabay.com user.

Data analysists at SaveOnEnergy.com recently assessed U.S. News & World Report's 2017 list of Top 100 universities and ranked them based on their commitment to the environment and their success with sustainability initiatives.

Here are updates from some of the twenty-five "greenest" schools that are located right here in the Northeast.

University of Vermont (Burlington, VT) – SaveOnEnergy.com's #7

The Environmental Protection Agency recently recognized University of Vermont (UVM) as a conference champion of the 2016-17 College & University Green Power Challenge. According to the EPA, UVM used 60 million kWh of green power in the last school year, representing the energy equivalent of 5,400 American homes and 99% of the school's annual electricity usage. UVM recently received its second gold rating from the Sustainability Tracking, Assessment and Rating System for higher education.

https://www.uvm.edu/sustain/

Dartmouth College* (Hanover, NH) – SaveOnEnergy.com's #10

Between 2008 and 2015, Dartmouth reduced its greenhouse gas emissions by nearly 22% by upgrading energy systems in its buildings and promoting conservation and efficiency among its students, faculty and staff. Dartmouth's campus features multiple LEED-certified buildings, one of which is the platinum-rated Class of 1978 Life Sciences Center, which is three times larger than the college's previous life sciences building yet uses 90% less energy. As reported in the June 2017 edition of Green Energy Times, the people of the surrounding town of Hanover recently committed to switching to 100% renewable energy by 2050.

https://www.sustainability.dartmouth.edu/

Northeastern University* (Boston, MA) – SaveOnEnergy.com's #13

This past April, Northeastern partnered with the Washington D.C. branch of Florida International University to convene scholars, research experts and public officials at Capitol Hill for a briefing on coastal sustainability and the threat of rising sea levels to coastal cities and towns, such as Boston and Miami. Northeastern has also reported it recycled nearly 40% of campus waste in 2016.

http://www.northeastern.edu/sustainability/

Clark University* (Worcester, MA) – SaveOnEnergy.com's #17

In 2016, Clark opened its new Alumni and Student Engagement Center, a building which receives half of its energy needs from a rooftop solar array. The university recently completed renovating a major steam distribution line as part of a four-year plan to reduce Clark's carbon emissions by 210 tons by upgrading uninsulated pipes. Clark's Climate Action Plan commits the university to reach net-zero emissions by 2030.

http://www2.clarku.edu/offices/campussustainability/

Columbia University* (New York, NY) – SaveOnEnergy.com's #19

Columbia's Board of Trustees voted in March 2017 to disinvest from companies deriving more than 35% of their revenue from thermal coal production and to participate in the Carbon Disclosure Project's Climate Change Program. In April, Columbia released its first campus sustainability plan and pledged to cut greenhouse gas emissions by 35% by 2020.

https://sustainable.columbia.edu/

Massachusetts Institute of Technology (Cambridge, MA) – SaveOnEnergy.com's #22

In May of this year, MIT's Office of Sustainability hosted the third annual Sustainability Connect conference for students, faculty and staff to come together and brainstorm innovative ways for MIT to improve its sustainability efforts. MIT recently published its first greenhouse gas emissions reduction strategy, which lays out how the institution's administration plans on meeting or surpassing its 2015 goal of reducing campus greenhouse gas emissions by 32% by 2030. MIT has already succeeded in reducing total campus emissions by 7%.

https://sustainability.mit.edu/

Boston University* (Boston, MA) – SaveOnEnergy.com's #25

Last year, Boston University (BU) was recognized by Mayor Marty Walsh as the 2016 recipient of the Greenovate Boston Award for Climate Preparedness and Resiliency for its commitment to identifying ways that the city of Boston can prepare for the effects of climate change. This year, BU is replacing over 300 washing machines with new EnergyStar units that will lower energy costs and reduce the university's water consumption by a million gallons a year.

https://www.bu.edu/sustainability/

Other northeastern colleges and universities that made SaveOnEnergy.com's list include Brown University, Providence, RI; New York University*, New York, NY; Rensselaer Polytechnic Institute, Troy, NY;

Dartmouth College in Hanover, NH. Photo: Wikimedia Commons.

Harvard University, Cambridge, MA; Tufts University*, Medford, MA; and Brandeis University*, Waltham, MA. To see the full list, visit https://www.saveonenergy.com/data-hub/top-green-universities/.

**Asterisks indicate institutions that have signed the 2017 "We're Still In" pledge. For the full list of American communities and organizations that are still committed to the Paris Agreement, visit www.wearestillin.com.*

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

Colby-Sawyer College Even Closer to Carbon Neutrality

By George Harvey

ReVision Energy installed a 68.4-kilowatt solar array on the roof of Colby-Sawyer College's new Center for Art + Design. Photo courtesy of ReVision Energy.

Readers of *Green Energy Times (GET)* should recognize Colby-Sawyer College as a long-time mover on renewable energy and climate change. *GET* has published articles on things going on at the college frequently.

In December, 2014, *GET* published "Innovative NetZero Classroom Is Built by Colby-Sawyer Students" (http://bit.ly/CS-sunshack), about the first commercial building in New Hampshire to incorporate straw bales in its construction, the Sunshack. This building was designed and built by students. In February, 2016, *GET* published "Colby-Sawyer College Announces Three-Year Degree in Community-Based Sustainability" (http://bit.ly/CS-sustainability-course). In the same issue, another article, "A Vision for a Permaculture City," covered efforts by Franklin, New Hampshire, and listed Colby-Sawyer College as one of the city's collaborators (http://bit.ly/Franklin-permaculture-city). And in April 2017, another article appeared, "Colby-Sawyer College Students Partner with PermaCityLife to Support Franklin's Revitalization Efforts" (http://bit.ly/CS-students-partner).

Clearly, Colby-Sawyer is a leading green college, so the next update on the work underway at Colby-Sawyer comes as no surprise. ReVision Energy installed a 68.4-kilowatt (kW) solar array in July.

The new installation is on the roof of the new Center for Art + Design. The 15,000 square foot building is opening this fall, with studios, theater, a fine art galleria, outdoor art areas, and offices.

The solar array includes 228 Q Cells 300-watt solar panels. It has four SolarEdge inverters to change the DC current from the array into the AC current used in the building. It also is equipped to allow college operators to track its performance with computers.

The array on the on the roof of the college's new Center for Art + Design is expected to produce a little over 80,000 kilowatt hours (kWh) of electricity each year. This is sufficient to offset nearly 83,000 pounds of carbon dioxide emissions annually. That amount would be emitted by burning a little over 4,200 gallons of gasoline. It is the amount one would save by allowing 36 acres of forest to grow to sequester carbon.

Jennifer White '90, who is Colby-Sawyer's Director of Sustainability, said, "We are excited about this additional solar array as it enables Colby-Sawyer to expand its commitment to sustainability and renewable energy while allowing us to gain internal control of a portion of our energy budget moving forward."

The solar system on the art and design center was installed at no upfront cost to the college and is owned by IGS Solar. The college is buying the power from IGS through a power purchase agreement (PPA). Under the terms of the agreement, the college will buy the power at a negotiated rate for seven years. At that time, the college will have the option to purchase the system at a significant discount, after which it would have projected savings of about $6,000 per year for the life of the array. Though the array is warranted for 25 years, it is expected to last about 40, so the savings over a 33-year term of ownership could approach $200,000.

This is not the first time Colby-Sawyer has installed solar systems under a PPA. Four buildings had rooftop systems installed in a 127-kW project financed by ReVision Energy under similar terms. That older system generates about 152,000 kWh of electricity per year.

Colby-Sawyer Collage has a goal of carbon neutrality by 2050, under a carbon action plan adopted by the board of trustees in 2010. Goals have included a 50% reduction in carbon emissions by 2015 and a 70% reduction by 2020. The college has been purchasing renewable energy credits under this policy since 2010. It sees purchase of the credits as a stepping stone to an integrated long-term approach to carbon emissions. Additions of solar power on the campus, along with efficiencies and other actions, work to achieve that long-term goal.

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
www.susdesign.com Online info for solar benefit with house design: overhangs, sun angle & path…

BUSINESS LISTINGS

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SECONDHAND SOLAR

Pre-owned solar equipment for sale: (10) Enphase m210 - $75; (1) Enphase m190 - $60; (2) Enphase m215 - $80; (2) Solectria PVI 5000S - $800; (2) SunnyBoy 6000 - $600; (1) Xantrex/Schneider XW-MPPT - $175; (4) Soladeck 0786 - $35. Also many Enphase trunk cables w/connections. Sunnyside Solar Store, 499 W. Brattleboro, VT. (802) 280-7319. joe@sunnysidesolar.com • www.sunnysidesolar.com

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GUIDE TO ADVERTISERS

Ingredient of the Month

PRESERVING THE GREENS OF SUMMER WITH DIY DRIED HERBS

By Larry Plesent

It is safe, free, fun and easy to dry your own herbs for those long winter nights to come. All you need is a ball of string and sturdy scissors or small pruners. Here's how to do it.

Start with clean, green, fresh, healthy plants grown away from pesticide and herbicide spraying. Discard yellowed, dead, moldy, or insect-ridden parts or plants. Cut stems near the ground leaving a two inch handle to tie your string to for hanging them. Harvest plants in bright sunlight while they are still photosynthesizing. Try to time things so you are harvesting on a sunny day after a light rain the day or night before to clean off the plants.

Herbs dry best upside down in a bundle. How big a bundle? That depends on the plant. What you don't want is a big mass of green leaves bunched together tightly so no air can get through. You want the plants to dry out completely, and to do it fast enough so that mold and mildew never get a chance to get hold.

Plants with an umbrella shape have lots of room for air flow so you can bunch them up in larger bundles. Even up the ends of the stems. Cut off excess stems leaving about two inches below the leaves. Wrap a single strand around the stem twice and pull the ends tight. Tie with a figure eight or a granny knot.

Make smaller bundles of the denser leafy plants so air can circulate through them as they dry.

Dusty plants can be rinsed in cold water before bundling. Shake and snap off as much water as possible before hanging them in front of moving air, fan or air conditioner.

Hang your bundles from nails, screws, or to a string tied between two strong points that allows the free flow of air around and behind the drying herbs. I have been known to dry herbs on the porch, in the living room and in the kitchen. Avoid placing fresh drying herbs in moist areas like the bathroom or basement. Some plant material will inevitably fall on the floor so lay down a sheet or cloth below your herbs if you have wall to wall carpeting or don't want to deal with a messy area under them.

You should harvest herbs and flowers when they are full of life, before they go to seed. Try to get them in early flower or just before. Some of my favorite drying herbs include mint family members like catnip, apple mint, horehound, peppermint and spearmint. I tie them in little bundles, and, within a couple of weeks, I have a yummy refreshing tea that may help with the occasional stomach ache too.

You can dry wormwood in early flower with nettles, fresh ginger and chaga mushroom (found on birch trees) to make the herbal bitters described in www.cancereraser.org. Check it out if you or someone you love is dealing with cancer.

St. John's Wort plant. Image from: Pixabay.com

I also like drying roses, hydrangeas (the petals can get loose so be prepared with a cloth below them) and lavender flowers for potpourri. Stir in a little essential oil blend for some extra strength.

Pick St. John's Wort when the yellow flowers appear. The tea is used for mild seasonal depression. Effectiveness drops off after six weeks of use so save it for when you really need it. Steep fresh St. John's Wort or calendula flowers in olive oil for a month to make an inflammation destroying topical healing oil.

Red raspberry leaves make a soothing pregnancy tea. Begin taking it in the second trimester for best results.

Dry herbs by tying the long stems together and hanging them in a dark and well-ventilated area. Photo: www.eatatburp.com.

A good test for when an herb has dried enough is to break a stem near the bottom. If it snaps with a clean sound and breaks off easily the herb is dry enough for jarring. Remove herbs from stems by grasping the tops with one hand and sliding the other hand down the stem towards the bottom, sloughing off the leaves, flowers and small sticks in one move. Most plants come cleaner working top to bottom. Place your plant material into a clean brown paper bag for another 2 to 3 days to finish drying them. Store in glass jars with tight fitting lids. Label with the plant's common and Latin name and the date you packed it into jars. Canning jars or recycled mayo type screw lid jars work best.

There are many good herbal guides out there and only one that should be avoided; Culpeper's Complete Herbal. Written in 1653, Culpeper's book utilizes the principle of like heals like. A brown oval leaf looks somewhat liver-like, so it must be good for your liver. Wormwood looks like worms or snakes growing out from a central stem; hence it must be good for internal parasites. Thistle has a purple flower (the color representing the head); so it must be good for brain issues. And so forth. Culpeper did more damage to the reputation of herbal medicine than any individual or institution in history, inadvertently promoting the ascension of modern medicine over plant based nature medicine techniques.

Green plants arose about 450 million years ago. Plants are chemical factories, and they have been producing molecules that discourage cancer, viral, fungal and bacterial growth every day of their 450-million-year history. As humans we can harvest and concentrate those molecules to make our own healing medicines. Plant medicines work precisely because we humans are part of the same ecosystem as those plants and share extensive DNA with them. Many modern medicines are in fact useful plant molecules that we have learned to synthesize and later patent and press into a brightly colored tablet.

Disease is part of life, and life has been curing itself for at least half a billion years. I believe that for every disease on earth, there is a plant-based cure in the same ecosystem that contains the disease. Shamans may shake their rattles, speak in dead languages, insert IVs and consider themselves the experts in their field; but it is nature that truly holds the answers we seek.

We live in a time when people seem to believe we are separate from or independent of the ecosystem that begat us. One might argue that such a notion is at the root of three centuries of bad decision making now culminating in the long term alteration of our world. Quite possibly, it has even been sowing the seeds of our own extinction. Will we humans recall and live in the knowledge of our Earth Wisdom in time? Possibly. The future is now in our collective hands.

Larry Plesent is a writer, philosopher, part-time farmer and soap maker living and working in the Green Mountains of Vermont. Learn more at www.vermontsoap.com.

SUSTAINABILITY FOR LOCAL BREWS, SPIRITS & WINES

Cont'd from p. 21

described Rock Art as "leading the pack" in terms of breweries in the state and country who are aiming to reduce their carbon footprint. By using solar energy, Rock Art will conserve the same amount of energy that is used annually by ten average-sized Vermont homes.

www.rockartbrewery.com

NEW YORK

Sundog Cider's Hard Cider Is Sustainable to the Core

Sundog Cider's factory in Chatham, New York is 100% solar powered and carbon neutral as a result of their use of vegetable oils, upstate New York's first solar-powered air conditioner and a 128 kW solar array. Looking to continue their exploration of groundbreaking sustainable technology, Sundog is currently looking into ways of sequestering the carbon dioxide from the fermentation process back into their hard cider in the form of carbonation.

www.sundogcider.com

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

Elmore Roots' Permaculture Know-How

I DRINK TO YOUR HEALTH!

By David Fried

SAll over the world at this very moment friends are lifting their glasses and saying: "Skol!," "Cheers!," "Nazdrovia!," or perhaps "L'chaim!"

They are not lifting a zucchini or an olive to say this, but something magical and transformative that they can drink.

We who grow and harvest fruit can have the pleasure of producing drinks we can pour from bottles. I have made apple cider, perry (pear cider), grape juice, wine from grapes, apple wine, apple cider vinegar, and "hootch." My friend loves the hootch, so I bring him some on his birthday.

Here is how to make the hootch. Start when you see a tree filled with small perfect apples or pears that have a special autumn glow. Harvest a bunch of them and pack them into gallon glass jars. Pour vodka over them and let them sit in the dark for a year or two – in a room with good feelings. When the result is ready, pour off the liquid into smaller bottles with screw-on caps using a funnel. Sip with friends. The apples or pears that remain are also good sliced and served with a meal, especially at festive times.

Other drinks start with gathering apples and pears for cider and perry over a week or two and letting them "sweat". This means they sit a little and their flavor develops. Hand grind and press them with a cider press, such as those from Happy Valley. Immediately capture the clear, cool juice in plastic jugs; these could range from a half pint to a gallon, but tall quarts may be best. Put them into the freezer right away, to preserve their "taste of autumn harvest" for any time through the year. Just thaw a jug and lift your cup. An apple and pear blend is one of my own favorites.

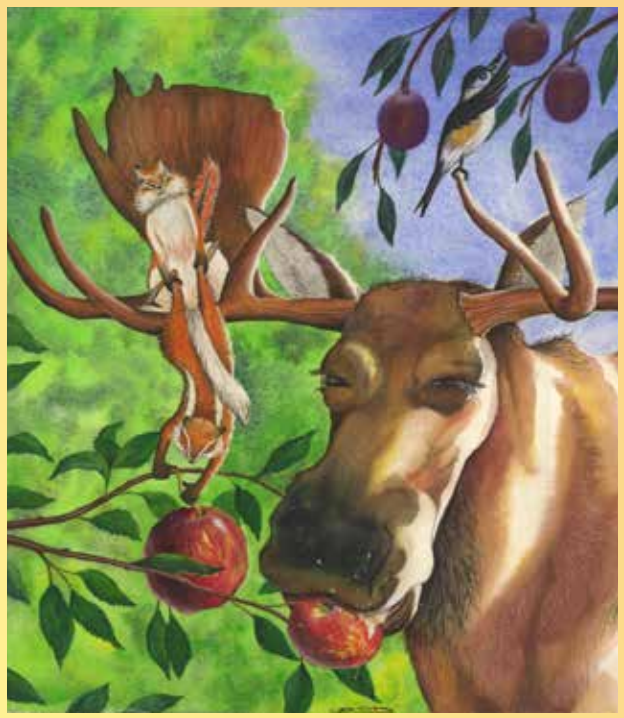
A jug of cider left on the counter at room temperature for a few days may turn into wine with no more work than securing a piece of cheesecloth over the top with a rubber band. When you like the flavor, put the bottle into the fridge with a cork in it. If you want cider vinegar, leave it on the counter and the microbes in the air will work their magic and transform it into excellent vinegar in about three weeks. After it has stopped bubbling and it has the aroma of salad dressing, funnel it into saved bottles with screw-on caps.

You can make an excellent drink from harvesting "bluebell" grapes and hand-pressing them with a tomato sauce-grape food mill or strainer. Since it was not cooked or canned, the flavor is pure, innocent and fresh. You can freeze some of this, too, and it is still excellent when thawed, 10 months later.

You can also use a Mehu-lisa steam juicer from Finland. Fill the bottom chamber with water, then the top chamber with apples, black currants and pears. On the stove the water boils and in about 15 minutes the fruits release all of their juice into a middle chamber, from which it can be released through a siphon hose (that is part of the contraption) into clean jars with new caps. This can provide many sealed jars of juice for the winter without any additional canning. Write the year and the variety of fruit on the cap with an indelible marker.

The harvest is over when there is no more fruit on the bushes or in the trees, and the cupboards and shelves are full with the fruit of my labors. Please come over. Sit down. Let me pour you a glass of something good. I lift my glass to your good health! The Zulu say, "Oogy Wawa!" It means, "Sante," or "Salud.".

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.



Moose painting by Gabriel Tempesta www.gabrieltempesta.com

Positive Disruption

Cont'd from p.27

istration, have always tried to project growth as linear, because their models did not account for a relationship that was non-linear. They have always failed badly as a result.

In addition to the use of Wright's Law, PD speaks of converging technologies. The costs of wind power, solar power, and batteries have been falling in a non-linear manner, but they are also mutually supportive, because they complement each other. Add to that use of electric vehicles, electric heat, and increased efficiency, and the result becomes greater than the sums of what each would do in the absence of the others. Also, business models can have profound effects. Virtual power plants (though not explicitly mentioned in PD) will also increase these effects.

Other technologies also can be brought into play, reducing our carbon emissions. For example, PD sees the agriculture sector, which has had a very large carbon footprint, as potentially sequestering more atmospheric carbon in the soil than it emits. One of the routes to this that PD discusses is the manufacture and use of biochar, which could become profoundly important, not only for sequestering carbon, but for reducing needs for irrigation and reducing dependence on artificial fertilizers, which have large carbon footprints.

PD includes a BAU scenario, to which it compares five others with varying levels of adoption of actions on the climate. The BAU, which is a linear projection, shows warming of about 3.7° C by 2100. The other five, which incorporate Wright's Law in the modeling, show warming ranging from 1.47° C to 1.77° C by 2100. All of these meet standards of the Paris Accord, 2° C, and one meets the hoped-for 1.5° C.

Biochar, essentially charcoal, is a soil amendment that sequesters carbon and can often eliminate any need for fertilizers. Photo: K.salo.85, Wikimedia Commons

Wright's law cannot show us progress for the distant future. It only applies to the beginning stages of adoption of certain technologies, such as solar and wind power, which run on curves that are not actually exponential, but follow S-curves. Also, the PD report cannot take into account technologies that will doubtless appear in the future.

However, there are other things about PD that I think might also be wrong. It certainly seems to provide a system for better modeling than what we have seen in the past. Nevertheless, it fails, I believe, to take one thing into account. That thing is what happens when Wright's Law is operating backwards. As renewable energy and efficiency grow, the fossil fuels industry and nuclear power will necessarily decline. But PD does not look at what will happen as they decline.

In the case of fossil fuels, the growth we could foresee is negative. The cumulative production base would be dismantled as we switch to renewable resources, but many costs are fixed, and so the efficiency of production would decline. With that decline, the prices would increase. With a decline in demand, there would be a decline in efficiency, leading to increases in costs.

This seems like the law of supply and demand is stood on its head. In a situation when both supply and demand are falling but the demand is decreasing faster, one would expect from standard economics that the price would be held down. But in this case, it may indicate increases in price because of decreased efficiency, leading to further reductions demand. And this creates a terminal feedback loop of price increases that would foreshadow the end of the industry.

In other words, as use of electric vehicles and electric heat increases, fossil fuels are used less. But the fixed costs of fossil fuel production remain the same, and the only way to deal with this is to increase prices. This drives further reduction in demand.

What I am suggesting is that the disruption foreseen in PD might go faster than expected, and this could keep our maximum temperature increases even smaller than PD suggests.

Top Solar Installers

Cont'd from p.11

Renewable Energy installs commercial, municipal, and community solar power systems. Aegis' services cover every aspect of bringing a project from concept to long-term operation including site analysis, permitting, financing, engineering, equipment procurement, construction, commissioning, and long term operation and maintenance. Aegis Renewable can be reached at 802-560-0055 or www.aegis-re.com.

Granite State Solar, in Boscawen, New Hampshire, is another installer that appears on the SPW list, being listed as number 194. Granite State Solar was the subject of our March, 2017 article, "Granite State Solar expands, breaking ground on new property in Bow, NH." Granite State Solar's number is 603-369-4318, and its website is granitestatesolar.com.

We might say that there is something rather unsatisfying about a list of 500 businesses from all states in the country, because the territory for the list is so broad geographically that potential customers may find it hard to get information. It may be time for Green Energy Times to prepare its own list of local installers we know and trust. So far, we have compiled a list of 24 installers in New York, Vermont, New Hampshire, Massachusetts, and Maine. We have told you about many of them in the past. In the future, they, and probably others, will no doubt grace our pages again.

It's Time To Plant Garlic -- for Next Year's Crop

By Mark MacDonald

Garlic is one of the most universally accepted culinary ingredients, appreciated around the world for its pungent flavor and its incredible versatility in complementing meat, vegetables, breads, and eggs. It is grown commercially all over the world, notably in China, where over 12 million tons are produced each year.

Provided below are guidelines to grow garlic in your garden.

Difficulty: Easy. Garlic is not suited for growing in containers. This can be done, but it's better in the ground, or possibly in raised beds.

Timing: Plant cloves from September to the end of November. There is a brief window at the beginning of March when you can plant for a fall harvest, but in this climate garlic performs better if overwintered.

Sowing: Separate the cloves and set each one, pointed end up, 10-15cm (4-6") apart and with the tip of the clove 2-5cm (1-2") deep. Don't skin the cloves! Use deeper planting if rain or frost may expose the cloves, and shallower planting if using mulch or planting into heavy soil. The largest cloves will make the largest bulbs.

Soil: Rich, well-drained soil. Dig well, add compost (lots of it if your soil is heavy) and do not compact it by stepping on it. Lime the soil several weeks before planting if the pH is lower than 6.0.

Growing: Fertilize when spring growth starts. Water as needed and keep weeded. Cut flower stalks to keep energy in the bulb. If individual cloves haven't formed, either eat the clove or replant, and it will bulb next year.

Harvest: When the tops begin to dry, pull and air-dry like onions. Some growers recommend waiting until 75% of the plant has dried up before pulling, and others say the key is to pull when each plant is down to 6 green leaves.

Storage: Store in a cool, dry environment. Moisture and heat will provoke sprouting.

Pests & Disease: Many growers have been hit with White Rot that causes black spots and decay on the bulbs. It is easily spread in infected soil and water and is very persistent in the soil. Flooding the bed for 4 weeks in the spring may kill it. Best way to avoid it is not to leave decaying alliums in the ground and by using a strict 4-year rotation.

Companion Planting: Planting garlic near roses will help to repel aphids. Because of its sulfur compounds, it may also help repel whiteflies, Japanese beetles, root maggots, carrot rust fly, and other pests. Garlic, made into a tea, or spray, will act as a systemic pesticide, drawing up into the cells of the plants. It's a good companion for beets, Brassicas, celery, lettuce, potatoes, strawberries, and tomatoes. Avoid planting it near peas or beans of any kind.

Excerpted from West Coast Seeds.

Vermont Bans Food Waste From Landfills

Cont'd from p.1

Along the way, we discovered that our increasingly synthetic leftovers were taking hundreds of years to break down. So our holes began filling up more quickly, forcing us to look for more spaces to dig more holes to fill with more trash.

In the intervening millennia, the planet's inventory of land qualifying as "away" decreased as our population increased. There are so many of us now, that one person's "away" has become another person's backyard, cellar hole museum, or frisbee golf fairway. Apply that to Vermont. That, combined with geological limitations, renders most of Vermont out of the running for a new landfill. Vermont's only current landfill is owned by a private company and located near the Canadian border in Coventry.

In the airless, lightless tomb of a landfill, even items similar to what our cave-dwelling ancestors tossed — apple cores, yard debris, kindergarten macaroni art — do not break down as quickly as when the saber-toothed raccoons and chipmunks helped winnow down the detritus. Even worse, when natural materials such as food, paper, and yard debris end up in a landfill, they generate a type of methane that is about 20 times more damaging to the planet than carbon dioxide. It is past time to focus on downsizing our methane footprint.

All of this adds up to why the Green Mountain State cares so deeply about what you do with your food scraps. The Legislature even voted unanimously (unanimously!!) to regulate what you do with them.

The Vermont General Assembly passed Act 148, Vermont's Universal Recycling and Composting Law, in 2012. It bans food scraps from landfill disposal on a rolling basis over six years. As of July 1, 2017, many businesses are required to keep food out of the trash. In 2020, food scraps will be banned from the landfill for all Vermonters.

This is a great opportunity for people to start a compost bin in their backyard, find a farmer who would love to have those food scraps, or take them to a composting facility or drop-off center where your scraps will be used to produce energy or compost.

Food scraps in a heap. Photo: Clare Innes.

It is also an opportunity for more small-scale food scrap collection companies to tap into the pent-up demand for this service. It's a difficult material to collect and transport, but companies are already popping up to serve this market. The current list is at 14 companies and growing—search for "food scrap haulers directory" on Vermont.gov to find one near you.

Nothing focuses the wits like a deadline, and the deadlines under Act 148 have already inspired positive change, helping us get our act together and pull more products into the "circular economy," where resources are used and used and used again—not wasted in a hole in the ground.

Claire Innes is the former marketing coordinator at Chittenden Solid Waste District (CSWD) in Williston, Vermont. For more information visit CSWD.net, or call their hotline at 802.872-8111.

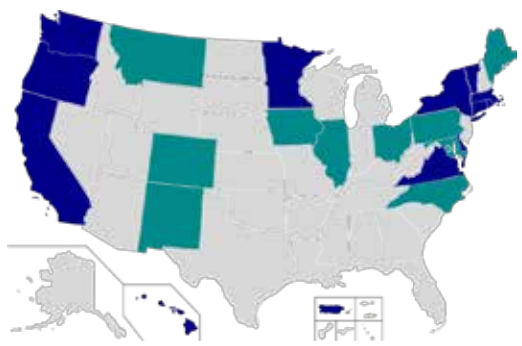
Still Committed to Climate Action

By Green Energy Times Staff

The United States Climate Alliance was announced immediately after President Trump announced that the U.S. was withdrawing from the Paris Climate Agreement. It is currently made up of thirteen states and Puerto Rico and seeks to achieve the U.S. Paris goals. The Alliance's member states and P.R. are home to over 107 million people, about 32.3% of those living in the U.S. Their website is www.usclimatealliance.org/.

Nine other states and the District of Columbia are not members but have also expressed support for the goals. Their population, totaling 67 million, is 20.8% of the U.S. population.

In addition to these states and territories, hundreds of municipal governments have expressed their intentions of achieving the U.S. climate goals. The Mayors National Climate Action Agenda, or Climate Mayors, are one group of these. Climate Mayors includes 364 cities in 44 states. All of the ten most populous cities in the country are included among its members. Their website is climatemayors.org/.



Thirteen states plus Puerto Rico (highlighted in navy blue) are members of the U.S. Climate Alliance. The states highlighted in aqua are other areas whose governing officials have expressed support for the Paris Agreement. Image: Wikipedia.

A number of other, similar groups have sprung up. There are advantages to putting them all into the same umbrella group, especially considering that France, India, and China have all expressed willingness to have the position that the U.S. had occupied at Paris Climate talks, which was vacated by President Trump, filled by some representative organization. For that reason, Governor Jerry Brown of California and former Mayor Michael Bloomberg of New York have started America's Pledge. This organization is not limited to government bodies, but can be joined by educational organizations, businesses and others.

The state of all this activity is constantly changing. It has only been a short time since the president reneged on the U.S. promise on climate change, and the situation has not settled yet. One thing is quite clear, however. Well over half the people in this country live in areas where state or local governments are pursuing the U.S. pledge on climate change. America is still doing its job, even though the president is not.

Climate Alliance

Solar at YMCA's Camp Huckins in Freedom, N.H.

By George Harvey

A 42.6kW solar PV array installed on the roof of Camp Huckins' dining hall. The array consists of 142 solar panels, each rated at 300 watts. Photo courtesy of Camp Huckins.

This summer, the YMCA's Camp Huckins, a girls' camp in Freedom, New Hampshire, had a 42.6-kilowatt (kW) solar photovoltaic (PV) array installed on the roof of its dining hall. The array's DC power is sent through three inverters to the dining hall, and it is grid-tied. The array consists of 142 solar panels, each rated at 300 watts.

The Camp Huckins solar array is expected to produce about 40,720 kilowatt hours of electric energy each year. This offsets 43,326 pounds of carbon dioxide annually, approximately what would be emitted by burning 2078 gallons of gasoline.

The array was installed by ReVision Energy, a Certified B Corporation in Brentwood, New Hampshire. The installation was done through a power purchase agreement (PPA), under the terms of which Camp Huckins can get use of the power from it, saving money in the process, without having to pay any initial costs.

The new array is not the first that Camp Huckins had installed by ReVision Energy. A 7.92-kW solar PV system was installed in 2012 for the Camp's bath house. It has 33 solar panels, each rated at 235 watts. It was also installed under a PPA with ReVision Energy, so Camp Huckins' decision to go ahead with the new system was based on earlier experience. In addition, the camp had a solar hot water system installed in 2003 and highly efficient heat-pump water heaters.

Jody Skelton, Camp Huckins' executive director, told us that she feels the most important thing about the solar array is not the money saved, or even the direct environmental benefit, but its value in terms of the effect it has on the children. "It is an education piece," she said. "Every day we visit the meter and read how many kilowatt hours we have made." The children leave with some understanding of solar power.

The solar array continues to run through the year, even when the only thing taking place at Camp Huckins is administrative work in the office. It uses net metering to save credit for excess solar power generated in the winter to use during the active summer months.

ReVision Energy's website is https://www.revisionenergy.com/.

Camp Huckins' website is https://camphuckins.org/

NH Saves Button Up Workshop Series Announced

New Hampshire: Button Up New Hampshire, the popular home energy savings workshop series, is returning to a community near you. These free workshops will take place throughout NH starting in September. The workshops are being sponsored by NHSaves and coordinated by the Plymouth Area Renewable Energy Initiative (PAREI).

NHSaves is a collaboration of New Hampshire's electric and natural gas utilities, Eversource, Liberty Utilities, NH Electric Cooperative and Unitil, working with the NH Public Utilities Commission and other interested parties to provide NH customers with information, incentives, and support designed to save energy, reduce costs, and protect our environment statewide.

The NHSaves Button Up Workshop is a 1.5 hour presentation about how to improve the energy efficiency of your home. It covers basic building science principles as well as examples of whole house weatherization measures that will button up your home for the heating and cooling seasons. It also covers details about the energy efficiency programs offered by NH utilities to provide energy audits and weatherization, rebates on electric and gas appliances as well as new construction.

NH residents wishing to use energy more efficiently, conserve energy and save money on their heating and cooling bills, will find the information very useful. The Plymouth Area Renewable Energy Initiative of Plymouth, NH is working with local groups statewide to organize the workshops for the public on behalf of New Hampshire's utilities. Each workshop is sponsored by the utilities through NHSaves and hosted by a local partner.

The utilities are offering a free LED light bulb to the first 10 households who attend each workshop. Each workshop is presented by a knowledgeable BPI Certified Building Analyst and a utility representative will also be available to answer further questions about their programs.

The workshop series will kick off with a workshop in Gilford, NH on Thursday, September 7th at 6:00pm. The workshop is being organized by the Gilford Public Library located on 31 Potter Hill Road in Gilford. All are welcome to attend.

The workshop organizers still have open slots on their schedule for additional local partners who are interested in hosting a NHSaves Button Up Workshop for their community. If your town committee, business or local organization would like to host a free workshop, please contact Robbin Adams, Button Up Coordinator, at the e-mail address below.

More info: NHSaves.com/events, 603-536-5030 or email to robbin@plymouthenergy.org.

Plant a Great Lawn and Save the Planet!

Believe it or not, you can do it at low cost and with little work

By George Harvey

Platinum level LEED home in Newton, MA with Pearl's Premium grass. Courtesy photo.

You can have a great looking lawn that needs very little water, needs no chemicals, and can be mowed just once a month. But while that may sound like a minor miracle to some people, it is just a beginning of an even more interesting story.

Pearl's Premium has released a new blend of Pearl's Premium Ultra Low Maintenance Lawn Seed, which it says is an entirely natural, non-GMO, grass. In fact, the grass carries the trade mark, "People, Pet & Planet Friendly."

Jackson Madnick who founded Pearl's Premium and has worked on perfecting blends of grass seed for years, is clearly an expert on lawns. His grass seed is a success story of its own, as it has been planted on 400,000 lawns in all fifty states.

The new generation of Pearl's Premium Ultra Low Maintenance Lawn Seed is impressively easy to grow. You should plant it in the fall for best growth, so right now is the time to think about it.

The first attractive feature of the seed is how you plant it. According to Madnick, "You don't have to tear up your lawn. You just plant Pearl's Premium grass right over the existing lawn to out-compete it." Grass that will out-compete the weeds seems like an idea that someone should have thought of long ago.

The new grass grows slowly. This is a huge advantage when it is fully established, because mowing need only be done once a month. Fertilizing likewise becomes unnecessary, except for about a quarter inch of organic compost spread out once per year.

One really great thing is that the grass roots go really deep, 12 to 48 inches. This has a whole set of implications, all of which are beneficial. The grass gets water from much deeper down, and this reduces watering. Reduced water and fertilizing are an important reason the new Pearl's Premium blend can out-compete other types of grass and weeds. The unwanted plants that grow faster need both more water and more fertilizer. And this, in turn, means that chemical weed controls are unnecessary for a great lawn.

Once the lawn is established, the grass does not spread easily. Other grasses can be a problem for those of us who plant gardens, but that is a problem that the new Pearl's Premium seed solves. That point alone would make it sufficiently attractive for many of us.

Since the lawn needs no chemical fertilizers or pesticides, it is much safer for pets and children. But that is not the end of its environmental benefits. The long roots of the grasses sequester carbon, benefiting all life on Earth. That may seem a bit of a stretch, if you think about it being just one lawn. But it is not just one lawn; it is hundreds of thousands of them, each doing its part.

And so, you see, the miracle may not be so minor after all.

You can visit the Pearl's Premium website at pearlspremium.com. If you place an internet order, use the code GreenEnergyTimes to get a 15% discount for the next three weeks only.

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