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2015 Historical SOLAR GROWTH IN THE NORTHEAST

By George Harvey

Over 60% of all new generating capacity added in the United States in the first ten months of 2015 was renewable, according to the Federal Energy Regulatory Commission. This agency only counts utility-scale installations, so new small solar capacity, roughly half of the total for solar, was not counted.

One renewable energy story came from New Hampshire. At the beginning of 2015, it had only ten megawatts (MW) of solar capacity. A huge increase in the net metering cap, intended to keep solar installers busy for quite a while, was quickly met, and many solar installers began having trouble proceeding on projects.

A solar project commissioned in early November in Peterborough, New Hampshire, deserves attention. This array, in a town of fewer than 7,000 people, has a capacity of 944 kilowatts (kW). Lacking incentives, New Hampshire has lagged behind other states, and this project is the largest in New Hampshire to date. It should save the town between $250,000 and $500,000 over the next twenty years.

In New York, Governor Cuomo set a goal to get to 50% renewable power by 2030. The state is also trying to get 150,000 families supplied by solar power by 2020. New York's solar initiative, NY-Sun, has a program designed to help families of below-average income get their own solar systems.

New York has banned fracking. It is supporting the EPA's Clean Power Plan in court. It is taking legal action against ExxonMobil for allegedly deceiving both stockholders and the public about climate change for decades.

Interesting projects include a 472-kW system belonging to four wineries in the Finger Lakes, getting them 50% to 100% of their electricity from the sun. Three ski resorts will rely on solar power for their lifts and snow-making equipment. And New York will have the tallest Passive-House building in the world, a Cornell University dormitory on Roosevelt Island, in New York City.

In Massachusetts, whose new governor seems uninterested in renewable energy, the state has been slipping from its leadership role. Solar incentives were not renewed by the legislature, leaving the solar industry very much adrift. Some people blame lobbying by utilities.

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This 944kW solar farm serves Peterborough, NH went online early November, 2015 . Courtesy photo.

We CAN Prevent Climate Disaster!

Clockwise: Dr. James Hansen, Ban Ki-Moon, John Kerry , Bill Gates, Bernie Sanders, Pope Francis, Mark Zuckerberg, Richard Branson, Richard Heinberg and Elon Musk. Courtesy photos.

By Jim Stiles

Our future is in danger, but we have a powerful solution. We have the ability to face climate change head on. A carbon compensation fee levied upon polluters can be an important tool to reduce carbon emissions. This will help nearly everyone both in their pocketbooks and with their health. And it can save the planet. Green Energy Times refers to this solution as a carbon compensation fee because it compensates all of us for the damage polluters do.

British Columbia (BC) introduced its carbon tax in 2008, and it has been so successful that it is now being copied by Alberta, a province that has been dependent on fossil fuel production. It is time to do it here, in the United States. Progress is being made to introduce such fees in Vermont and Massachusetts, and we hope other states will follow. Vermont's proposed plan is based on the successful implementation in BC.

How does this work? Carbon compensation fees would be charged on fossil fuels based on their carbon content. The income from the fees would reduce everyone's taxes and help support people with lower incomes to compensate for any extra burden they would bear. Higher cost of fuel makes energy conservation measures more attractive. When implemented in Vermont, the fees would lower taxes such as the

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Paris – COP21: Encouraging Promises!

By George Harvey

The news of the 21st Conference of the Parties (COP21) on climate change came thick and fast as the conference progressed. There was a lot more to say than there was time to say it. We kept a diary of the events as we found them, however. (The dates represent when we saw the news, which was, in many cases, the day after the events took place.)

November 29 – As negotiators gathered in Paris for the on climate Change, the question of the day was "Can we avoid an apocalypse?" As the meetings began, nearly every country involved had agreed that an increase of 2° Celsius from pre-industrial times was too much for safety. The promises the countries have already made would cover about 90% of the carbon emission reductions needed to slow climate change.

After the terrorist attacks of November 13 in Paris, security was high and many people worried about disruptions to the proceedings.

November 30 – There are 195 countries represented at COP21. Leaders of 147 of them came to address the conference.

There had been over 2000 demonstrations and protests across the world. The poorest countries have expressed a fear of "being left behind." Many people from developed countries were afraid the conference would fail generally. In London alone, 50,000 people took to the streets in a march.

December 1 – National leaders addressed the conference, saying that the stakes were too high to allow the conference to end without success on agreement on how to meet a goal of 2° or less.

Indigenous people from around the world gathered at Paris to bring attention to damage their homelands

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GREEN ENERGY TIMES (G.E.T.)

1749 Wright's Mountain Road • Bradford, VT 05033
t/f: 802.439.6675 • info@greenenergytimes.org

G.E.T.'s COMMUNICATIONS TEAM:

Publisher/Editor/Production ..... Nancy Rae Mallery
General Factotum ..... George Harvey
Copy Editor ..... Ray Brewster
Coordinating Director ..... Michelle Harrison
Contributing Writer and Consulting Editor ..... Jim Stiles
Design/Layout ..... Nancy Rae Mallery, P.J. Fischer
Printing..... Valley News Lebanon, NH Using 100% Recycled Newsprint & Smudge-Free Environmentally Safe Inks*

Advertising Team:

Nancy Rae Mallery, Bradford, VT **802.439.6675**
nancy@greenenergytimes.org

Michelle Harrison, Londonderry, NH **603.437.0167**
michelle@greenenergytimes.org

Danielle Turo, Danville, VT **802.424.1482**
dany@greenenergytimes.org

Hope O'Shaughnessy, Stratham, NH 413.222-2820
hope@greenenergytimes.org

Aubrey Cabot-Case, Peacham, VT **802.778.0906**
aubrey@greenenergytimes.org

Tate Pasquini, Burlington, VT **413.328.9596**
tate@greenenergytimes.org

Donna Stein, New York, NY **212.307.6189**
donna@greenenergytimes.org

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

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Solavore Launches Indiegogo Campaign to Fund the Distribution of Solar Ovens in India, Cambodia and Kenya

Solavore, LLC, a women-owned social enterprise committed to the manufacture and global distribution of 100% fuel-free clean cooking technology, announced that it is launching an Indiegogo campaign today to initiate a program called Solavore Works that distributes solar ovens to individual families in India, Cambodia and Kenya. Nearly 3 billion families today cook on indoor open fires, resulting in serious respiratory disease and climate-altering deforestation. Founded by former NeXT Computer and 3Com senior operations executive, Anne Patterson, Solavore™ is the manufacturer of the Sport solar oven, a 100% renewable energy solar oven.

Every solar oven purchased helps to fund a Solavore Sport somewhere in the world where an open fire is still the main kitchen appliance. Solavore Works is Solavore's corporate social responsibility program that supports projects in the developing world.

Solavore Works brings benefits to communities in the developing world including:

- Respiratory health: freedom from common diseases such as pneumonia, which kills more women and children each year than malaria or AIDS
- The removal of one of the main causes of deforestation in the developing world
- Savings in energy expenditures, which can range up to 25-50% of a family's budget
- Water pasteurization and food dehydration
- The ability for girls to attend school rather than spend their days collecting firewood with their mothers
- Increased income generation, enabling a woman to sell the food that she bakes or dehydrates in her solar oven

"As a social enterprise, our approach to poverty reduction is more in terms of enabling opportunity and less in terms of aid," said Anne Patterson, CEO of Solavore. "Not just a source of clean food, we expect these ovens to help their owners develop goods to sell in the marketplace, and local assembly of ovens creates jobs as does the sales, distribution, and support of new ovens."

The Solavore Sport is a virtually indestructible, retained-heat box-type solar oven made of rugged, durable, lightweight injection-molded nylon resin. Surround insulation and two-pot capacity enable unattended, family-size year-round cooking. The integral water pasteurization indicator adds clean water to the Sport's versatility, along with slow-cooking, baking, and de-hydrating. The Sport solar oven is an industry leader in price, performance, family-size capacity and rugged durability. The solar oven, in conjunction with a small, efficient wood burning stove when sunlight is not available, can reduce a family's fuel consumption up to 80%.

The campaign's featured perk is BOGO – Buy One Solavore Sport for your family, Give One to a family in a Solavore Works program.

In addition to this, a collection of perks carrying the outdoors, solar, travel themes include:

- 100% silk scarf from Cambodia
- Nick Brandt (Big Life) photo book, signed copy
- Sec rid Mini Wallet (contributed by SportiqueSF)
- Fjallraven Backpack (contributed by SportiqueSF)
- Silicone Solavore trivets/pot-lifters
- "I'm a Solavore BAGGU" re-usable grocery bag
- USB recharger contributed by GoalZero
- Kristin Laing Designs Solavore necklace
- Nomad Portable Solar Panel contributed by GoalZero
- 1 week yoga retreat in Culebra, PR
- ThermoTent TT3 by ThermoTents
- Nightswapping.com: One Level-4 Standard Night
- Solavore CEO Anne Patterson cooks for your social or corporate event

Via profits from the sale of the Sport in the developed world, Solavore aims to empower women through "caring capitalism". Solavore will direct the funds from this Indiegogo campaign to Solavore Works' developing country programs which will expand to develop micro-loans and other consumer finance programs.

For further Information contact Cathy Clarke, at 508-833-8533, 617-527-2089 or cathy@cncassocs.com.

Solavore is a women-owned social enterprise whose mission is to promote clean-cooking technology around the world. Solavore pledges to use its profits to remain independent and self- sustaining while providing clean cooking alternatives to the world's 3 billion people who are still cooking over open fires. Solavore is an active member of the Global Alliance for Clean Cook Stoves and Solar Cookers International. www.solavore.com.

CORRECTION: On page 1 of the October 2015 issue of Green Energy Times, the article "Coming Soon to a College Near You" incorrectly put R.W. in front of the Hitchcock Center name. It should have just been the Hitchcock Center. In our August 2015 issue of Green Energy Times, we published an article about the R.W. Kern Center which is a different center entirely. Our apologies for this mistake.

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Net-Metering Woes ...

By George Harvey

Net metering is a system that allows those who have their own power sources to put excess energy on the grid, retaining credit for it which can be drawn against at some other time. It has been under attack of late, by people and organizations who oppose it, some of whom believe net metering does not fit well with their business models.

One claim is that net metering shifts the cost of power from those rich enough to be able to afford solar photovoltaics (PVs) to those who are poor. Since solar PVs can usually be financed for costs below those of grid power where net metering is allowed, it is clearly not true that only wealthy people can afford PVs.

There are other objections, but to understand them we should review the wholesale electricity market. Utilities do not simply buy power at a fixed wholesale price and sell it to consumers at retail. There are long-term contracts at fixed price, but the utilities have to use what they contract for, so they buy the minimum amount they think they might need. They usually have to buy more on a short term or immediate basis, and this is costlier.

Electrical JATC of Southern Nevada demonstrating net metering technology. Photo: US Department of Energy (DOE).

For example, if a utility foresees an increased demand for electricity because predicted hot weather will require air conditioning, it fleshes out its supply by buying short-term contracts. The price of short-term wholesale power can be several times that of a long term contract.

Sometimes, even a short-term contract is insufficient to cover a need, and the utility has to buy more electricity yet, if they can, on the spot market. Peaking plants supply this power at a high price, and since the utilities have no choice, they have to pay. The prices are sometimes astounding. Record prices are in excess of ten dollars per kilowatt hour (kWh) – as compared with typical prices to consumers in the range of cents per kilowatt-hour.

Utilities normally have to provide power to customers at fixed prices. This means that if the retail price is 15¢/kWh and the spot price is $1/kWh, they are losing a lot of money on the short term, which they have to make up at other times.

Traditionally, the highest price for power is in the daytime. This is because businesses and factories are open, schools are in session, and people are otherwise busy, so the demand is high. Interestingly, solar PV systems just happen to produce power during the daytime hours, when the demand is highest.

The implication is that solar power nearly always has higher value than power from a conventional base-load power plant, even without considering environmental issues. We have a good economic incentive to make sure that it solar power adequately compensated, because if the compensation is fair, it will lower the cost of electric power for everyone.

Net-metered PV array. Photo courtesy of All Earth Renewables.

Even if the compensation for net-metered solar power is at the retail rate, it can reduce costs for everyone, because when the sun is shining, the wholesale market price for electricity can be very much above the retail rate. Furthermore, customers with net-metered PVs reduce the peak demand, which reduces the highest wholesale prices. Finally, those same customers buy most or all of the electricity they buy at the very times that demand, and wholesale prices, are lowest, producing the highest profits for the utilities.

In short, the idea that customers with net-metered PVs increase the costs of everyone else is simply wrong.

There are reasons for some utilities not to favor net metering that have nothing to do with immediate economics. One is a worry that net-metering will allow customers to become too independent. Another is that they have yet to face altering their business plans with the changing times.

In fairness, there are reasons a utility might want to limit the amount of electricity it can take from solar PVs. For example, in southern Italy, the installed PV capacity is so great that it pushes the daytime wholesale power costs nearly to zero. This means that if the utility is paying retail prices for net-metered power, they are paying for something they have to give away. Such problems can be solved, however, but uniform adoption of a smart grid.

Despite the clear

Cont'd on p.24

Climate Deceit and Climate Deniers

By George Harvey

Knowledge of human-caused climate change has been around for a long time. An early scientific paper on the connection between carbon dioxide (CO_2) and changes in the Earth's climate, based on scientific measurement of CO_2's ability to absorb infrared emissions, appeared in 1896.

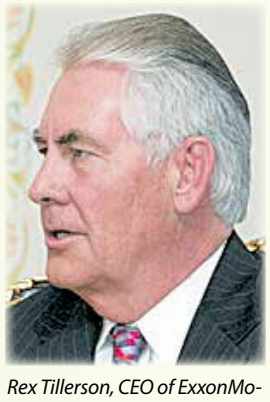
Scientific research on our current situation, connecting use of fossil fuels and climate change, was certainly underway more than half a century ago. On November 5, 1965, a group of well-known scientists sent a paper, "Restoring the Quality of Our Environment," to President Lyndon Johnson. The paper had a section on CO_2 and climate change. The section was written by Roger Renelle, director of the Scripps Institution of Oceanography, who had been working on issues of CO_2 pollution since 1956, at the latest; Wallace Broecker, known for developing the understanding of the "ocean conveyor belt," that explains circulation of major oceanic currents; Charles Keeling, who developed the first instrument for monitoring the level of CO_2 in the atmosphere; Harmon Craig, professor of Geochemistry and Oceanography at Scripps; and J. Smagorinsky, director of the U.S. Weather Bureau's Geophysical Fluid Dynamics Laboratory.

Sen. Sheldon Whitehouse of Rhode Island. Photo: Kenneth C. Zirkel

Though the press and the public ignored the problem, the question of CO_2 and climate change was soon taken up by companies in the fossil fuel industries. They had an interest in the issue because the CO_2 that was beginning to be accused of altering the weather was coming from their products. What they did with the information they found should probably come as no surprise to anyone who understands that many companies are run by people who believe first duty of any company is to make money, regardless of the social costs or externalities.

On September 16, 2015, InsideClimate News (ICN) issued the first part of a story detailing the history of the effort at Exxon, now ExxonMobil, first to study, and then deny, the implications of climate change. The report was based on a long investigation by a group of researchers. What they found was that Exxon had climatologists studying the issue of climate change since 1977, at the latest. The Exxon scientists did a very creditable job, drawing conclusions that are very close to those accepted by mainstream science today.

When the Exxon scientists gave their report to the corporate management, they advised that their conclusions be published outside the company for reasons of ethics. What the company did, however, was precisely the opposite. They chose to pursue two paths. One was to find ways to make use of their private knowledge of climate change to make advantageous investments. For example, they determined what Arctic regions would thaw first and become the best prospects for drilling. The other was to hire scientists to develop plausible explanations on climate change, to cloud the issue for everyone else.



Rex Tillerson, CEO of ExxonMobil. Photo: premier.gov.ru.

In this case, clouding the issue included outright denial of the conclusions of their own scientists, which they were using to advantage. Their reason for doing this almost surely included an intention to maintain their very profitable business model as long as possible.

We might take the actions of Exxon, and later of ExxonMobil, to constitute deception for the purpose of making money. If that is what happened, then it is fraud. Maintaining a fraud over time is one of several things referred to as racketeering, which is covered by its own set of laws.

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PARIS AUTOBARN
Takes Green To a Higher Level

By George Harvey

Paris Autobarn building showcasing solar panels.

In many ways, the Paris Auto Barn, in South Paris, Maine, is not all that different from other auto repair shops. The owners, Adam Beril and Tony Giambro, specialize in Subarus and Hondas, but they do all sorts of jobs on all sorts of cars. They change the oil, fix the leaks, swap out spark plugs, attend to problems with breaks and mufflers, and do many other common garage chores. They do these things, however, with an attitude that has transformed their business into an example for green operations.

Perhaps one machine in the Paris Auto Barn can be taken as an emblem of what the business is all about. It is not a cheap machine, and has limited usefulness. Its sole purpose is crushing oil filters. That might not sound like much, but the underlying importance is that nearly all the oil in the filter is extracted in the process, and this means that both the oil and the filter can be recycled. Otherwise, because the last bit of oil never drains out by itself, both the filter the oil in it would go to a landfill.

Between them, Beril and Giambro had about twenty years' experience working on cars when they went into business together in early 2014. Their reason for starting out on their own was that they wanted a business that was environmentally and socially responsible. Doing that with a shop that services automobiles is not as simple as it might be for other businesses.

The building they operate in was the less than five years old and was Energy Star certified, so the windows, air sealing, and insulation, while not at the highest levels, were not problems of greatest concern. They had a pair of Mitsubishi air-to-air heat pumps installed. They also insulated the garage doors and set them to operate on remote controls so they could be closed as quickly as possible when cars are moved in or out.

Lighting was replaced with LEDs. In this case, the whole fixtures were replaced through a program run by Efficiency Maine. They were installed in great enough numbers and with care to placement so that they entire shop is brightly lighted.

The solar system was installed by ReVision Energy last July. Since that time, it has produced more electricity than the shop used, with the excess banked in a net-metering program. It is expected to generate well over 15,000 kilowatt-hours of electricity each year. This offsets the equivalent of 25 barrels of oil.

The shop owns a dump truck with a gasoline engine. Beril and Giambro purchased a diesel-powered parts truck and will soon put its engine into the dump truck. They will be using a 99.9% biologically sourced diesel oil to operate this, produced by Maine Standard Biofuels. They look forward to getting a Tesla Model S as a second business vehicle, and have already put down the deposit.

Their research into biofuels led them to another small organization in Ohio, Renewable Lubricants, which provides bio-based common weights of engine oil, transmission oil, and bar and chain oil.

The Paris Auto Barn can provide recycled engine oil. All the oil drained from engines is sent to the recycling facility that they buy from, and this greatly reduces waste by keeping the oil in a closed-loop system.

The oil filters they provide also reduce waste. The filter has slightly more complicated design than standard filters, putting a portion of the oil it gets from the engine through a super-fine filter. The effect of this is that while the filters need to be replaced about every 10,000 miles, the oil can keep going for 30,000 miles between changes. Again, waste is reduced.

Instead of washing parts in solvents, they have a non-chemical Smartwasher, which does 'bioremediation' by using organisms that consume petroleum products. This eliminates waste solvents and hazardous chemicals entirely.

Eco-Friendly auto supplies at Paris Autobarn. Photos courtesy of Paris Autobarn.

The owners' interest in helping customers has led to having a rack for bikes for a local bike share. The interest in bikes led to the Autobarn selling bikes with electric assists. This led to a general battery recycling program being part of the business. Additionally, they have installed a level-two charger for electric vehicles.

They support green organizations, including the Maine Organic Farmers and Gardeners Association and the Center for Ecology-Based Economy. The focus is on sustainable food and transportation, but also on a sustainable way of life.

Summing up the Paris Autobarn approach, Tony Giambro said simply, "We try to be responsible for the products that we sell."

They are proudly part of the EPA's Green Power Partnership. They have also won the 2015 Environmental Excellence Award from the Governor of Maine.

Car Sharing in New England in 2016

By Jim Stiles

Charging stations in Indianapolis for BlueIndy electric vehicles. Photo courtesy: http://bit.ly/gannett-cdn

2015 was a good year for car sharing in the Northeast and 2016 looks to be much the same. Across the region more shared cars were placed in more locations. Big players like ZipCar and Car2Go and little ones like Car Share Vermont continue to grow.

One interesting development in car sharing occurred in Indianapolis, Indiana in September when BlueIndy moved to join its European cousin Autolib as it started deploying French electric vehicles from Bluecar. Well-suited for city driving with a range of 155 miles and top speed of 75 mph, Bluecars appear to be a good match for many car-sharing demands in large metro areas such as Indianapolis, with its nearly two million residents. The company currently lists forty locations as being under construction and has plans for five hundred Bluecars distributed across the city at two hundred locations. As with many car share providers, BlueIndy got a big boost from strong local support, in this case the mayor of Indianapolis. He sees potential benefits for the city from reducing parking demands and traffic congestion.

With a population of less than eight thousand, Montpelier is tiny by normal car-sharing standards. Its two cars from Car Share Vermont, placed there this year, were deployed in response to strong interest from residents and the state government. It is still in its early days, and the jury is still out on its success.

Although similar to car rentals, car sharing is more cost-effective and convenient when there are enough people who are willing to become members of a car sharing service. This normally means these services are limited to larger cities or special locations such as universities, although smaller populations may attract car sharing if interest is strong. Car sharing advocates readily admit that car sharing does not address every need for a car. However it seems to be a good fit for people who occasionally need a car or don't really want a second car.

At a recent public hearing on transportation planning in St. Albans, Vermont, car sharing piqued many people's interest. With a population of less than seven thousand, St. Albans is not an obvious candidate for the service. The benefits are there, but the cost structures of conventional car sharing make it unlikely that such a small community could attract a provider. Other than the issue of enough people with interest, insurance for shared vehicles was identified as the big barrier. The state transportation planners promised to consider ways the state could ease this barrier as long as the cost to the state was not significant.

Car sharing, including innovative services like BlueIndy, is one good way to help wean society from our reliance on cars. As car sharing organizations continue to seek out partners to help overcome barriers to placing cars, expect to see strong growth at universities, companies, communities, and other organizations looking to support green initiatives.

Jim Stiles has worked in alternative energy, high tech, and construction. His passion is figuring out what a prosperous, sustainable society can look like, so he can do a better job building it.

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**

COMMUNITY ALLIANCE TRANSPORTATION - Services for Claremont & Newport. 603-863-0003

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**

Manchester Center, Vermont Welcomes Two New Vehicle Charging Stations

Charging station at Northshire Bookstore. Photo Courtesy of Chris Morrow, Managing Partner

Manchester, Vermont – Fill up your bellies with a burger, fill your mind with information, and fill up your car with clean electricity! It's all possible at Zoey's Double Hex Restaurant in Manchester Center and the Northshire Bookstore, thanks to a partnership between Green Mountain Power and the two Manchester, Vermont, businesses.

"We are so pleased to see Vermonters embrace our efforts to build a comprehensive EV charging network," said Chris Condon, Innovation Champion at GMP at an unveiling of the charging stations Wednesday morning. "As more businesses see the value of offering charging stations, more of us will be able to save money and reduce fossil fuels while conveniently charging our cars."

GMP's commitment to a comprehensive statewide EV charging network will help increase Vermont's energy independence and contribute to cleaner air and lower carbon emissions. GMP has installed charging stations in 22 locations, eight of which have a DC fast charger.

"Tourists come to Vermont for many wonderful reasons, and being able to offer them a convenient way to charge their electric vehicles makes Vermont even more attractive," said Megan Smith, Commissioner of Tourism for the State of Vermont. "We commend Zoey's, the Northshire Bookstore and Green Mountain Power for their efforts to bring this option to tourists as well as the local community."

Co-owners of Zoey's Double Hex Restaurant, Guy Thomas and Bob Albert, are always looking for ways to serve their customers better while honoring the environment. "It is a huge asset that Green Mountain Power is making it possible to host the charging stations," Albert said. "It's a great convenience to our traveling customers to have an EV station here at the Double Hex Restaurant, at Exit 4 on Highway 7."

Chris Morrow, Managing Partner of the Northshire Bookstore, expressed his enthusiasm in partnering with Green Mountain Power to bring a new NRG EVgo Freedom Station to Manchester. "Manchester is already an appealing place to shop and this is a great way to help the environment and also help attract more people to our great shops and restaurants."

"We are thrilled to have two new charging stations in Manchester," said John O'Keefe, Manager Town of Manchester. "Manchester already has so much to offer its visitors, and this is one more reason people will come. I see it as a huge value for our community."

Michele Boomhower, Director of Policy Planning and Development for VTrans, said, "Vermonters are quickly adopting clean electric vehicles, and additional charging stations will entice even more Vermonters to make the switch."

The charging station at Zoey's Double Hex, at 1614 Depot Street, will have three dual port level 2 stations that provide up to 24 miles of charge per hour. The charging station at Northshire Bookstore, 4869 Main St, will have an ABB fast charger that is capable of providing approximately 80 percent of a battery charge in 25 minutes when using the DC fast-charging option and that serves all electric vehicles (Tesla owners need an adapter), as well as a dual port level 2 station.

GMP offers customers the option to pay as they go or sign up for various monthly charging memberships starting at $5.95 a month. Memberships are available for GMP customers at 1-877-494-3833 or www.greenmountainpower.com/evgo, but anyone can pay by credit card at the charging station.

Workplace EV Charging Station Incentives

Vermont Clean Cities with support from the Vermont Public Service Department is now offering two levels of incentives for the installation of EV charging stations at workplaces across t.he state.

In addition to the $525 available for non-networked single-port stations, $1050 will be made available for networked single-port stations, and $1575 for dual-port stations.

We also have EV parking signage available.

Interested and want to learn more? VTCCC can walk you through the process and share the best practices.

To learn more, visit: uvm.edu/vtccc/electric-and-hybrid/

A "Vermont Grown, Vermont Green" SOLAR FARM

Ribbon Cutting Ceremony. Photo Courtesy of Aegis Renewable Energy.

By GET staff

The 150-kilowatt Boardman Hill Solar Farm in West Rutland, Vermont, was designed, installed, and commissioned by Aegis Renewable Energy in late 2014.

It finally had its ribbon-cutting ceremony, on October 25, 2015.

The solar farm is an entirely Vermont-grown project, owned and operated under democratic management by its members. At the ceremony, the member-owners officially retired the Renewable Energy Credits (RECs) the farm had received so far. These two conditions make it a "Vermont Grown, Vermont Green" project, the first community solar array that meets that goal.

The Boardman Hill Solar Farm is owned by thirty Vermont families and small businesses who purchased shares in the project. Under its direct ownership structure, each Boardman Hill member-owner receives economic benefits of a share of the project, rather than being retained by third-party owners or financiers. The benefits include a 30% investment tax credit and net metering credits valued at approximately 125% of retail electrical rates.

It is noteworthy that the member-owners of the Boardman Hill Solar Farm decided to retain the RECs generated by the project. This means that they are not allowing others to buy the credit for going green, but are retaining that credit in their organization. Polluters often buy RECs so they can claim to have reduced their pollution, but the Boardman Hill Solar Farm was built, in part, to address pollution, and its members do not want their efforts to be used by others as an excuse to continue producing polluting emissions.

The member-owners of the Boardman Hill Community Solar Farm like to think their project stands out as an example for what solar development should be. They have created a community solar project that returns all of the value that it generates to the local community and to the environment, making their solar farm truly "Vermont Grown, Vermont Green."

Aegis Renewable Energy intentionally made the project a special case. They provided draft documents for the operating agreement, general conditions, and land lease. They structured the owner contracts, and provided other outreach efforts. They did the negotiations with the Vermont Land Trust. They designed, permitted, and installed the project, and continue to maintain it. All of this is particularly important because they made a conscious decision to open-source all their work, so as to provide it as a model for other projects.

The Boardman Hill Solar Farm won the award at the VECAN Conference for Best Renewable Project of 2015.

Many thanks to our Sponsor

aegis RENEWABLE ENERGY

Free Electricity in Texas

From a very simple point of view, electric rates are typically arrived at by marking up average wholesale prices, subject to approval by some governmental agency. But since utilities must sell at the standard rate regardless of how little or how much the wholesale power costs, consumers are usually unaware of the great range of those prices. In developed nations, record highs for wholesale grid power are well over $10 per kilowatt hour. And the lowest costs can be deep into negative territory.

Though wholesale power costs normally fluctuate through a much narrower range, they do fluctuate predictably through the 24-hour day. Normally, the highest prices are at high demand times in the afternoon, and the lowest prices are at night, when demand is low.

Unlike solar power, which handily comes on at the very times that demand is strongest, wind turbines can merrily churn out electricity regardless of whether anyone wants it or not. Now TXU, a Dallas-based utility, has figured out how to make money out of that fact.

TXU has special rates for anyone who signs up for wind power. The daytime rate is somewhat higher than the normal rate. However, there is a nice financial incentive to sign up. Between the hours of 9:00 pm and 6:00 am, any quantity of electricity for customers buying wind power is free.

Any sneaky individual (we could include ourselves) might ask how they would make money if we decided, for example, to put in a battery big enough to power the house for a day, and charge it completely every night for free. We could have our power bills go to the connect fee plus zero. Interestingly, TXU would lose very little money on the power they gave us for free, and could even make money on it, if the wholesale price is negative. But they would more than make up for any night-time loss by not having to provide power that costs them a lot at a standard rate during the daytime.

Free electricity is an idea that might catch on.

Grant Links Solar Power with Horse Power at NH Farm

Windswept Farm is among 31 New Hampshire farms and small businesses that have received $1.2 million in United States Department of Agriculture Rural Development grants. The USDA grants spur renewable energy generation and conservation while helping increase profitability. Funds from the Rural Energy for America Program (REAP) have allowed New Hampshire recipients to install more than two dozen solar arrays, three modern wood heating systems, one energy efficient lighting project and one geothermal project.

One of the projects is a 19.6 kilowatt solar array installed by ReVision Energy at Windswept Farm in Canterbury. The equestrian facility received a $20,000 REAP grant to offset part of the cost. The array is expected to produce 21,612 kilowatt hours annually and will help power an indoor arena with an attached, 14-stall horse barn. The system will offset 25 to 30% of the farm's electric load. The switch to solar power at the farm is equivalent to avoiding carbon dioxide emissions from 21 barrels of oil each year.

"Even though it was a long process that involved a lot of paperwork, it was the right thing to do and the responsible thing to do, and we're fortunate that we got the grant," said Windswept Farm owner Corinne Pullen.

"From solar panels to wood pellet boilers, these projects will help farmers and small businesses reduce their energy bills, help our nation reduce its carbon footprint, and help make rural communities more sustainable," said Vermont and New Hampshire USDA Rural Development State Director Ted Brady. "USDA's REAP grants incentivize farmers and small businesses to invest their own funding to reduce one of their largest barriers to profitability – energy costs."

Since 2009, the USDA has awarded $545 million for more than 8,800 REAP projects nationwide. This includes $361 million in REAP grants and loans for more than 2,900 renewable energy systems. When fully operational, these systems are expected to generate more than 6 billion kilowatt hours annually, enough to power more than 5.5 million homes for a year. The New Hampshire projects will create or save enough electricity to power the equivalent of 243 homes annually. The next REAP application deadline is in May of 2016.

For more information about the REAP Grants and loans, see information on p. 16 of this issue of Green Energy Times. For more information about Revision Energy: revisionenergy.com.

NH Communities' Energy News

ANDOVER

The town of Andover, New Hampshire, with a population of 2,371, ranks 125th among 234 NH cities and towns in size. Yet after participating in Solarize Kearsarge between November 2014 and the end of January 2015, Andover ranked sixth among New Hampshire cities and towns in the total number of applications approved by the NH Public Utilities Commission (PUC), with 36 solar rebates on record (as of May). And the town placed fifth in the state for rebates per capita, with one for every 66 residents. Thank you, Solarize Upper Valley -- and Sarah Simonds in particular.

DERRY

On October 20th, the Derry Town Council approved a proposal to replace 930 streetlights with new LED fixtures. This project was initiated by the success of the downtown streetlight conversion pilot project in FY 2015 to install LED fixtures for 36 streetlights along East Broadway, West Broadway and the Abbott Court parking lot. The cost savings have been dramatic with a 70% reduction in usage and a payback of less than three years. The expanded, town-wide retrofit is scheduled for spring of 2016 and is expected to have a payback of 3.7 years, including an Eversource rebate. The town also expects that this project will cut the town's annual electric streetlight bill in half.

DURHAM

The Durham Energy Committee gratefully received approval for its 651 kW DC solar array project from both the Lee selectmen (who had to approve a property tax pilot) and the Durham Town Council (who had to grant the Durham administrator signing authority for the 20-year deal). When this new array comes online by June 2016, 100% of our town's non-wastewater related electricity use will be on renewable energy. ReVision Energy and IGS Solar are their partners in this project which will be financed through a Power Purchase Agreement and enjoyed the support of a $501,000 grant from the NH PUC. They are also pleased to have had 20 or more electric cars, over a hundred attendees, and dozens of test drives at their National Drive Electric Week event on September 20th and are looking forward to next year's event.

BATTERIES: Storing Energy for Today and Tomorrow

An Introduction to Our Options Available Now!

By George Harvey

We use batteries for all sorts of things, and most of us probably take them for granted. It is an easy thing to do. If we need AAA batteries, we often do not think beyond that fact. However, when we buy batteries for an off-grid house or backup power, things can get very complicated.

Designing a system requires a good deal of understanding. There are many kinds of batteries out there, and there is no such thing as a best battery for all applications. In fact, there may not be a single best type of battery for a specific application, because different kinds have different advantages and disadvantages, making the choice a trade-off.

For example, one way to measure cost of a battery is by the price per kilowatt-hour (kWh) of electricity the battery can store. This is not as straight forward as it might seem. A lead-acid battery that can store 2.6 kWh might cost half as much as a sodium-ion battery of the same capacity. The problem with the comparison, however, is that lead-acid batteries should not be discharged to less than 45% to 80% of their capacity, depending on design, while a sodium-ion battery might be able to be 100% discharged. That means while only about a quarter to a half of a lead-acid battery's capacity is actually available, all of the sodium-ion battery's capacity might be.

Cost comparisons also should include life expectancies of batteries. These are impacted by maintenance requirements, and tolerance for abuse such as overcharging or temperature swings. Also, some batteries are designed to maintain backup power when attached to the grid, while others are designed for off-grid applications, and installing a poorly chosen battery can reduce its life.

Another thing that can reduce battery life is poor charging practice. Some batteries are damaged by overcharging, and some are damaged by undercharging.

Different kinds of batteries have very different storage requirements. Flooded lead-acid batteries are not safe to use inside a building unless they are contained in a sealed box with ventilation to the outside, because they can generate hydrogen, which can be explosive when it is mixed with air. Some kinds of batteries can be stored inside without ventilation.

Many batteries have toxic chemicals in them, but some do not. Many are difficult to recycle, but some, including lead-acid batteries, can be nearly 100% recycled.

Some batteries store electricity more efficiently than others. But if the energy is free, such as when there is a superabundance from a solar array, storage efficiency alone does not tell us much.

Here are a few battery types:

LEAD-ACID BATTERIES

Presently, the most common energy storage systems for grid-tied and off-grid applications are the lead-acid batteries. They come in a wide variety of types, with different requirements for how they are stored, how they are charged and discharged, and how they are maintained. They are

well-known, and they are among the least expensive technologies.

It is imperative that users of lead-acid batteries understand their limitations and maintenance. They are rated for 20% to 55% discharge, so you should get batteries sufficient to store a minimum of twice the energy you actually need and possibly five times as much. They are, however, the best known batteries we have, and if the right battery is chosen for a job, they can perform for many years (generally they are warrantied for seven to ten years; but with proper care can last much longer), inexpensively. They deserve to be covered in articles focusing on them alone.

A number of different companies make a number of different types of lead-acid batteries. It is important for home and business energy storage that appropriate deep-cycle batteries be used. These cost more than automotive batteries, but you get what you pay for. Two reputable battery brands are Trojan and Rolls (Surrette).

NICKEL-IRON

Nickel-iron batteries were designed in early 20th century, and had some really superior characteristics. They are a really good choice for batteries that will be discharged and recharged every day, such as in off-grid applications.

While they cost more than lead-acid batteries, they are also very forgiving of abuse and last for a long time. Their very long service life can make them a better investment than lead-acid batteries in the long term, despite a higher price.

It is said that nickel-iron batteries may wind up being used by a grandchild of their original purchaser. They are rated at 10,000 cycles to 80% discharge, which implies that you should buy sufficient storage to cover about 1.25 times as much power as you need.

Iron Edison is the only company we know of that is offering nickel-iron batteries at present.

LITHIUM-ION

Anyone who reads Green Energy Times should know about the lithium-ion batteries offered by Tesla. They are intended for daily charging and discharging, for off-grid applications, and for weekly storage, which is for grid-tied backup. They are a good deal more expensive than lead-acid batteries, but require little to no maintenance and are long lasting. They can be deeply discharged, but not 100%.

These are coming to the market slowly, and getting them from Tesla might entail a wait of over a year for most people. Green Mountain Power does have a supply, however, and its customers might find they are able to get batteries quickly. It also happens that Iron Edison is also building lithium-ion batteries, and orders for these are being fulfilled much faster than those from Tesla. Though their chemistry is not identical to Tesla's, it has its own advantages.

cont'd on p.9

P.8 top: Trojan Renewable Energy Product Family. Photo courtesy of Trojan Battery Company; bottom rt: Tesla's new lithium-ion batteries. Photo courtesy of GMP; P. 9: An off-grid system using Aquion salt water batteries and the Schneider Electric XW Hybrid inverter powering a home office. Photos courtesy of Ben Farmer and Sarah Jakubiak.

have sold about 200 of the batteries, with a capacity of 2.6 kilowatt-hours each, in the past year. They are so successful that the store currently has about 500 on order from the manufacturer.

We will continue looking deeper into these and other types of batteries in future issues of Green Energy Times.

SODIUM-ION

Sodium-ion batteries, made by a company called Aquion, came to market over a year ago. Their components consist of carbon, magnesium oxide, and sodium sulphate. These are about as non-toxic as chemicals can be, and they have the added advantage of being commonly available.

Aquion's batteries can be 100% discharged. They should be good for 7000 cycles of charging and discharging and require less maintenance. A notable drawback is that they have a slow discharge rate, and so the battery bank should be somewhat over-sized for this reason.

One dealer of Aquion batteries, altE Store in Boxborough, Massachusetts, says they

An Interview with Brian J. Beaudoin:
A Series with Sanborn Head & Associates

Sanborn Head provided engineering support at the Stafford Hill Solar Farm, Rutland, VT. Photo: Eric Hudiburg.

Brian J. Beaudoin, P.E., is the Project Director at Sanborn Head & Associates, Inc., which provided engineering support at the Stafford Hill Solar Farm at the closed Rutland City landfill. We had the good fortune to be able to interview him about solar photovoltaic (PV) installations at problem sites.

What are the most important problems that come up with landfills?

There are a few design components that need to be considered when developing solar farms on municipal solid waste landfills that are typically not of concern for greenfield sites. The design needs to address the potential for ongoing long-term settlement of the landfill, protection of the landfill cap, and the risk associated with landfill gas. In addition, because most landfill projects require a ballasted foundation system to protect the cap, the solar arrays can't be placed on steep slopes for stability reasons.

What are the important problems that might come up with other problem sites?

Similar to landfills, brownfields sites may be capped; therefore, maintaining the integrity of the cap is an important design consideration. Also, projects that are developed on contaminated sites need to be designed to mitigate the risk of further impact to the environment. Another challenge is that towns and businesses need to make sure that the development of a solar project on a brownfields site is consistent with the approved land use for the subject property.

What would you recommend for a town or business planning for PVs for such a site?

To meet with a developer and engineer that has experience developing landfills and brownfields sites prior to issuing an RFP [request for proposal], so that they get a general understanding of the project requirements and associated additional cost.

Are there solar installers who have specialized in problematic installations, such as those on landfills orbrownfields? How many, would you guess?

Development of solar projects on landfills and brownfields has dramatically increased in the northeastern United States over the last few years. As such, the number of solar installers with experience developing solar projects on landfills and brownfields has increased as well. We have worked with at least six different solar installation companies over the last few years in New England and the eastern United States. I'm sure there are other solar installers with experience developing landfills and brownfields in other regions of the United States as well.

Stafford Hill Solar Farm, Rutland, VT. Photo: Eric Hudiburg.

Have you had problems arise because owners of land or solar installers suffer from a lack of experience? What problems?

Fortunately, for the most part, the solar installers that we have worked with have experience developing these types of projects. There is a lot of upfront design and coordination that is incorporated into the development of a solar project on landfill and brownfields sites, which has helped reduce problems during construction. The biggest challenge is getting the owner or developer to understand the increased cost associated with developing these types of projects. Another commonly overlooked design consideration from inexperienced owners and developers is assuming the entire landfill cap can be developed. Many landfills are constructed with steep slopes that are not suitable for the installation of solar arrays because of stability concerns. When an inexperienced entity initially sizes a project, this requirement is often overlooked, and the project is conceptually designed with more capacity than is realistic based on this site constraint.

If solar installers have no experience with the issues and want to install PVs on a problem site, what should they do?

They should consult with an experienced engineer and developer, so that they get a general understanding of the project requirements and associated additional cost.

What benefit does Sanborn Head provide to a town or business with a landfill?

Sanborn Head has over 20 years of experience designing and overseeing construction of landfills, landfill gas collection and conveyance systems, and landfill capping systems. This experience combined with over six years of providing design, permitting, and construction quality assurance services for the development of solar projects allows us to efficiently and properly assist towns or businesses with the design and permitting of these projects.

What trouble could a town or business get into by trying to go it alone?

The design of a solar project on a landfill or brownfields site is more complicated than a greenfield site. If a town or business tries to develop a project on their own, there is a possibility that specific design requirements may not be included, which could result in inadequate design, delayed permitting, and unsafe construction and operating conditions. Although there are additional design considerations needed for the development of solar projects on landfills and brownfields sites, I can't think of a better use of closed landfills than for the development of solar projects.

Sanborn, Head & Associates, Inc. is an engineering consulting firm specializing in geo-environmental and geotechnical engineering, providing services in Energy, Solid Waste, Developer, Industrial, and Public Sector areas. Contact Brian J. Beaudoin, P.E. at bbeaudoin@sanbornhead.com or (802) 728-8000.

A New Approach to Solar in Concern for a Warming Climate

Aerial view of Hubbard Brook Research Foundation PV array. Photo courtesy REDA

The Hubbard Brook Research Foundation (HBRF) in Thornton and Woodstock, NH is now solar-powered. The campus, which consists of twelve buildings along Mirror Lake Road, has installed a 40.6 kilowatt ground-mounted photovoltaic (PV) array, expected to produce 44,700 kilowatt-hours of clean electricity each year. The commercial installation is the result of a partnership with Renewable Energy Development Associates (REDA), of Portland, Maine, who integrated the project.

The Hubbard Brook project employs a new approach to solar, allowing for more efficient siting and economy of scale. The solar array's output is shared through New Hampshire's neighborhood net metering program (NH RSA 362-A:9.) This program, in conjunction with the NH Electric Co-op grid, allows solar production from the Foundation's most ideal site (about 87% efficient) to be shared among the twelve buildings at the Hubbard Brook campus, many of which have heavy shade, or non-optimal orientation. Annually, the system output is expected to provide 90 to 100% of the campus's electricity from the sun.

"We are excited to be able to use the resources on our site to meet our electricity needs and contribute renewable energy to the grid. It is both an economical move and one that is consistent with the ecosystem thinking that developed right here at Hubbard Brook," says Geoff Wilson, HBRF's Facilities Manager. "Working with REDA's Will Kessler has been excellent and we look forward to sharing lessons of our solar experience with the community."

"Once installed, solar PV panels generate zero-carbon electricity, because their fuel is the sunshine," says Kessler. "The predictability of that sunshine makes the solar project an attractive investment for a business, town, or non-profit, who avoids the volatility of the energy markets while at the same time managing their carbon footprint." Based on the NH Electric Co-op's environmental disclosures from 2013, the solar arrays at Pleasant View Farm will offset pollution by about 675 tons of CO_2, 904 lbs. of SO_2, and 586 lbs. of NOx over the first 25 years of its lifetime. It will also reduce the reliance on electricity imported from Canadian lines, which currently makes up approximately 17 to 18% of the NH Electric Co-op's grid supply.

With a warming climate, New Hampshire has seen a change in customer's electricity consumption and increasing summertime air-conditioning usage. In every year since 2000, the peak grid usage has come between 1:00 and 5:00 PM during the month of Jun, July, or August. Because the grid sees peak demand during afternoon hours in the summer, the solar PV plant contributes its generation during the times when customer demand is greatest. This *Cont'd on p. 15*

Solar is Power for the People

By George Harvey

Solar array on a roof in Massachusetts. Photo by Gray Watson. CC BY SA 3.0.

Solar 'PV' systems save homeowners money. A system that has been financed 100% can be paid off in six to twelve years, in most cases in the Northeast when they are appropriately sited. After that, they just produce electricity, requiring very little maintenance.

Not only do the systems save money on the electric bills, they also add to the value of a house where they are sited. According to a study released early this year from Lawrence Berkeley National Laboratory, (bit.ly/solar-price-premiums) a typical solar system can add $15,000 to the value of a house, roughly $4 per watt.

The combination of savings and added value can mean upwards of $35,000 for an average household in Massachusetts, over a twenty-year period.

There are many ways to have solar systems installed. Until the end of 2016, a federal tax incentive is available in amounts up to $7,500. To take advantage of this, the system owner has to owe federal taxes that can be avoided. For a person who has less tax burden than that, there may be other ways to benefit from the incentive. For instance, anyone who pays to install the system can take advantage of the incentive, and that includes any company doing the work, any bank financing it, or any wealthy relative who wants to help out. One installer I know will reduce the price for one or more panels in a community system from $4 per watt to $3, lease the panels to the person who ordered them until they are paid off, and then gift them to that person.

Net-metering, a system that varies from one state to another in its specifics, is an important consideration. Net-metering means that if a person's solar panels produce more than is immediately needed, the excess can be put on the grid, with the value banked until it is needed. The net-metering system gives a person the ability to save daytime solar power for nighttime use and credit for power from the summer into the winter. Since solar power comes at traditional peak demand times in the summer, it can actually lower wholesale prices for the utilities, lowering all consumers' costs.

Some homeowners' roofs are really not suitable for a solar system, and renters typically have no roof at all. For those without a suitable site, many states allow community solar. The nature of community solar varies widely. In some cases, it simply consists of a group of friends and neighbors hiring a solar installer to put in panels owned by individuals, with the owner of the land getting a benefit, such as a lease on the land used. Just a few families are all that's required to build systems of this type..

There may be loans and grants available. One can pay cash, but it is possible to get low-interest loans on solar systems these days, because banks and other institutions have become accustomed to financing them. In some places, non-profit lenders offer financing at very low rates for people on limited budgets. It can really pay to look around to find what is available locally. Solar installers often are helpful sources for contact information.

Of course, the easiest approach, and quite possibly the least costly in the long run, is to pay cash for a system. A system at a house can be sold along with it. When an owner of panels in a community system moves, solar panels can be sold but often need not be. People who move within the area of their utility may be able to keep the solar panels in community systems, switching them to the account at the new location.

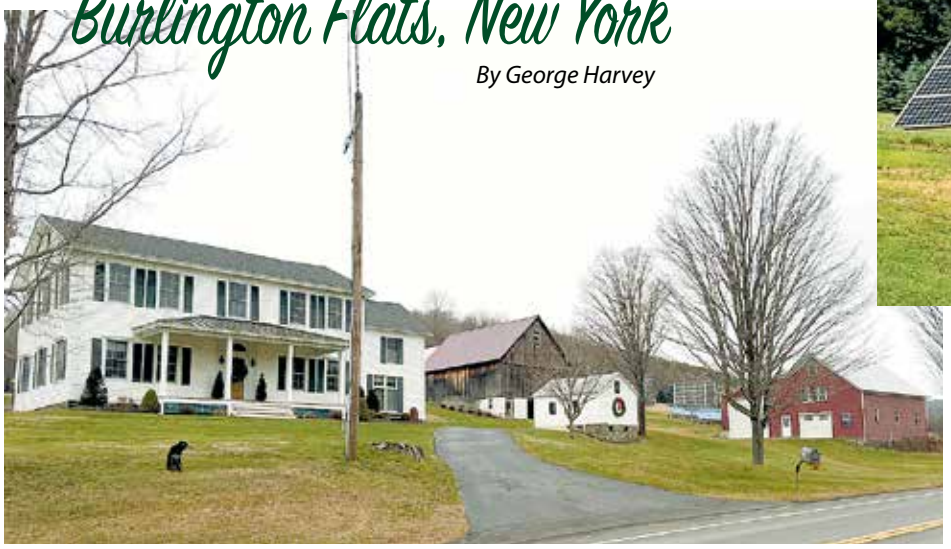
One thing that has to be pointed out again and again is that people who invest in solar systems often have their total costs go down immediately, even if the systems are 100% financed. This may run counter to what many people expect, because we are all used to the idea that renewable power is expensive. Times have changed, however, and if you want to save the planet, secure the future for you children, and be a benefactor of the earth and humanity, you can actually help do it today while saving money.

A solar system is no longer a rich person's toy. It can provide power for all of us.

100% Renewably Powered

Burlington Flats, New York

By George Harvey



Left: Rob Head's family home in Burlington Flats, NY is powered by 100% renewable energy. Above: The PV solar tracking system sits above the solar thermal evacuated tube arrays. Courtesy photos.

Built in 1817, Rob Head's home has been in his wife's family since 1830. It is a typical farm house of its period in many ways. At 4200 square feet, it may be big by modern standards, but not by those of its own times.

When Head took his turn caring for it, it was uninsulated and had leaky windows. Its boiler used 3,000 gallons of oil per year, providing hot water for radiators throughout the house. Its electrical system was hardly new. Head had a lot of work to do, and, as an electrical engineering technician, he knew pretty much what he wanted to do.

He also had a fair amount of experience working with renewable electrical systems. He and other members of his family shared a summer camp, and they worked together to install an off-grid solar photovoltaic (PV) system to operate lighting and a pump for the well. The PV system has been functioning ever since, over twenty-seven years.

Insulation was put into the old farm house, consisting of blown cellulose and spray foam, depending on location. The windows were replaced, and air sealing was done. The effect was a reduction of nearly 50% in the amount of oil used. Improvements did not stop there, however. The entire electric system was revamped, and Head began planning to move to solar power and heat. Along the way, the home was divided so he and his wife could live in one part of it, while in-laws lived in a separate unit. The heating and electrical systems, however, would not be separated, so the improvements to renewable sources for the house would provide for both units.

Several years ago, as the price of oil was spiking, he decided to install a wood gasification heating plant. In some parts of the house, radiant heat was installed in the floors, though radiators were retained elsewhere. The system required thermal storage, and so he put in a large tank, 2000 gallons, to hold water for household heating. With the system installed, the house used nine cords of wood, instead of the oil it had once burned. The wood comes from the old farm's own woodlot.

Knowing about the potential for solar power, Head next designed and built an array of six hundred evacuated tubes to heat the heating water tank. The solar thermal system is the main source of heat now, and the wood gasification system is only used when the temperature is very low or during a period of low sunshine. The solar thermal system cut wood consumption by 50%.

Head and his family like to swim, and they have a swimming pool to use. The solar thermal heat, which provides for the house in the winter, also heats the pool, making it warm in the summer and extending the swimming season. Solar

Cont'd on p.25

Arkwright Summit Wind Project

FIRST-OF-ITS-KIND CORPORATE PURCHASE OF ENERGY FROM A LARGE-SCALE RENEWABLES PROJECT IN NYS

The New York State Energy Research and Development Authority (NYSERDA) announced a first-of-a kind agreement where a large-scale renewable project supported by NYSERDA's Main Tier program for large-scale renewables will supply energy directly to a corporation rather than to the wholesale market.

EDP Renewables North America (EDPR NA) and Bloomberg LP entered into a voluntary agreement for Bloomberg to purchase 20 megawatts (MW) of energy annually over 20 years from the Arkwright Summit Wind Project being developed in Chautauqua County. This is the largest purchase of power from a New York wind project by a corporation on record in the state, and was made possible by a long-term renewable energy credit contract NYSERDA awarded in 2014 under the Renewable Portfolio Standard (RPS) Main Tier Program to develop the wind project.

This announcement was made as New York and world leaders were convened on climate change in Paris this week at COP 21. New York, under the leadership of Governor Cuomo, is committed to building a clean, affordable and resilient energy system that will use 50% renewable energy by 2030. To that end, the Governor recently directed the New York State Department of Public Service to enact a new Clean Energy Standard mandating the achievement of this renewables target.

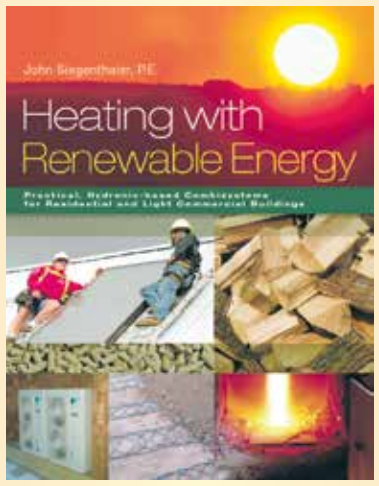
"Governor Andrew M. Cuomo has championed efforts to reduce greenhouse gas emissions and combat climate change by increasing the use of renewable energy in New York," said John B. Rhodes, President and CEO, NYSERDA. "With our support, the development of the Arkwright Summit Wind project will help ensure New York achieves its 50% by 2030 renewable energy goals. Bloomberg's purchase of the power from this project demonstrates that demand for long-term, fixed-price electricity exists in New York. In the future, we look forward to working with corporate customers throughout the state to help meet this demand with output from earlier-stage projects to enable greater deployment at a lower cost."

The Arkwright Summit Wind Project will have 44 turbines and generate approximately 78 megawatts of clean, renewable energy, enough to power nearly 12,500 average-sized homes. Bloomberg has agreed to purchase more than 25% of the energy generated by the project. The project is expected to reduce emissions by more than 340,500 metric tons over 20 years, the equivalent of taking more than 71,000 cars off the road.

For every dollar invested in the RPS Main Tier projects, New York realizes three dollars in economic benefits. A total of 70 projects have been supported through 10 RPS Main Tier solicitations, producing more than 5.3 million megawatt-hours of renewable energy annually.

Reforming the Energy Vision (REV) is New York Governor Andrew M. Cuomo's strategy to build a clean, resilient and affordable energy system for all New Yorkers. To learn more about REV, visit www.ny.gov/REV4NY.

Hydronic Heating with Renewable Energy Heat Sources



Heating with Renewable Energy is written by John Siegenthaler, an experienced hydronic-system designer, for use by designers who are integrating high performance hydronic heating and cooling systems powered by green energy. It shows how to use hydronic technology to "glue" renewable heat sources, such as solar thermal collectors, hydronic heat pumps, and wood-fired boilers, together with the latest hydronics hardware and low temperature distribution systems.

This text begins by introducing the building blocks used on all hydronic systems. Next it delves into renewable hydronic heat sources. Finally, it assembles the pieces into several complete system designs that illustrate a wide range of available options. These systems are crafted to illuminate simple, efficient approaches to these systems and the synergies that produce elegant, pragmatic solutions to thermal hydronic system challenges in buildings.

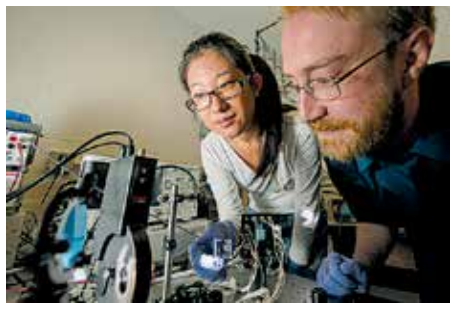
This book is fashioned after the reference text Modern Hydronic Heating For Residential and Light Commercial Buildings, now in its 3rd edition. With its abundant, full-color illustrations, mathematical tools, detailed piping and control schematics, detailed examples, and reference information, it allows one designer to help others successfully comprehend and use the nuts and bolts of hydronic thermal systems in their own projects.

Watch for an exclusivel article about Hydronic Heating with Renewable sources by this author in our February 2016 Issue of Green Energy Times

Cutting-edge, Hyper-efficient Solar Cells in Our Future?

Many people still consider environmentalists' favorite black panels as the cutting edge of renewable energy. However, the burgeoning solar industry has spent the last four decades refining these original photovoltaic panels, giving way to an entirely new generation of solar technology.

Most of us could hardly recognize some of the new solar collectors. Researchers at Michigan State University specifically responded to the aesthetic critics of solar panels by creating transparent solar cells. Well, not totally transparent--they actually have thin strips of traditional solar panels to convert the infrared light being reflected by the entire panel. This technology could effectively turn any sheet of glass into a solar energy producer, from the windows of your office building to the screen of your cell phone.



Researchers Richard Lunt and Yimu Zhao test cutting-edge transparent solar cells at their Michigan State University lab. Credit: G.L. Kohuth, The State News.

This could spell the end for space-intensive solar plants. Currently the cells cannot convert light into electricity at efficient enough levels to be productive, but researchers hope to achieve efficiency closer to that of existing photovoltaic panels in coming years. Though less effective than older technology, the sheer scale of utility of the new model makes it a much more substantial potential energy source.

Beyond the collection of solar energy, storage continues to be a problem. Modern batteries are typically inefficient and expensive, making solar energy only useful during daylight hours. Researchers at Ohio State University are working to solve this problem and recently introduced a photovoltaic panel with a built-in battery. If the new design is successful, fusing the battery and panel into one could be a game-changer. The design has already shown to make batteries 20 percent more efficient and 25% less expensive.

Another area of solar innovation has been ingenuity of application. Thinking outside the box has helped establish potential ways to industrialize the production of solar energy without consuming an excessive amount of acreage in the process. The Dutch have already pioneered solar roadways, in which highways are lined with solar panels. This saves clearing more land and makes use of land that is otherwise entirely unproductive. Another effort to limit land use involves constructing solar plants in the 70 percent of the planet that is covered by water. Experiments have already begun in France, England, India and California.

And while seemingly far-fetched, generating solar power from space is another area being examined. Satellites could capture significantly more sunlight than earthbound panels, as they could be positioned to collect solar radiation all the time. The first proposal and tests of this idea began over 40 years ago. The challenge is to create satellites that can capture sunlight, convert it to microwave energy, and beam it back to Earth. The exciting potential of this idea has led to large-scale investment by India, China and Japan.

No doubt we are only at the beginning of the age of alternative renewable energy, and the next few years and decades will be an exciting time to follow the growth of solar power from a fringe sector to a dominant player in the global energy mix.

Contacts: "The World's First Solar Road is Producing More Energy Than Expected," http://bit.ly/first-solar-road; "New design brings world's first solar battery to performance milestone," http://bit.ly/solar-battery-milestone.

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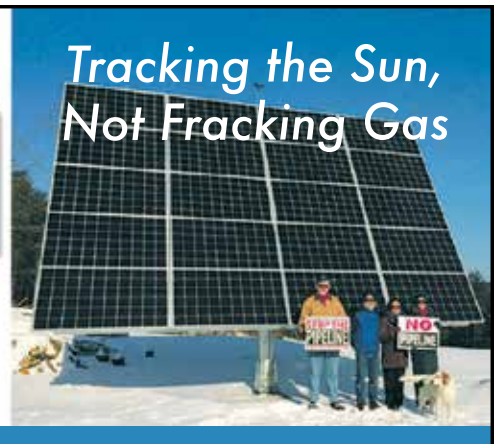


Solar Hot Water Provides Competitive Edge in N.H.

Highly efficient solar hot water systems reduce costs for New Hampshire's hospitality industry.

Eastern Slope Inn solar thermal. Photo courtesy of Revision Energy.

By GET Staff

New Hampshire's hospitality industry requires a lot of hot water to clean dishes, provide showers and keep swimming pools comfortable. In a state where many people spend their vacations, ReVision Energy has helped a number of local businesses maintain a financial competitive edge while curbing fossil fuel consumption.

Solar hot water (SHW) installations have helped this industry in the state. Some business that have chosen to use solar hot water to help them reduce their energy costs include the Woodstock Inn Station & Brewery, Inn at Sunset Hill, Purity Springs Resort, Moat Mountain Smoke House & Brewing Company, The Common Man restaurant in Concord and the Eastern Slope Inn Resort.

Revision Energy of northern New England is behind helping these companies to achieve their goals. One of the Revision Energy's larger projects is a system of 24 flat plate solar collectors and a custom-made 700-gallon hot water tank at Eastern Slope Inn Resort. On a sunny day, the resort's system can raise the temperature of 700 gallons of water from 70º to 160º.

Gil Harris, chairman of Eastern Slope's sustainability committee, has been named an "environmental champion," the highest environmental designation by the state's Sustainable Lodging and Restaurant Program. "The implementation of solar panels is reflective of the resort's proactive commitment to incorporating best-in-practice green initiatives as they become available," said Harris.

The solar company confirms that flat panel solar thermal collectors are over 90% efficient, producing substantially more heat per square foot than solar photovoltaic panels paired with an electric water heater. The collectors are an attractive solution for applications with large hot water loads, limited roof space or less-than-optimal roof orientations.

Flat plate collectors work by harnessing thermal energy from the sun. When the rooftop collectors are warmer than the water storage tank, a differential temperature controller activates a pump. The pump then circulates a non-toxic antifreeze mix up to the collectors and then down to the tank through a closed-loop system, never allowing the antifreeze to come in contact with the water supply. The heated fluid is then pumped to an insulated water storage tank where it passes through a heat exchanger. The cycle continues as long as the sun shines. A backup system is integrated to provide hot water in the absence of sunshine.

Many thanks to our Sponsor:

ReVision Energy has four locations throughout New Hampshire and Maine. For more information, visit revisionenergy.com or call (603) 801-6003.

A New Approach to Solar

Cont'd from p. 11

Hubbard Brook Research Foundation PV array. Photo courtesy REDA.

pattern is also true at the Hubbard Brook Campus, since field technicians, undergraduate researchers and scientists arrive for the field work season each May, and return to university in the fall.

The system commissioning event was held on Thursday, December 10, at the Pleasant View Farmhouse, located at 25 Dobson Hill Rd, in Thornton, NH.

For information about the solar integrator: REDA contact Will Kessler. tankfullofsun@gmail.com.

For information about the Hubbard Brook Research Foundation, Contact Geoff Wilson. gwilson@hbresearchfoundation.org.

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 – BASED ON RATED CAPACITY OF SYSTEM

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

Pellet Heating

- Advanced wood pellet heating systems -- $2500 per boiler (+$500 if an audit is completed and +$500 if the system includes at least 20 days' worth of pellet storage).
- **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.

EFFICIENCY VERMONT

Lighting (must be ENERGY STAR)

- CFLs - select ENERGY STAR qualified spiral and specialty CFLs are just 99¢ at participating retailers
- LED's – bulbs with special pricing/ coupons at register while supplies last at participating* retailers

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 - $25 mail-in rebate
- Clothes Washers - $40 rebate for CEE Tier 3 qualifying models, $75 rebate for ENERGY STAR Most Efficient
- Refrigerators - $40 rebate for CEE Tier 2 Refrigerators, $75 for CEE Tier 3 & ENERGY STAR Most Efficient
- Working second refrigerators or freezers are potentially eligible to be picked up. $50 incentive to retire old units.
- Clothes Dryers - $50 to $400 rebate on select ENERGY STAR models

Heating/Cooling

- heating systems - se EV*
- solar hot water - $950 rebate post installation
- heat pump water heater - $400 rebate or point of purchase discount
- energy efficient central AC and furnace fan motor - up to $100 mail-in rebate
- central wood pellet boilers (excluding outside wood systems) - $2,000

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 – special pricing/ coupons at register at participating retailers*
- Pool Pump – up to $400 rebate on qualifying ENERGY STAR models
- Meter Loan – borrow "Watts Up" meter to measure the electric consumption of your appliances

**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

Program open to non-profits, businesses, public entities and other non-residential entities.

Category 1:

- Less than or equal to 100 kW AC.
- New Solar PV = $0.50/Watt AC or 25% of total project cost, whichever is less.
- Expanded Solar PV = $0.50/watt AC capped at $2,500 or 30% of system cost. whichever is less.
- New Thermal (total size of less than or equal to 15 collectors) = $0.12/rated or modeled thousand Btu/year or 25% of total cost, whichever is less.
- New Thermal (total size of greater than 15 collectors) = $0.07/rated or modeled thousand Btu/year or 25% of total cost, whichever is less.
- Expanded Thermal = $0.04/rated or modeled thousand-Btu per year or 25% of total cost, whichever is less.
- Maximum incentive in combination with other incentives received: Rebate in combination with other rebates or grants received from the utility or other programs, including other state, local or federal programs, shall not exceed 40% of the total cost of the system (Does not include federal tas credits).

Category 2:

- Maximum 500 kW AC and greater than 100 kW AC.
- New Solar PV = $0.65/Watt AC or 25% of total project cost, whichever is less.
- Expanded Solar PV = $0.30/Watt AC or 25% of total project cost, whichever is less.
- Maximum incentive in combination with other incentives received: Rebate in combination with other rebates or grants received from the utility or other programs, including other state, local or federal programs, shall not exceed 40% of the total cost of the system (Does not include federal tas credits).

Contact Elizabeth.Nixon@puc.nh.gov

PLEASE NOTE: Changes are anticipated for the solar PV residential program and the solar C&I program. For Info contact executivedirector@puc.nh.gov.

Commercial Bulk Fuel-Fed Wood Pellet Central Heating Systems

- 30% of the heating appliance(s) and installation cost, up to a maximum of $50,000. An additional 30% up to a maximum $5,000 is available for thermal storage. Systems must be 2.5 million BTU or less

Residential Solar PV Rebate Program

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

Residential Solar Water Heating Rebate Program

- $1500 - $1900 per system based on annual system output
- Maximum incentive in combination with other incentives received: Rebate in combination with other rebates or grants received from the utility or other programs, including other state, local or federal programs, shall not exceed 40% of the total cost of the system (Does not include federal tax credits).

Contact jon.osgood@puc.nh.gov

Wood Pellet Boiler or Furnace

- 30% of installed system up to $6k
- 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.

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH THE NH ELECTRIC CO-OP

***PLEASE Check for UPDATEs With NHEC*.**

Commercial Solar Thermal (Hot Water)

- is 25% of the project cost up to $20,000.

Commercial Solar PV

1. $0.50 per watt up to the lesser of 15% of installed cost or $20,000

Commercial Fossil Fuel Program

2. Incentives of 35% up to $15,000

Residential Solar PV

- is 20% of the project cost up to $2,500.

Residential Solar Hot Water

- is 20% of the project cost up to $1,500.

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.

Heat Pump Water Heaters

- is 50% of the project cost up to $1,000.

Heat Pump Conversion

- is 35% of the project cost up to $10,000 for Geothermal Heat Pumps.
- is $450-$900 per system based on SEER rating for Ductless Mini-Split Heat Pumps.
- is 35% of the project cost up to $3,500 based on SEER rating for High Efficiency & Hybrid Central Heat Pumps.
- is 35% of the project cost up to $25,000 based on SEER ratings for Commercial ground or air source heat pumps and ERV's.

PAREI

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

WWW.NHSAVES.COM

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 comprehensive 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/residential/retrofit.html for more information and an online Home Heating Index calculator

NH ENERGY STAR HOMES

Incentives for builders of new homes who meet ENERGY STAR guidelines. Incentives include HERS rating fee paid by the utility, rebates for ENERGY STAR lighting, appliances and heating systems, and $800 - $4,000 additional incentive depending on the HERS score.

Visit www.nhsaves.com/residential/homes.html for more details.

NH ENERGY STAR APPLIANCES & LIGHTING

Mail-in rebates for ENERGY STAR-rated clothes washers ($30), room air conditioners ($20), room air purifiers ($15) and smart strips ($10).

Visit www.nhsaves.com/residential/es_appliance.html for more information and rebate forms.

Instant rebate coupons ranging from $1 to $7 for ENERGY STAR-rated CFL and LED light bulbs purchased through qualifying NH retailers.

Visit www.nhsaves.com/residential/es_lighting.html for more information.

NHSAVES LIGHTING AND EFFICIENCY CATALOG

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

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

Visit catalog.nhsaves.com/ for an online version of the catalog.

2014 ENERGY STAR® RESIDENTIAL HEATING, COOLING, & WATER HEATING EQUIPMENT REBATE

Rebates of up to $1,500 on high efficiency Furnaces and Boilers, $200-$500 rebates on Mini Split Heat Pumps, up to $800 rebates on water heaters, rebates on programmable and Wi-Fi thermostats

Program details and application at www.NHSaves.com/heatingcooling

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, NSTAR, Unitil (Fitchburg Gas and Electric), Eversource or a participating Municipal Light Plant community. .

Residential Rebate: $75/per collector X the SRCC thermal performance rating of the collectors (pls refer to kBTU/ panel/day for Category C, Mildly Cloudy climates)

Metrics for typical SHW system for 2-4 people, 2-panel roof-mounted plus 80 gal solar tank: materials/installation costs = $10,000, MA CEC residential rebate = $3860 including • Adder for moderate home value or for moderate income. MA State Tax Credit (use only once) = $1000, Federal Tax Credit (30% system cost) = $3000, Net Cost = $2100 **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 electric 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 design will work 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.masscec.com/programs/mass-solar-loan**

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 program. Note: appropriate, approved Data Acquisition System monitoring must be utilized for PV systems >10kW in order to qualify to sell SRECs.

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 hw or pv systems.

There is no increase in property tax assessment for residential hw or pv systems for 20 yrs.

NEW MA SREC POLICY

Massachusetts' new version of its Solar Renewable Energy Credits Program is informally being called SREC II.

SREC II prioritizes sites, however, 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.

More information can be found at: http://bit.ly/Mass_SREC_II

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH nyserda

New York State Energy Research and Development Authority.

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

DISCOVER YOUR HOME'S 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: nyserda.energysavvy.com to get an energy assessment

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.

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

Find a Commercial/Industrial Solar Installer

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

Find a Residential/Small Commercial Solar 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

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/nysuninitiative/dashboard.aspx

Eat Local - Heat Local

By Jim Van Valkenburgh

Lately everyone is eating local. I think you should heat local!

These days, there seems to be nothing more important than knowing where everything in your salad was grown, when it was picked and how far it traveled to get to your plate. Why should you eat spinach from local farms instead of spinach from California?

- The carbon footprint of locally grown spinach is tiny because of low transportation costs.
- You economically support local farmers—your neighbors.
- You support the local economy. Of $3 spent on a bag of local spinach, over $2.75 stays local! Of $3 spent on a supermarket box, maybe $1 stays local.
- Locally grown spinach is better for you: nutritional values diminish over time.

When enough people demand locally produced products, local farmers scale up production, increasing their efficiency and lowering unit costs, thus solidifying their businesses and reducing your costs.

Heating local is very similar to eating local.

Today you can heat local using cord wood, wood pellets or wood chips.

When you choose one of these locally produced biomass fuels to heat your home or business, there are many benefits:

- The carbon footprints of biomass-based heating fuels are much smaller because they are near-carbon neutral* and have very low transportation and energy costs because biomass fuels are typically grown within 100 miles of where they are consumed.
- You are economically supporting lots of local people— loggers, equipment operators, truckers, property owners, employees of pellet manufacturers, wood chip and cord wood processors, and delivery truck drivers. Many are making their living from the money that you and your neighbors pay for their local fuel.
- You are supporting the local economy. Of the $3 spent on a gallon of fuel oil, about 66 cents stay local. Of $3 spent on local fuel, over $2.75 stays local!
- Locally grown fuels are also better for you! The latest versions of stoves, furnaces and boilers that burn wood pellets, cord wood or dry wood chips have generally lower emissions than heating oil.

Heating local is a long time tradition in New England. Fireplaces, pot belly stoves, 1970s airtight stoves and modern clean burning wood and pellet stoves are part of our culture. After years of heating with a wood stove, I now love my pellet stove! Self-igniting and thermostatically controlled, it effectively heats my whole house from fall to spring. It's a manual way to heat but all I do is dump in a bag of pellets each day and brush it out once a week.

However, many people want a fully automatic heating method. How can they heat local? With a state of the art pellet boiler that provides the same level of convenience found in oil and gas boilers. All you do is to turn up your thermostat and local heat will warm your house. Experienced companies install and service them throughout New England.

HEAT LOCAL!

** Biomass fuels are "near-carbon-neutral" because trees recycle carbon from the atmosphere. We can cover this in a future article!*

Jim Van Valkenburgh is VP of Business Development at Froling Energy. Call, email or snail mail Jim to get your free HEAT LOCAL bumper sticker. He may be contacted at Jim@FrolingEnergy.com or 603-924-1001x2.

NHEC Incentives Help with the Cost for Heat Pumps and Weatherization

By Seth Wheeler

TIME TO RETHINK HOW HEAT PUMPS ARE USED

For a long time, heat pump technology was like pecan pie and sweet tea - something best enjoyed in the south. In New England, winter laughed at heat pumps, which back then produced heat only when temperatures were in the mid-30s or warmer. But all of that changed with the advent of ductless mini-split heat pumps that maintain high efficiencies at sub-zero temps. Now, New Englanders are using heat pumps for more than just supplemental heat during the "shoulder" months, they're using them as the primary heat source year round. Heat pumps are typically three to four times more efficient than fossil fuel furnaces or boilers and can save up to 70% on heating costs for an electrically heated home.

This new way of heating requires a new way of thinking. In 2015 manufacturers began producing systems that could attach a single outside condenser to multiple indoor distribution "heads." That is why New Hampshire Electric Co-op (NHEC) recommends a "whole house" approach that maximizes the value of your heat pump investment. NHEC offers its members an incentive of up to $500 per ton (of heating or cooling capacity) for the installation of heat pump systems and an additional incentive of $250 per ton if the system is sized to meet 80% or more of your home's total heating needs.

SIZE IT RIGHT

It is important to size your system properly, though, so you will have heat (and cooling) where you need it, when you need it. A qualified HVAC contractor can help homeowners install the right system designed to heat and cool evenly.

USE IT RIGHT

A multi-zoned heat pump system can be your primary heat source. But that does not mean it's business as usual. When you wash your hands, do you turn on every faucet in the house? Similarly, do you turn on every light in the house when all you need is one? That's kind of what you were doing when you turned up the heat with your old oil or electric system. You were getting heat in the living room where you wanted it, but so were those empty bedrooms that were part of the same zone. It's much more efficient to distribute heat only to the space you are using. Heat pumps offer individual temperature control in each room. And with the ability to remotely adjust the temperature of each heat pump head, you can turn up your bedroom heat on your smart phone while you're still cozy in the living room!

STARTING WITH SEALING

Warm air can escape a leaky house just as easily, whether it's generated by an oil furnace or a heat pump. It's crucial to make sure your home is adequately insulated and weather-sealed. The Home Performance with ENERGY STAR® Program provides a home energy audit and up to $4,000 in incentives towards the installation of recommended weatherization measures. NHEC offers an additional weatherization incentive of $250 per ton to members also installing heat pump systems.

WHOLE-HOUSE SOLUTIONS

NHEC wants members to think about heat pump technology as one piece of a whole-house energy system strategy. From high efficiency heat pumps, weatherization, lighting and appliances to solar PV, we have programs to make your whole house energy efficient and maximize total energy savings by combining numerous programs.

Seth Wheeler is the Communications Coordinator at New Hampshire Electric Cooperative, which is a non-profit electric distribution cooperative serving 83,000 homes and businesses in 115 New Hampshire communities. Learn more about energy efficiency programs available for members at www.nhec.coop/energysolutions.

HEATING INCENTIVES

Massachusetts

Through its Clean Heating and Cooling program, MassCEC offers rebates to residents who install qualifying air-source heat pumps (ASHPs) as part of a five-year, $30 million commitment to supporting clean heating and cooling technologies.

Rebates will be reduced for applications received January 1, 2016 or later. Current rebate levels are $750 per system, up to three systems for single head and $750 per 12,000 BTU/hr of capacity at 5 degree F, up to 60,000 BTU/hr for multi-head. Maximum rebate is $3750. Rebates effective January 1, 2016 is $625 per system, up to three systems for single head and $625 per 12,000 BTU/hr of capacity at 5 degree F, up to 48,000 BTU/hr for multi-head. Maximum rebate is $2500.

For more information on the program and how to apply for the rebate, visit http://bit.ly/MA-CEC_ASHP.

New York

Renewable Heat NY (RHNY) provides incentives toward the installed costs of high-efficiency, low-emission wood heating systems for homeowners and businesses without access to natural gas.

Residential Incentives:

- Wood pellets stove - $1,500 (up to $2,500 for income qualified homeowners).
- Advanced cordwood boiler with thermal storage - 25% of installed cost up to $5,000 per unit, with an additional $5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or $2,500 for recycling whole house wood furnace.
- Wood pellet boiler with thermal storage - 45% of installed cost up to $36,000 based on system size, with an additional $5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or $2,500 for recycling whole house wood furnace.

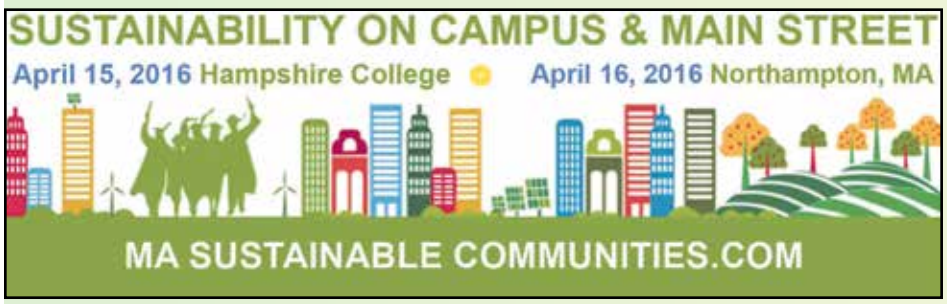
For small commercial businesses, the incentive for small pellet boiler with thermal storage less than 300 MBtu/h (88kW) is 45% of installed cost up to $36,000 based on system size, with an additional $5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or $2,500 for recycling whole house wood furnace.

Incentives for large commercial businesses include:

- Large pellet boiler with thermal storage (More than 300 MBtu/h, 88 kW) - 40% of total installed cost ($200,000 maximum incentive)
- Tandem pellet boiler with thermal storage {More than 300 MBtu/h, 88 kW) - 45% of total installed cost ($270,000 maximum incentive)

For more information on the program visit http://www.nyserda.ny.gov/All-Programs/Programs/Renewable-Heat-NY

Mark Your Calendars for these Important Events!



Efficiency Vermont's

BBD - Better Buildings by Design 2016

Conference in Burlington, Vermont

Efficiency Vermont's Better Buildings by Design conference will be held in South Burlington on February 3rd and 4th. Better Buildings by Design is the region's premier design and construction conference, which features interactive learning about building durability, efficiency, and value for both residential and commercial projects. The event is estimated to have over 1000 attendees, 40 workshops, and 50 exhibitors. The conference will be kicked-off by keynote speaker Bill McKibben, co-founder of 350.org. Highlights of the event are:

Hear from the experts - Find out what works, what doesn't, and what you can put into practice immediately through the research and experience of nationally recognized leaders in the field.

Strengthen your competitive edge - Learn the latest techniques and technologies for superior building performance, energy efficiency, and indoor air quality.

Make key contacts - Network with the region's top design and construction professionals who share your commitment to quality construction, energy efficiency, aesthetic integrity, occupant health and comfort, and environmental stewardship.

See the latest products and services - Talk with more than 50 exhibitors and sponsors displaying the latest residential and commercial building products and services.

Technical workshops - Participate in high-quality presentations throughout both days of the conference. Workshops cover four learning tracks: Building Envelope, Mechanical Systems, Lighting, and Innovations and High Performance.

Exhibit hall trade show - See the latest innovations in energy-efficient products and services for the design and construction industry. Speak with service providers and manufacturers' representatives about cutting-edge techniques, materials, equipment, and systems for superior building performance, energy efficiency, and indoor air quality.

Best of the best - Winners of Efficiency Vermont's 2016 Best of the Best Awards in Building Performance and Home Performance with ENERGY STAR®, Residential New Construction, and Commercial Building Design and Construction will be honored. Throughout the conference, browse among inspiring plans, drawings, and photos of the award-winning homes and buildings from this year's design competition.

For more information on the conference schedule and to register visit http://bit.ly/Register-for-BBD-today.

NORTHEAST BIOMASS HEATING EXPO COMES TO BURLINGTON

Burlington, VT -- From March 30th to April 1st, 2016, the Northeast Biomass Heating Expo will draw hundreds of visitors from the U.S. and Canada to Burlington to attend what has become one of the premier biomass thermal energy conferences in the United States. What started out as "Heating the Northeast with Renewable Biomass" in 2009 has now grown into the Northeast Biomass Heating Expo, with over 1,500 individual attendees and 400 businesses, agencies, and organizations represented since that year.

Industry expert speakers, panel discussions, presentations, educational sessions and opportunities for tours and workshops make the Northeast Biomass Heating Expo an invaluable event for networking across industry, organizations, and government while also building a comprehensive knowledge base on biomass thermal heating. Previous year's presentations have included a range of topics, such as the USDA's Rural Energy for America program, feedstock procurement for large and small boilers, heating with cordwood, emissions reduction, and much more. An all-day bus tour viewed a variety of biomass heating systems in action, installed in buildings ranging from private residences to schools and churches, and a pellet fuel distributor and system supplier. Some participants signed up for a class in hydronics for high efficiency wood-fired and pellet-fired boilers for engineers, architects, and system designers and installers. This in-depth course with hydronics expert John Siegenthaler provided valuable continuing education credits for maintaining professional certifications.

The Expo has always had strong support and representation by the wood pellet and wood chip industries, but other types of biomass thermal energy and products are an integral part of telling the story of biomass heating in the United States. Cordwood heating, biochar, high efficiency furnaces, boilers, and gasification units are just a few of the growing movements and consistently improving technologies in residential and commercial biomass heating. Consumers, the general public, and other interested parties will be able to view state-of-the-art technology in wood stoves and other heating units on the expo floor. Last year's event included ample time for manufacturers to meet with consumers to effectively showcase these products.

Individual registrants, exhibitors, co-hosts, and sponsors are encouraged to take part in this year's Northeast Biomass Heating Expo. For more information visit http://nebiomassheat.com/.

'Proven, Better, Together' NESEA'S BUILDINGENERGY CONFERENCE in Boston -- March 8-10, 2016

Green Energy Times was fortunate to briefly interview Stephan Wollenburg, one of the vice-chairs planning the Northeast Energy Association's BuildingEnergy Boston conference and trade show.

GET: WHAT IS THIS EVENT, WHY IS IT HAPPENING, WHO IS IT FOR?

Stephan Wollenburg: BuildingEnergy Boston 2016 is the latest event in the Northeast Sustainable Energy Association (NESEA)'s 40-year legacy of high-performance building and clean energy conferences and trade shows. It will run from March 8-10 at the Seaport World Trade Center in Boston, MA, and any sustainability professional in the region should consider going in order to learn or exhibit their products and services.

The people who show up vary in some great ways. The NESEA community itself goes back 40 years, and for a number of attendees, the conference is a chance for community with old friends who have pioneered this sustainability stuff since the 1970s. For years, the conference was mainly about residential building and solar generation, but more and more each year, the sessions feature content on commercial buildings, energy distribution, the water grid, community-scale solutions, and institutional sustainability for higher education and municipalities.

GET: WHAT MAKES THIS CONFERENCE DIFFERENT?

SW: When I attend, I'm struck by two things. First, the depth of the content is refreshing. Speakers, who always represent the best in the business, have a willingness to be wrong, so that they might improve. It isn't a place where you go to hear an infomercial about a new product, it's where you go to find out what really works. The other aspect that strikes me is that the event is very diverse. It's easy to get stuck in our specialized fields, but at BuildingEnergy the builders, designers, developers, engineers, municipal planners, and so many more get to meet and cross-pollenate each other's ideas in exciting ways. Specifically, I will be sure not to miss the session on the innovations that Stamford Conn. has pioneered through microgrids and local development. You'll always find both technical expertise and grand inspiration.

Additionally, it's FUN! There is an awards gala and dancing planned for NESEA night, an annual treat at the conference. Most of all, it's the place to go if you want to build new networks, and connect with serious practitioners who share your passion for performance and professionalism.

One last detail that sets the event apart: it's organized by volunteers. I myself am a NESEA member who first started being involved by attending the BuildingEnergy conference, and now only a few years later, I'm one of the leaders helping to organize it! Many conferences are organized in a pay-to-play way, but BuildingEnergy Boston's content is curated by NESEA members who only care about high quality material and advancing the field. I think that's why the offerings are always so strong.

GET: WHAT HAPPENS ON THE TRADE SHOW FLOOR?

SW: In addition to the educational opportunities that attendees enjoy, there is also an impressive floor of high performance building and energy products, services, schools, publications (including Green Energy Times!) and nonprofit organizations with tables on a vibrant trade show floor. We've planned happy hours, special programs, and community meals to coincide with times that attendees can conveniently visit these tables and have other exciting programming in the works to keep the party going.

Stephan Wollenburg is an independent renewable energy procurement and demand response consultant. Prior to going solo, he worked at the Cape Light Compact and the Massachusetts Energy Consumers Alliance.

Climate Change and Financial Stability

Breaking The Tragedy of the Horizon

By George Harvey

The Thames Barrier protects London against flooding. At the time of its construction, the barrier was expected to be used two to three times per year. It is now being used six–seven times per year. Photo by Andy Roberts. CC BY-SA 2.0

Steven Strong sent us a note on a lecture given in London in September. Our readers may remember mention of Steven Strong in several of our articles, and the fact that his company, Solar Design Associates from Harvard, MA, engineered the efficiency and renewable power at the Bullitt Building, the first building to meet the Living Building Challenge Standards.

The lecture is well worth a review, even if we are a little bit tardy with it. Strong had this to say of it.

> With his talk on "The Tragedy of the Horizon," Mark Carney, the Governor of the Bank of England (equivalent to the US Federal Reserve) is addressing the world insurance and financial community via an "A-List Event" at Lloyd's of London and lecturing them about the reality of climate change and the urgency to address this global threat in the immediate term before it is too late. Incredible!

Many people who have heard of Lloyd's think it is an insurance company. That is close, but not really correct. Lloyd's is an insurance market made up of many members, both individuals and corporations. It is a huge organization, contributing 300,000 jobs to the United Kingdom's economy and 25 billion euros to its gross domestic product. The industry it guides manages about 2 trillion euros in assets.

Mark Carney's lecture was notable from several points of view. One of them is the tone of the lecture. He did not bother trying to persuade anyone that climate change was real and important. He was clearly speaking to a group of people who did not need to be convinced.

In recent years Lloyd's has had to pay ever-increasing claims, and it has researched the nature of the changes that have made its profits increasingly vulnerable. The audience was made up mostly of people who understood well that most important of these is disruption of the normal climate. Climate change is costing them billions of dollars each year, and the amount is increasing. Those people in the audience who were not part of Lloyd's, and might have been unaware of this, only had to turn to the people at their elbows to understand the importance of the problem.

The word "horizon" was important to the lecture. It has to do with how far into the future we look to see what conditions are coming up, typically two to ten years, depending on purpose. Of this, Carney said:

> We don't need an army of actuaries to tell us that the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix.

He also commented on the tragedy of what will come about if we do nothing within the horizons we typically use for economic planning:

> [Once] climate change becomes a defining issue for financial stability, it may already be too late.

He points out that about 19% of the companies in the country are at risk because of their intimacy with fossil fuels. He also points out that the switch to green business provides enormous opportunities for investment. Say's Law, a well-known dictum of economics, says that supply creates demand. In real-world example, the supply of photovoltaic panels is one of the things that enable their own demand. This means demand is increased beyond the value of incentives, and that is an opportunity.

Carney quoted an old adage, "That which is measured can be managed." He uses this to introduce an appeal for better information and clarity, and this is a central issue he advocates. He says that every company should make public its climate-change footprint. Every company should not only disclose its current effects on the climate, but how it plans to deal with those effects, ultimately reducing them to zero.

Carney concluded with this observation:

> With better information as a foundation, we can build a virtuous circle of better understanding of tomorrow's risks, better pricing for investors, better decisions by policymakers, and a smoother transition to a lower-carbon economy.

By managing what gets measured, we can break the Tragedy of the Horizon.

While we found the lecture entirely credible, we also found it precisely as Steven Strong said we would, "Incredible!"

"Breaking the Tragedy of the Horizon" can be found at http://bit.ly/breaking-the-tragedy.

Easy Energy Upgrades in Vermont

eHome Program Includes Heat Pumps, Solar Systems & More

Green Mountain Power is transforming the way we all use energy with its eHome program, a holistic home energy initiative that helps people save money, have greater comfort in their homes, and reduce fossil fuel use. This program started in Rutland, helping one family incorporate multiple energy and money saving technologies, starting with improving the thermal shell of their home. More than 100 families and small businesses are now saving money and are more comfortable in their GMP eHome or eBiz!

The eHome and eBiz concept is that GMP makes it easy for our customers to make energy upgrades in their homes, often combining it with financing that improves their cash flow immediately. Green Mountain Power sends an energy expert to assess your home, including whether it can benefit from weatherization, air-source heating and cooling systems (cold-climate heat pumps) that use half the energy of traditional propane or oil systems, hyper-efficient heat pump water heaters, efficient LED lighting, and innovative home automation controls to see energy use in real time and allow you to control thermostats, lights and heat pumps, even when you aren't at home. GMP also discusses rooftop solar possibilities and electric vehicles during the evaluation of your energy goals for your home. GMP then coordinates with local contractors to make the home improvements, ensuring a hassle-free experience with money-saving results.

New products and services are always in the innovation pipeline. Green Mountain Power is the first utility to partner with Tesla on its new Powerwall, a home battery storage system that can be used with solar to store locally generated energy, or without solar to store power from the grid. GMP expects the first batteries to arrive in Vermont soon!

Installing an air-source heat pump will help this homeowner use half the energy needed for propane and oil systems. Photo: Steve Costello, GMP.

Turning your home into an eHome is easy – simply call Green Mountain Power at 888-835-4672, or sign up on line at http://products.greenmountainpower.com/. You'll save money, be more comfortable AND help Vermont reach its goals to reduce total energy consumption and fossil fuel use and increase renewable energy generation!

VERMONT'S CALL TO ACTION ON CLIMATE CHANGE

By Brian Forrest

Pictured are hundreds of Vermonters gathered at the State House earlier this fall to stop the fracked gas pipeline. At the upcoming legislative session many Vermonters will be pushing the legislature to pass a joint resolution urging the Vermont Pension Investment Committee (VPIC) to divest from fossil fuels. Photo courtesy of Jim Mendell.

We have a delegation in France for the Paris Climate Conference (COP21) because we have squandered the time we had to reverse our destructive habits and now climate change is upon us. A report by the Gund Institute for Ecological Economics and UVM in 2014 states, "The state's average temperature has risen by 1.3º F since 1960; 45% of this increase since 1990. The most recent decade was Vermont's hottest on record." Two devastating hurricanes within two years caused us millions in damages and untold personal grief. Flood waters we haven't seen since 1927 destroyed bridges and roads and scoured topsoil from our valley farms. The warming of our climate is bringing insects that have historically remained south of us such as the Pear Thrips, Deer Tick, and the Emerald Ash Borer. The effects of climate change are becoming our new reality.

Vermont is responding to this new reality in many ways. The draft of the state's Comprehensive Energy Plan has committed us to reducing greenhouse gas emissions to 50% by 2028 and obtaining 90% of our energy from sustainable resources by 2050. It seeks to obtain these goals by:

- passage of Act 56 establishing a Renewable Energy Standard;
- the Thermal Efficiency Task Force and two Clean Energy Finance Summits;
- updated building energy codes and a Vermont residential building label;
- pilots of new financing programs including the Heat Saver Loan;
- signing of the multi-state Zero Emission Vehicle memorandum of understanding;
- expansion of the Standard Offer program while lowering the cost of new contracts by more than 60%;
- expansion of net metering to 15% of peak load in the private sector.

Green Mountain Power has teamed up with two community-solar providers to buy back solar power from home-owners. Efficiency Vermont saved enough energy from reducing our need for power that since the turn of the century to power every home in Vermont for 5.3 years. Towns like Woodstock have started on the planning necessary to meet the plan's short and long term goals and Burlington, with the purchase of the Winooski 1 Dam, became the first U.S. city to get 100% of its energy from renewable sources

This looks like a lot of work to reduce our greenhouse gas (GHG) emissions but we need to do more both individually and as a group. We can pay more attention to "reduce, reuse and recycle; drive more fuel efficient cars (transportation accounts for 46% of our GHG emissions in Vermont); replace our electrical source with solar power. To have a habitable planet, we need to build the infrastructure necessary to move away from fossil fuels and keep two-thirds of the known fossil fuel deposits in the ground. Taking a page from the anti-apartheid movement, Bill McKibben, a Middlebury College ecologist, started the "Divestment" movement to convince investors, individually and as a group, to move our money - colleges and universities, cities, churches, foundations, pension funds - away from carbon-intense fuels into renewables. That was three years ago, and so far over 500 institutions and 3.4 trillion dollars world-wide have been moved from fossil fuel sources. A recent study facilitated by 350Vermont has shown that in that time the Vermont State Pension Fund forwent $77 Million due to fossil fuel assets. This legislative session many Vermonters will be pushing the legislature to pass a joint resolution urging the Vermont Pension Investment Committee (VPIC) to divest from fossil fuels so that our state's financial actions are directed towards building a sustainable future. What other institutions are we associated with that could divest themselves?

Global warming is here and to slow it down that means all of the above and more. The time has come to be proactive in the pursuit of a livable planet to pass down to our children and grandchildren.

Brian Forrest lives in Williston and is a life-long activist and a volunteer at 350VT.

Capturing Efficiency in Residential Real Estate Transactions

The U.S. Department of Energy (DOE) has released a new whitepaper *(http://1.usa.gov/1MXB5TA)* that highlights how residential programs can help make home resale prices account for the value of high-performance energy efficiency features to appraisers, real estate agents, mortgage lenders, homebuyers, and sellers.

Multiple studies in recent years have indicated that energy efficiency is an important consideration for homebuyers. In fact, energy-efficient homes sell for a premium in some regions of the United States. Only when investments in energy efficiency are more accurately reflected in home resale prices, however, will homeowners be confident that efficiency investments will be recouped at resale.

Prepared by Lawrence Berkeley National Laboratory (LBNL), the white paper provides examples of programs across the United States that have successfully engaged the real estate community and overcome barriers to valuing energy efficiency in the home resale process.

Energy efficiency programs already capture data needed to make efficiency more visible and valued in real estate transactions. Program administrators can make sure this information is transmitted to the people who need it in formats they can use and understand. A number of programs highlighted in the paper have already begun closing the energy-information gap through efforts, including the following:

• Issuing a home energy rating or score to program participants provides a standardized approach to documenting a home's performance that can easily be indicated in a multiple listing service (MLS), which provides home sale listings to be used for and between professionals who then inform their clients and customers.

• Issuing certificates that leverage existing national standards provides trusted, third-party-verified information that real estate agents prefer.

• Requiring participating contractors to attach stickers documenting a home's efficiency information to the home's electrical circuit-breaker box ensures it can be found by the listing agent when the home is put on the market.

• Working with the local Board of Realtors to establish green fields in the local or regional MLS provides a repository necessary for transmitting homes' efficiency information to the market.

• Adopting standards for documenting efficiency data for energy upgrade or performance certificates and integrates with established real estate tools.

DOE's Better Buildings Home Energy Information Accelerator http://1.usa.gov/1Pkalmb, launched earlier this year brings together real estate and efficiency partners to build on these efforts, address challenges raised in the paper, and facilitate improved access to and use of energy information in real estate transactions.

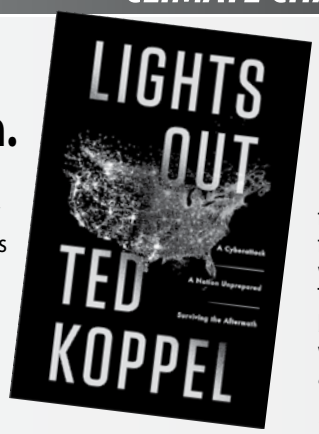
More Real Estate Resources

Dig deeper into the valuing of energy and building efficiency in residential real estate by exploring these Peer Exchange Call summaries and Residential Network member stories:

- **Trends in Real Estate and Energy Efficiency:** *http://1.usa.gov/1kZO1l7*
- **Connecting the Dots Between the Real Estate Market and Residential Energy Efficiency:** http://1.usa.gov/1NCa79G
- **Promoting High-Performance Homes to Portland Real Estate Pros**: *http://1.usa.gov/1XA6sbV*

Source: Better Buildings Network View bbresidentialnetwork@ee.doe.gov.

LIGHTS OUT:
A Cyberattack, A Nation Unprepared, Surviving the Aftermath.



Ted Koppel is well-known as an award-winning journalist and forty-two year veteran of ABC News. Photos courtesy of Crown Publishers.

By Ted Koppel

Crown Publishers, New York, 262 pages, hard cover, $26.00

Book Review by Tammy Reiss

Virtually all our civilian infrastructure – including telecommunications, water, sanitation, transportation, healthcare, oil and natural gas pipelines – depends on three aging electrical power grids. On a daily basis our nation's grid is vulnerable to cyberattacks, digital time bombs, natural disasters and physical attacks.

Ted Koppel, an award-winning journalist and forty-two-year veteran of ABC News, has an urgent message for America in his book Lights Out. He wants us to know it's not safe to assume the federal government, in the interest of safeguarding what is arguably the most critical infrastructure in the country, can simply impose security and maintenance standards on the industry. At present it cannot.

The list of people who appear in the book reads like a who's who in the nation's energy security services, procurements, and logistics. It is organized in three parts. Part one reveals how a majority of the experts interviewed concede the power grid is not as protected and resilient as our government and the industry would like the public to believe. It's not a matter of if millions of residents will simultaneously lose their connection to the grid, for days or months on end, but when.

> It's not a matter of IF the grid will go down - It's a matter of WHEN!

The book gives an example of a physical attack to the U.S. grid by reporter Rebecca Smith. The uncontested story was printed in the Wall Street Journal, Febuary 5, 2014. A well-organized attack using AK-47s on a California substation took place on April 16, 2013, destroying seventeen giant transformers. This attack caught the attention of our top military leaders.

Part two covers the logistical nightmares of replacing transformers. More than 75% of our country's custom built transformers come from overseas. Each can cost upwards of $10 million and take months to receive. This section of the book continues with how inadequately prepared U.S. emergency response groups are trained to handle an extended power outage.

Part three reiterates how there is no national strategy in place incase our nation's grid is brought down by a cyberattack. Koppel shares an interview with retired NSA director, Keith Alexander, owner of IronNet Cybersecurity, Inc. Mr. Alexander is used as an example of how our system of government allows departing government officials the ability to transform their expertise, experience, andcontacts into extraordinarily high fees, contracts and lucrative businesses.

After the reader considers the sum of all the factors presented, it should be no wonder that a new lifestyle of resiliency and self-reliance is emerging. One branch of this movement is known as "preppers." A prepper is a person who believes a catastrophic disaster or emergency is likely to occur in the future and makes active preparations for it, typically by stockpiling food, ammunition and other supplies for "Doomsday." It is estimated there are three million preppers, and the movement is growing around the country. While the author does not brand people of the mormon faith as preppers, he does use the actions taken by the mormon church as another example of how some people are taking personal responsibility for their own well-being when a catastrophe arises, instead of completely depending on outside help.

A few people interviewed for the book use renewable energy as a way to be more self-reliant. Because this group's goals and reasons for becoming self-reliant are entirely different from the run-of-the-mill prepper's goals, they would rather be referred to as "early adopters." The "early adopters" are highlighted in the book as more resilient and better prepared, while providing a glimpse into a more sustainable future.

A reasonable conclusion is that electricity is what keeps our society tethered to modern times, but that society is dependent on an unprotected industry that puts profit ahead of building a resilient infrastructure – and this compromises our nation's security.

Tammy Reiss teaches and promotes energy efficiency and independence through renewables and energy conservation in the Marcellus Shale region of NY State.

An electrical substation in Roaring Spring, Pennsylvania. Photo by Andrew Bossi CC-BY-SA-2.5

Net-Metering Woes

Cont'd from p.3

benefits of net-metering, it is under wide attack. For example, in Massachusetts, people with net-metered systems are currently paid the retail price there for the power they produce. When they buy it back, they pay the same price that they get, which is close to 18¢/kWh. The electricity they produce is worth more than what they buy, however, at close to 22¢/kWh, according to the Solar Energy Business Association of New England. In addition, there is a societal benefit, which might be valued at 6.7¢/kWh.

Nevertheless, a current bill before the House would limit the price paid for net metering to the average wholesale rate, which includes long-term contracts, of 4.99¢/kWh. Such a rate for net-metering is so far from what is fair that it can only be considered punitive – punishment for providing clean power to a grid that desperately needs it.

The problems of net-metering for Massachusetts are worse than those in New Hampshire and Vermont, but neither of these states has clear guidance at present. In both states, net metering caps have been met much faster than was expected, and neither state has good plans to raise them. In Vermont, Green Mountain Power is requesting the Public Service Board to allow an increase, but only by another 7.5 megawatts, and amount that could be reached in a few weeks of installation.

Federal incentives run out in 2017. We urgently need to install whatever we can before them to limit climate change. Our legislatures should be made very much aware that anything less than powerful action increasing net-metering is not acceptable.

Climate Deceit and Climate Deniers

Cont'd from p.3

Last spring, Rhode Island Senator Sheldon Whitehouse wrote an opinion piece calling for an investigation into ExxonMobil and other fossil fuel companies under the Racketeer Influenced and Corrupt Organizations (RICO) Act. This fall, a group of twenty prominent scientists wrote an open letter to President Obama, requesting such an investigation.

Interestingly, on the same day ICN issued its report, a U.K. nonprofit, InfluenceMap, issued a similar report looking at the broader scale of denial of accepted science for the sake of protecting profitable business models. They found the practice was in use by about half the world's largest corporations.

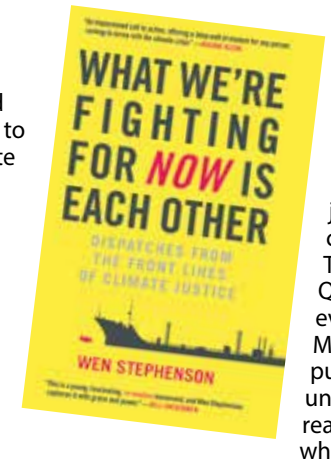
The Federal Government is not the only organization capable of working under the RICO act. It can be done in criminal or civil court, and it can be instituted by anyone. The Attorney General of New York has announced that it is investigating ExxonMobil. New York has indicated that the investigations could go beyond ExxonMobil to any organization that has promoted climate denial for profit.

The idea of a RICO investigation was roundly denounced by a number of organizations, including a set of non-profit organizations that disseminate money, information, legal advice, and literature, and also have a record of attacking renewable power, from whatever source, and supporting fossil fuels. These organizations tie their goals to legitimately conservative political goals, often masquerade their output as news articles, and have heavily influenced the current political campaigns.

We should certainly bear one thing in mind. New York State's RICO investigations are not targeting people or organizations because of what they believe. They are targeting them because their actions suggest a continuing pattern of fraud, in which the victims include not only the public, but the shareholders of the companies engaging in deceptive practices.

What We're Fighting For Now Is Each Other
Dispatches from the Front Lines of Climate Justice

By Wen Stephenson, Beacon Press, October 6, 2015, 256 pages, $24.95 hard cover



An urgent, on-the-ground look at some of the "new American radicals" who have laid everything on the line to build a stronger climate justice movement

The science is clear: catastrophic climate change, by any humane definition, is upon us. At the same time, the fossil-fuel industry has doubled down, economically and politically, on business as usual. We face an unprecedented situation—a radical situation. As an individual of conscience, how will you respond?

In 2010, journalist Wen Stephenson woke up to the true scale and urgency of the catastrophe bearing down on humanity, starting with the poorest and most vulnerable everywhere, and confronted what he calls "the spiritual crisis at the heart of the climate crisis." Inspired by others who refused to retreat into various forms of denial and fatalism, he walked away from his career in mainstream media and became an activist, joining those working to build a transformative movement for climate justice in America.

In What We're Fighting for Now Is Each Other, Stephenson tells his own story and offers an up-close, on-the-ground look at some of the remarkable and courageous people—those he calls "new American radicals"—who have laid everything on the line to build and inspire this fast-growing movement: old-school environmentalists and young climate-justice organizers, frontline community leaders and Texas tar-sands blockaders, Quakers and college students, evangelicals and Occupiers. Most important, Stephenson pushes beyond easy labels to understand who these people really are, what drives them, and what they're ultimately fighting for. He argues that the movement is less like environmentalism as we know it and more like the great human-rights and social-justice struggles of the nineteenth and twentieth centuries, from abolitionism to civil rights. It's a movement for human solidarity.

This is a fiercely urgent and profoundly spiritual journey into the climate-justice movement at a critical moment—in search of what climate justice, at this late hour, might yet mean.

Message from the editor: *We found out about this book too late to read it before this issue of Green Energy Times went to press, but from the start, knew that we needed to recommend it to our readers. Stephenson's message is so important that, after his realization of the urgency of the catastrophe bearing down on humanity, he walked away from his career in mainstream media to join the front lines to help to fight climate justice in America. This is a must read! I*

Cont'd from p.1

We CAN Prevent Climate Disaster!

sales and income taxes, to free up money for energy conservation.

It gets better. Since Vermont does not produce fossil fuels, it must import them, taking two billion dollars a year out of the state's economy. Moving away from fossil fuels will result in much of that being retained in the state. This would be very good thing for Vermont's economy.

This approach has worked so well in BC that it has become the most prosperous of all the Canadian provinces. The program under consideration in Vermont is based on BC's. In fact the fee schedule for the first year would be identical – $10 per ton of carbon in fossil fuel imports in the first year. In BC it then increased at increments of $5 per ton for the next four years to $30 per ton total.

The proposal for Vermont differs from BC's because Vermont would keep raising fees at the initial rate until they reach $100 per ton of carbon dioxide emitted, in ten years. So ten years out, the cost of gasoline would have increased by 88¢ a gallon, home heating fuel by $1.02 a gallon and other fuels by similar amounts.

The proposal for how Vermont would use the revenues is also similar but not identical to BC's. In BC, 100% of revenue goes to offset taxes. In Vermont the proposal is to use 90% to offset taxes and 10% to mitigate the impact of the changes on those who are hit the hardest.

The Earth's atmosphere is rapidly becoming a particularly tragic commons. As with any other commons, be it a village green in Vermont or the vast Pacific, abuse is their normal fate unless some means of regulating overuse is enforced.

We have seen nations try to band together and come up with a reasonable approach, most recently at the Paris Climate Conference. While Vermont's impact on global warming may seem small, our example will be huge. The risks from failure to lead the way are far greater than the risks of failure to act.

The example that BC provides can guide us to work out whatever problems opponents are voicing. Their concerns should and will be addressed.

Global climate change is almost certainly real, and well over 99% of climate scientists agree on this. MSNBC did a survey of nearly 70,000 atmospheric scientists who published in peer-reviewed journals and found only four who were willing to deny the problem. Elon Musk and Dr. James Hansen are among the many agreeing that it would be insane to believe the four deniers. They also agree that the solution at hand is a carbon fee.

There are opportunities that will make doing the right thing attractive. In this case, a carbon compensation fee can bring new prosperity to our state. Besides reducing carbon emissions, Vermont's payrolls are expected to grow by over $150,000,000 a year when the carbon fee program is implemented. This could also mean at least 2000 more jobs.

Even though no state can have a dramatic effect on global carbon dioxide emissions by itself, each can do its part and prosper as it does so. Vermont can provide effective leadership for other states, as it often does. If Vermont does not do it, someone else must. The alternative of no leadership from anyone is too grim to contemplate.

The editor and staff of Green Energy Times find the fundamental arguments in favor of carbon compensation fees compelling. A stronger state economy is a good thing. Doing the right thing is something Vermonters care about. Details can be worked out. We hope our readers will do their best to help find best way forward with this exciting opportunity.

For more about the program in British Columbia see http://bit.ly/BC-carbon-tax or http://bit.ly/BC-carbon-tax-review.

For Vermonters who want to weigh in with their legislators, find contact information at http://legislature.vermont.gov/people/search/2016. Do your best to think it through so you can make your opinions clear to them – what you like, what you dislike, and how you would like to see questions resolved, along with any other specifics you want to share.

Editor's note: Please do keep in mind that Nature waits for no one.

2015 SOLAR GROWTH

Cont'd from p.1

Massachusetts' Attorney General commissioned a study to find out whether new natural gas lines coming into the state would really be in the interest of the citizens. The study says they are not needed.

Vermont, like Massachusetts and New Hampshire, has hit its net metering limit. Green Mountain Power asked the Public Service Board to extend the credit by 7.5 MW. This is clearly not enough to keep solar installers going or to keep the state on target for its renewable energy goal of 90% by 2030. The timing timing is not good, since the federal tax incentive ends on December 31, 2016.

Chris Recchia, the Commissioner of the Vermont Public Service Department, pointed out that the renewable capacity installed in Vermont over the past four years exceeds what the state used to buy from the Vermont Yankee nuclear plant. "Okay. I get it," he added, "The sun doesn't always shine and the wind doesn't always blow." But it shows progress.

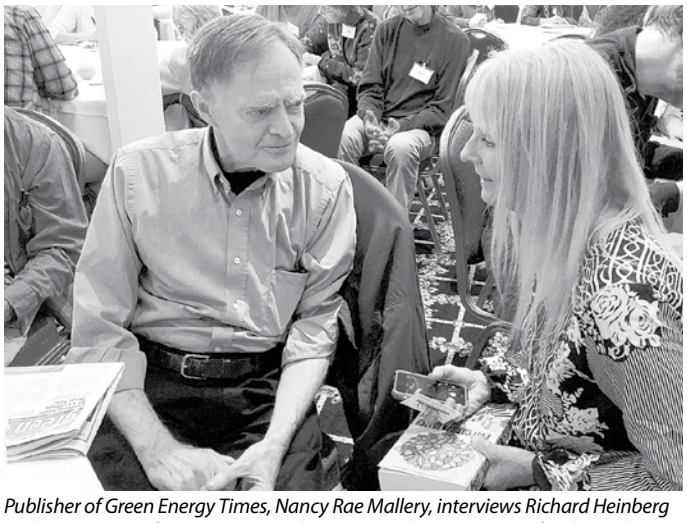
Phil Coupe, of Maine's Revision Energy, says that without solar incentives and with a rather hostile governor, renewable energy has still been making progress, even if it is slow going. He cited a number of interesting projects, including a Maine's first 100% solar powered food processing plant, belonging to Grandy Oats.

The price of solar has never been lower; the Paris Climate talks have set the goal to reduce our dependence on fossil fuels greatly. Solar is not likely to slow down any time soon, despite all these problems.

We wish you all a solar filed new year in 2016.

The Challenge of Stabilizing CO2

By Alan Betts



Publisher of Green Energy Times, Nancy Rae Mallery, interviews Richard Heinberg at the VECAN Conference on December 5, 2015. Photo courtesy of 'Bob Farnham.

Richard Heinberg from the Post-Carbon Institute gave an excellent talk on the challenges we face to stabilize carbon dioxide in the atmosphere. One aspect though is not well appreciated. About a third of the CO2 coming from the burning of fossil fuels and the clearing of forests is being stored in the oceans. This is a hidden benefit to us now, because this reduces CO2 in the atmosphere and the warming of the climate. But at the same time, dissolved CO2 is weakly acidic and this is making the ocean more acidic (less alkaline), which is an increasing threat to ocean ecosystems. The oceans are also storing a lot of heat now, and this has slowed the warming of the continents. Both these processes, the storing of heat and CO2 in the oceans, are why the Earth has such a long memory: what we burn now is 'remembered' for centuries. So the more and the longer we burn fossil fuels, the harder it is to undo the consequences, since not only does atmospheric CO2 rise, so does CO2 in the oceans. So even when we have succeeded in reducing our greenhouse gas emissions to a small value, and we are addressing the task of reducing atmospheric CO2 by storing more carbon in the soils and by replanting forests, it will be a slow process. Yes, CO2 will start to fall, but some of the CO2 stored in the oceans will be released back to the atmosphere, and we must remove that also. The recovery of our present atmosphere and climate will take centuries. But this is not a reason to turn away: it is simply one of the many reasons why climate scientists keep telling us that the sooner we act the more grateful we will be later this century.

Notes on the VECAN Conference by Alan Betts (http://alanbetts.com). The conference was held in Fairlee Vermont on December 5.*

** VECAN (Vermont Energy and Climate Action Network) is a network of over 100 grassroots energy committees and organizations in Vermont working to help people and communities transition to clean, renewable energy.*

100% Renewably Powered
Burlington Flats, New York

Cont'd from p.13

power may be free, but it is not wasted.

One thing Head really wanted, for many years, was to provide all his electricity from solar PVs. When he began thinking about this, the price of solar PVs was still much higher than it is today. As the price of solar systems declined, he began looking for a company that could put in the system he wanted. He was very particular about knowing that company that did the work was absolutely the right one and the quality of the work would be up to his standards.

He found what he wanted with Revolution Solar in Milford, New York. Together, they planned the system Head wanted. It would have a capacity of twenty kW, provided by 72 solar panels on three trackers. AllEarth Renewables, of Williston, Vermont, provided the trackers.

The system is grid-tied, but requires very little electricity from the grid. What it does need is offset by the extra power the system feeds into the grid, through net-metering.

The Head homestead now produces, on balance, all of its own heat and electricity. It is a very neat example of a deep-energy retrofit in a building that is very nearly two hundred years old.

Left: Rob Head's family home in Burlington Flats, NY is powered by 100% renewable energy. Above: The PV solar tracking system sits above the solar thermal evacuated tube arrays. Courtesy photos.

DEEP ENERGY RETROFIT

Bulk Water Management for Roofs

By Michael Goetinck

A "kick-out" at the bottom of the roof would prevent the saturation of the siding.

I'm often asked, "When is the best time to replace the roof?" Roof replacement is not very fun to contemplate and people want to put it off as long as possible, so I somewhat jokingly reply that "the most cost effective time to replace the roof is the day before it starts to leak." Rather than push the limit, I recommend replacing asphalt shingled roofs according to the manufacturer's instructions even if they look like they're in "pretty good shape." If they are wavy, cupped, or otherwise damaged they should be replaced sooner. Standing seam roofs last a long time and should be inspected with an eye toward replacement when they start to rust. They can often be made to last longer by painting them periodically, but at some point they're going to rust through and should be replaced.

Roof replacement is the time to inspect the roof sheathing (boards or plywood under the roofing's surface) and flashing details. Damaged sheathing should be repaired or replaced and the decision should be made with the idea that the sheathing is not going to be exposed or inspected until the next time the roof is replaced. All of drip edge (metal under the perimeter of the roofing) and end-wall flashing (see photos) should be replaced since the existing material will probably not last as long as the new roofing material. It may be necessary to remove some of the siding to access the wall flashing.

After all the existing materials have been removed it's time to install new drip edge, flashing, and underlayment. These details must be installed to account for how water will move from the moment it hits the roof until it lands on the ground. The water will flow downhill until it is blocked. Then it will flow around the obstruction or pool up until it can flow over it. In our climate obstructions include ice and snow. (A thermally efficient home should not experience ice dams due to heat loss, but when snow slides down a steeper roof and lands on a more gently pitched roof it's likely that it will accumulate on the lower roof.) If converging roof lines or end walls are going to create places where water can back up, then the flashing and counter flashing need to be installed in such a way as to prevent water from getting into the building when it runs down and when it backs up.

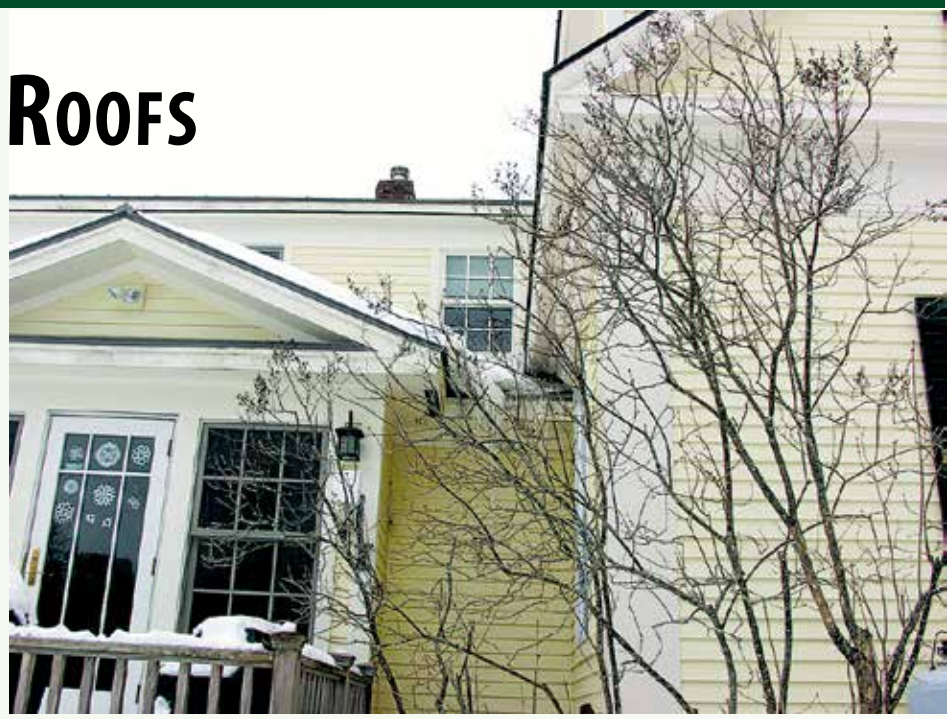
There are a wide variety of underlayment materials to choose from. Felt paper has been standard under shingles for years. Increasingly, bituthane rubber underlayments are used, at least in potential problem areas, and sometimes on an entire roof or slope of one. Manufacturers' websites can be a wealth of information to help you decide which one to use. An important thing to note in installing underlayment is to lap the upper course over the lower course just as you would shingles. I have seen roof underlayment installed vertically which is incorrect. Another useful tip is that if conventional felt paper is used, and is held down temporarily by wood strips or strapping, the wood should be applied up and down the roof slope – less likely to cause leaks.

Asphalt shingles and standing seam metal roofs are the most common in our area. There are many other options as well. Whichever one you choose, make sure it is installed to allow water to flow downhill with little or no interruption. If the roof intersects with a vertical wall then the siding material must be lapped over the end wall flashing. There should also be a "kick-out" at the bottom of the roof (see photo) to prevent water from running down the wall instead of over the edge of the roof.

Roof gutters can be used in our climate as long as they are designed to withstand the effects of ice and snow. A future article can cover these.

Michael Goetinck is the owner of Snowdog Construction, Ltd, in Norwich, VT. This series will continue in Green Energy Times, *where the author will cover other topics that can help achieve the deep energy measures which help buildings' energy performance, and so can benefit us all.*

Wall flashing using underlayment. Metal step flashing will be added as part of the shingling. Additional building paper will lap over the step flashing and under the upper course of building paper. All Photos courtesy of Michael Goetinck



Converging roofs led to snow and ice accumulation which caused interior wall leaks.

Basics of the Magical Blower Door

By Allan Bullis

Double blower door test at the Statehouse by Common Sense Energy. Photo: Allan Bullis.

The blower door is the most important tool an energy auditor has to diagnose a building' performance. Before explaining the blower door and how it is used to improve a building's performance, let's look at some building-science basics. Buildings loose heat primarily in two basic ways, conduction and convection. Heat loss via conduction is reduced by adding insulation. It is measured in 'R-value.' The higher the R-value, the greater the resistance to heat flow. The other major way a building loses heat is via convection or air leakage. Air leakage is a combination of air escaping the building (exfiltration) and outside air entering (infiltration). For over a century the building industry has understood the value of adding R-value to reduce heat loss. Convective heat loss on the other hand has not been well understood until the 1970s when building science as we know it was in its infancy. Early researchers were trying to figure out why some buildings with equal R-values performed differently. What they discovered is that significant heat loss was caused by air leakage, which led to the development of the blower door which was used to measure the air tightness of buildings. The first blower door was put on the market in 1980 and since then the device has become the cornerstone tool of every energy auditor to evaluate a building's performance.

A blower door consists of several items. First is an adjustable frame that expands to fit a door opening. Next item is a fabric cover that goes over the frame that has a large hole about two feet in diameter where a large fan is installed in the hole. The final component is a manometer (pressure gauge) which measures the pressure between inside and outside as well as air flow through the fan in CFM (cubic feet per minute). The blower door's purpose is to blow air out of the building to create a pressure difference of 50 pascals and then measure the amount of air required to create that pressure difference. The more air leaks a building has, the more air the fan has to move to maintain the pressure difference. Once the air flow is measured, the air leakage rate for a given building can be calculated, usually ACH (air changes per hour). A very tight new home has an ACH of 0.6 or less; on the other end a leaky home has an ACH of 10 or more.

Now that we know how leaky a home is, what do we do with that information? First is to ensure that the home is not too tight which can crate poor indoor air quality (IAQ). Holding in the air is great in saving energy but can also hold in moisture and other indoor air pollutants creating poor IAQ. Below a certain point, mechanical ventilation such as bathroom exhaust fans or a central ventilation system is required to ensure a minimum air exchange on a regular basis. Second thing is to find the baseline air leakage rate as when weatherizing the building. Rebate amounts under many energy-efficiency or weatherization programs are based on amount of air leakage reduction after weatherization work is completed.

The blower door is also a tool to find where air is leaking. When the house is under pressure, it simulates a strong wind blowing on the house from all directions so if there is an air leak, you can feel it. Once air leakage areas are identified and then sealed, the blower door can check the quality of the air-sealing job and remedial air sealing can be accomplished if needed. Another use of blower door is to perform advanced pressure diagnostics to identify less obvious air leaks but is too complicated to get into here.

Perhaps the most important aspect of the blower door is to make sure that home has enough air leaks to supply air to heating systems and gas water heaters. In a home that is very tight, turning on exhaust fans such as bath fans, dryers and range hoods, can pull air down the chimney. In this scenario, combustion gasses that contain carbon monoxide and other pollutants are drawn into the house instead of going out the chimney. At a minimum this leads to poor IAQ, and death in worst case conditions.

In summary, each building should have an energy audit which includes a blower door test to make sure first that there are no IAQ issues and secondly to identify energy-robbing air leaks. Both of these items can be rectified by a qualified weatherization crew.

Allan Bullis is a CEM, LEED AP, and Auditing Engineer at Common Sense Energy.

The second phase of insulating the 1858 part of the Statehouse attics has just been completed for the Vermont Statehouse The work was done by Common Sense Energy who worked with Montpelier Construction Company to achieve a 35% reduction in air leakage! The blower door numbers went from 30,000 cfm50 to 20,700 cfm50.

The air leakage reduction was achieved by sealing recessed lights, drop-down lights, unsealed causeway's for ducts, electrical conduits and sprinkler pipes. The sealing has established a proper air barrier between the attic and the occupied space in the Statehouse.

The VT Statehouse weatherization dome work was done by Montpelier Construction and Common Sense Energy. Above: Before the existing 3- 4 inches of fiberglass was in rough shape. Eightinches of cellulose was added. Right: rotunda is done. The insulation is held in place with netting to insulate the sides of the rotunda dome from above. Photos: Indigo Ruth-Davis, Montpelier Construction.

Preventing Toxic Pollution from Attached Garages

Photo: flickr.com

When looked at as a group, studies of attached garages offer helpful information about when and how carbon dioxide and fumes pollute the home.

Among the more interesting observations to come out of 20 years of research on attached garages is the fact that they have lousy energy efficiency. This makes sense of course. Few builders spend a lot of time insulating and sealing the garage. But blower door tests found that garages are often TEN TIMES leakier than the home they're connected to. Even in the best case scenarios, they leak twice as much air.

But hold on, the next question is, "Do we really want garages to be as airtight as a home?" On a gut level, you might think, sure, I want the leakiest garage possible, so toxins will clear out naturally. But that's not how it actually works. Air flows from higher pressure to lower pressure areas. We'll get into that more below.

The ideal scenario is to have all airflow in all parts of a structure under the control of the occupant, not blowing wild. That's why, in a tight, modern house, it's essential to install mechanical ventilation (typically an HRV or ERV) so that toxins don't have time reach high concentrations before the next air change.

One of the most comprehensive surveys of research on garages is still relevant, although it was conducted by the National Institute of Standards and Technology twelve years ago. The researchers found "substantial evidence that transport of contaminants from garages has the potential to negatively impact residential IAQ in either an acute (e.g., carbon monoxide from automobiles) or chronic manner (e.g., storage of chemical products)." One study tracked the specific types of VOCs and other toxins found indoors, and noted that up to 75% of all indoor pollutants could be traced directly to the same compounds being released in the attached garage. Some of these come from automobiles (the majority), but garages are notoriously polluted with dangerous compounds such as benzene, which has been found at dangerous levels in studies of home-garage-to- indoor air transmission. In fact, one study (Thomas, 1993) found that garage pollutants such as benzene can actually hit higher levels in the home than having someone smoke cigarettes indoors.

If you're building, buying or remodeling a home with an attached garage, these are some key things to know.

1. Winter warning.
Studies comparing pollution from vehicle tailpipes on cold mornings vs. warm days found a major difference in the amount of carbon monoxide (CO), carbon dioxide (CO2), volatile organic compounds (VOCs) and carbonyl compounds transferred to living areas in cold weather. Another study (Fugler, 2002) measured the average pressure difference between inside the home and the garage and arrived at 1.6 pascals in winter, .5 in summer, with the garage being the higher pressure in both cases.

2. Ventilating the garage helps *(sometimes)*.
Ventilating the garage directly can help, but only if the garage is sufficiently airtight that it can be depressurized separately from the house. Unfortunately, most garages fail this test. Fugler found, for example, that when they installed an automatic exhaust fan in garages that would operate for a few minutes after the vehicle started and continue after it left, at a speed of 100 l/s, it had little effect on the typical, leaky garage. But on a tighter garage, it proved quite effective.

3. Ventilating the home helps *(somewhat)*.
One test (Kaluza, 1999) of a whole-house ventilation system caused a 50 % reduction in the peak CO level in the home. Researchers found that when combined with an exhaust fan to keep the garage air pressure lower than the home, this kept 100% of the CO from migrating into living spaces.

4. Tighter home-garage wall interfaces help.
Research suggests that it's best to treat the attached garage like a completely separate system, not an "add-on" to the home's mechanical system. Sure, you need to monitor pressure in both spaces, and keep the garage lower, but running exhaust ducts into garage spaces from the home mechanicals can invite trouble..

I wish there were a simple formula to fix every garage pollution problem, but especially in older homes, you need to first assess the biggest pathway for pollutants. Check the pressure difference between the two shells, and get your ventilation expert to balance it in favor of slightly higher pressure indoors. Control the air. Don't let it run wild. That way, if there are airborne pollutants, you can send them outside, where they can do less harm.

References: http://bit.ly/1NiL8GB.
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Paris - COP21: Promises!

cont'd from p.1

Hundreds of people at the Paris Climate Conference formed a peace symbol shaped with the Eiffel Tower to relay the message to confront climate change. Credit Benoit Tessier/Reuters

had suffered as results of pollution and climate change. Allison Akootchook Warden of Kaktovik, Alaska, told reporters, "Our world is melting. Climate change and global warming is a reality in my home."

December 2 – President Obama said the negotiations should lead to legally binding agreements. This undoubtedly would produce opposition from Republican leadership in the U.S., much of which denies climate change is even real.

Brandalism, a group of activists in the U.K., posted 600 fake outdoor ads all over Paris, imitating those of COP21 sponsors, whose hypocrisy they satirized. One, which looked very much like a real VW ad, said, "We're sorry that we got caught."

December 3 – At a meeting in Rome, many reflected on Pope Francis's social encyclical, "Laudato Si': On Care For Our Common Home," and considered what role free markets could play in helping with environmental action. The meeting was hosted by the Acton Institute for the Study of Religion and Liberty.

Elon Musk addressed students at the Sorbonne, telling them it was imperative to put a price on carbon emissions. Other business leaders taking the same stand in connection to the COP21 activities included billionaires Bill Gates, Mark Zuckerberg, and Richard Branson.

December 4 – After three days of stressful meetings, negotiators agreed on a 54-page draft pact, in which 250 important issues remained unresolved.

December 5 – Representatives of the Indian government said they would cut back on the use of coal if wealthier countries paid them enough. They said industrialized countries produced most of the carbon emissions, so they should assume most of the burden of stopping them. India is expanding its use of coal quickly, despite the fact that it has the most polluted air in the world, leading to health issues for tens of thousands of its people.

Leaders of thirty of the world's poorest countries issued a strongly-worded statement saying they wanted the world to be 100% powered by renewable resources by 2050.

December 6 – Delegates approved a new 48-page draft of an agreement on climate change. They hope it would be a basis for a final document.

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An agreement was reached to limit the temperature increase from greenhouse gasses to 1.5° C above pre-industrial times. This was seen especially as a victory for poor countries.

The US, Japan, and developed countries in Europe would consider increasing supports for fighting climate change in the poorest countries to $100 billion per year by 2020.

December 7 – Climate chiefs from the various countries have taken up discussions of the draft agreement, with a view to making it legally binding.

Australia agreed to the 1.5° C limit on warming, providing it had more favorable carbon emission rules.

December 8 – The draft agreement was found faulty because it failed to address a large number of key points of disagreement. UN Secretary-General Ban Ki-Moon said the world expects more than "half measures."

Cities, states, and other regions announced they would pursue climate initiatives of their own, regardless of what the nations agree to do. Businesses are also taking important stands of their own.

December 9 – The European Union formed an alliance with 79 African, Caribbean, and Pacific nations to push for a final agreement at COP21.

Australia says it wants to continue selling coal because it is "good for humanity."

December 10 – Barely more than half an hour after the last session of December 9 closed at 11:28 PM, the first meetings of December 10 began, at midnight. Their focuses on included losses and damage, forests, mechanisms the preamble, and other topics.

A "high ambition coalition" emerged, formed of the US, the European Union and others. On December 10 it comprised well over 100 countries.

December 11 – France, the US, Britain, and seven other partners renewed commitment to mobilize a cumulative $10 billion between 2015 and 2020 to boost access to energy in Africa. The costs are to be offset by repealing all subsidies for fossil fuels and ending the tax breaks that encourage corporate inversions.

Because an agreement had not been reached, negotiators at COP21 decided to extend the conference for an extra day, to end on Saturday, December 12. "Things are moving in the right direction," said French Foreign Minister Laurent Fabius, who has chaired the summit. But more compromise is needed if an agreement is to be reached.

December 12 – The conference produced a global agreement, supported by all of the major countries, to limit climate change, the first of its kind. The agreements include a limit well below 2° C on warming and extensive support for efforts by poor nations. French Foreign Minister Laurent Fabius, the president of the conference, said of the agreement, "This text contains the principle elements that we previously felt would be impossible to achieve. The proposed agreement is differentiated, fair, durable, dynamic, balanced, and legally binding."

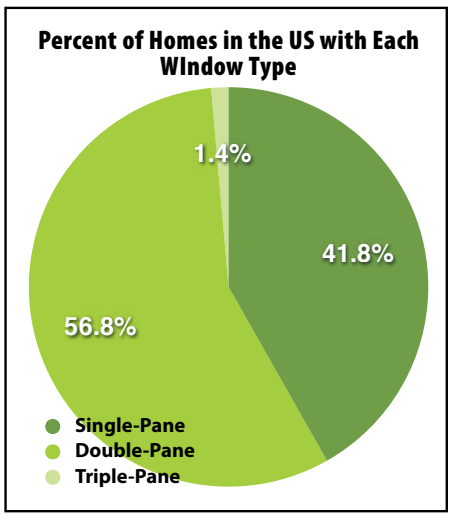
It appears that the conference went far better than anyone could have expected. There were many people, including a large number of negotiators, who believed that this conference could never achieve valuable goals. There are some people who complain that it has no enforcement included – though the countries voted the results legally binding, and in many countries citizens and organizations can hold their governments responsible for adhering to the law. Some complain that the agreement does not go far enough, though we should remember that the agreement will be revisited every five years.

One thing people should understand is that the wording of the conference agreement makes it a statement of intent. This means that it does not need the approval of the U.S. Senate, which is largely dominated by climate change deniers.

Cost Analysis: Low-E Storm Windows

High-performance storm windows are a lower-cost alternative to window replacement and can save significant amounts of energy.

WINDOWS ARE A MAJOR SOURCE OF heating losses and gains in the building and can significantly drive up energy bills. Window replacement is not an option for many homeowners, whether the cost is too high or because they want to keep the historical integrity of their homes. Low-E storm windows can provide a cost-effective alternative to replacement, in particular for moderate and low-income households. DOE has supported technology development, market assessment and early deployment of low-E storm windows through a variety of research, including climate-based modeling and field lab tests.



Over 40% of existing homes have single-pane windows for their main windows. In addition, almost half of all the double-pane windows are not high-performing low-E windows, but are made of standard glass.

The PNNL Lab Homes Test

Building on previous research, the Pacific Northwest National Laboratory (PNNL) recently tested low-E storms on manufactured homes to determine the energy savings and payback periods. Side-by-side tests were conducted in two lab homes built in Richland, Washington. These manufactured homes were provided by Marlette, a manufactured housing manufacturer in Hermiston, Oregon. They were specified so that they would be representative of 1970s-era housing stock in the Pacific Northwest region. For example, insulation levels for floors, walls and ceilings are R-22, R-11 and R-22, respectively. The windows are double-pane, clear glass with aluminum frames. The performance of these baseline windows was compared to the performance of those same windows with exterior low-E storm windows attached, and to highly insulated windows retrofitted into the lab home.

Performance measures.

Windows with low-E storms showed significant reduction in the U-factor and solar heat gain coefficient (SHGC). The significantly lower SHGC for the highly insulated window would not pay off in the Northwest.

Whole-house energy savings.

The homes with low-E storms saw an average whole-house savings of 10%, compared to 12% for triple-pane primary windows. The low-E storm windows saw better savings in the heating season than the summer. The opposite was true for the highly insulated windows, because of their low solar heat gain coefficient.

Air-leakage performance.

Manufactured homes are generally airtight, since factory environment is more controlled, compared to stick-framed homes built onsite. The lab homes did not see a significant benefit from decreased air leakage; this would probably not be the case in the field.

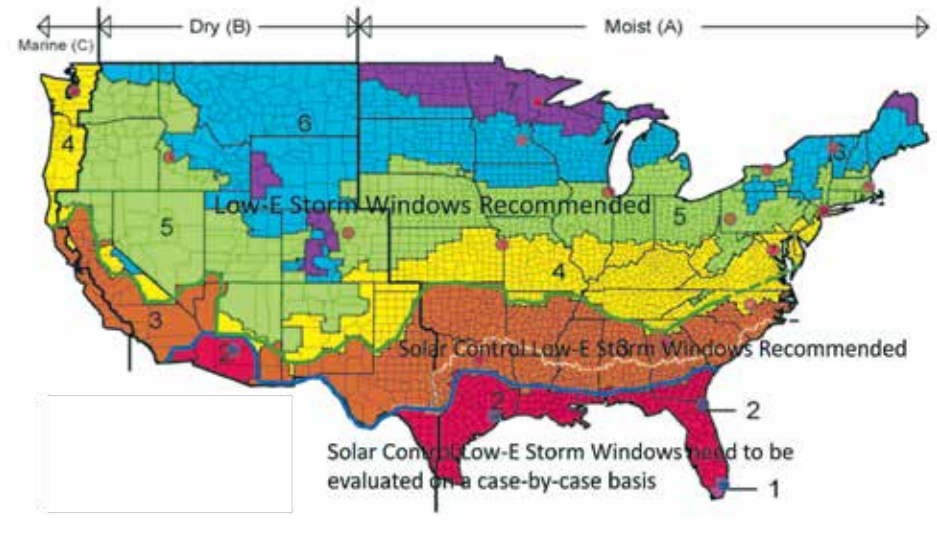
Weep holes.

For some experiments, weep holes at the bottom edge of the storm windows were sealed to see if this improved air leakage performance; results were not significant. Weep holes are designed to prevent air leakage into that dead air space, because they are only at the bottom and there is no intentional air escape at the top.

Peak energy use.

During the heating season, the majority of savings occurred on sunny days at night, when it was the coldest outside. In summer, the greatest savings occurred on hot, sunny afternoons. This coincides with peak power periods the electric utilities experience, indicating that low-E storms can potentially decrease peak power use in the summer.

Low-E storm windows and interior panels installed over all single-pane windows, as well as all double-pane metal frame windows with clear glass, are cost-effective in climate zones 3 through 8.
In climate zone 3, solar control low-E storm windows are recommended.



Whole-House Energy Savings

Average annual savings from low-E storm windows is 10%, compared to 12% for triple-pane windows.

Experimental Period	Operating Scenario	Average Daily Energy Savings	Average Energy Savings (%)
Summer Cooling Season	With Storm Windows in Lab Home B	3,623 ± 349 Wh	8.0 ± 0.5
Winter Heating Season	With Storm Windows in Lab Home B	14,251 ± 2,720 Wh	10.5 ± 0.2
Estimated Annual Results	With Storm Windows in Lab Home B	2,216 ± 31 kWh	10.1 ± 1.4
Estimated Annual R-5 Results	With R-5 Windows in Lab Home B	1,784 ± 189 kWh	12.2 ± 1.3

Cost and payback

The total installed cost of low-E storms ranged between $1,500 and $2,000, for a simple payback period of five to seven years. In comparison, R-5 windows showed greater annual savings, but with a payback of over 20 years, because of the higher initial expense.

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Installing Low-E Storms

Window or general contractors can easily install low-E storm windows; the only tools needed are caulk and caulking gun, screw gun and measuring tape.

Storm windows, such as the interior unit shown here, can be custom ordered from window distributors and some big box retailers. Some common sizes are available off the shelf.

- Measure existing window opening. Exterior storm windows can be installed in two different configurations: an overlap installation or a blind stop configuration, in which the storm fits into the window opening. For a slider or any horizontal opening, measure the top, middle and bottom; use the smallest measurement to ensure the window will fit into the opening.
- Dry fit the window by holding the exterior window up to the window opening and checking that the screw holes all land on solid wood. Make sure that the storm window and the primary window open in the same direction.
- Caulk around the opening, then put the window back in place and screw it in. Caulk around the top and sides of the opening, but not around the bottom, as exterior storm windows have weep holes designed into the bottom. These help drain any condensation that occurs between the primary and exterior windows.
- Blind-stop installation is recommended for interior storms. Typically, a trim piece is installed between the primary window and the interior storm window to ensure a good thermal break and sufficient air gap between the two windows. Make sure that the low-E coating is facing the right side. (The side with the low-E coating feels squeaky.)
- Caulk around the entire opening, as interior storms function as the primary air barrier. Interior low-E storm windows don't have weep holes.

References: *http://1.usa.gov/1KDqHkG. http://bit.ly/low-e-storm-windows. Reprinted with permission, courtesy of Green Builder Media: www.greenbuildermedia.com*

Permaculture Tips

APPLE CULTIVARS

By David Fried, Elmore Roots Nursery


Photo: D. Fried

"Apple scruffs, apple scruffs, how I love you, how I love you" – George Harrison

It's been raining apples since August. I can barely walk across the hill.

Dark red, pink blush, yellow and crimson striped, green and red, russet.

What an artist could do with all these colors! What a chef can do with all these flavors!

Most people like a crisp tart apple. What many do not know is that all apples are crisp and tart if you pick them at the right time for these qualities. A bunch of apples will get sweeter and softer as they get riper or sit longer on the tree. The same is true after they are picked and sitting in the fridge or on the table.

It's November 23rd and I am up a 12-foot ladder reaching for Bethel apples. Bethel is a really hardy apple that originated in Vermont a long time ago. Its easy-to-grow qualities and its usefulness have kept it around a long time. It shares a tough skin with the people who grow it; it can put up with a lot and not complain. Even after a long growing season it still makes excellent pies and crisps and will keep until spring in the fridge or the root cellar. As unbelievable as it may sound, after a few nights in the teens these apples are still firm, beautiful and ready to use.

I bring them inside in a clean bucket and start slicing them thin. I fill four trays in our Harvest Maid dehydrator before going to sleep. In the morning, I pack them into a half gallon mason jar and use a Sharpie marker to write on the lid: "bethel apples." I've been doing this for about two months now, and the pantry is full. My daughter likes them chewy and I like them dry and crisp, like apple chips. They melt in your mouth with a concentrated apple sweetness. So I dry some longer (15 hours) and some shorter (8 hours) so that everyone has some the way they like it!

Last month I was filling Mac Free apples into a Mehu Maja steam juicer, from Finland. The red and green apple is easy to grow and is not prone to diseases, so the apples are smooth and attractive. After an hour of steaming, the juices release into a lower chamber, and I can fill jars with refreshing apple juice. The apples have now given up their juice and their color, but what is left is a lot of hot apples ready to go through a strainer to become applesauce. I added a spoonful of local Vermont honey and some cinnamon and cardamom. I froze a few pints and we feasted on the rest.

The first yellow transparents were ready in August. The Beacons were ripe and red and plentiful in early September along with the Hazens, which are easy to pick on a naturally shorter tree. We were oohing and ahhing over the burst of flavors in the Kerrand Centennial tasty crabapples in mid-September. We made cider with our friend's Happy Valley cider press with a lot of Burgundy and Freedom apples that kept fruiting into October. Keepsake Roots Russet and Scott Winter gave us fruit to keep us appley until spring.

The amazing thing is we get all this without spraying anything. Our trees are mining the earth for what they need and do not take up a lot of space or use a lot of resources. The birds and butterflies and all kinds of pollinators like to hang out here amongst them. We do too.

All winter we will be snacking on dried apples and sharing them with our friends. We will be lifting our glass of cider to the apple trees and to the amazing universe that lets us have a taste of its preciousness.


Painting by local Vermont artist, Gabe Tempesta. Used with permission of Elmore Roots

David Fried has been keeping some wonderful apple cultivars going at Elmore Roots Nursery for 36 years. David Fried has been planting and growing fruit trees, nut trees, berry plants and natives in Elmore, Vermont at Elmore Roots Nursery for 35 years. Learn more at www.elmoreroots.com or (802) 888-3305

WINTER IS FOR DESIGNING THE GARDEN OF YOUR DREAMS

By Kay Cafasso

If you are looking back on the last growing season discouraged that you still do not have the garden you dream of, don't despair! This is the perfect time to plan your garden.

This is a busy season for tending to all late-season garden tasks and reviewing the year. Along with final transplanting, composting, and mulching, late fall and winter provide a time for planning. Start with making notes on what you have learned about the land and the needs of the residents. Your findings can be included in well-planned multi-purpose garden designs that can combine diversity, beauty, recreation, and nourishment.

Here are other tasks for the end of the growing season:

- As you plan, remember always to keep in mind the extremes in climate and weather patterns, to anticipate next year's conditions.

- Consider the needs of beneficial insects and pollinators. If there were times in the growing season when your garden lacked flowers and nectar, research the plants that would provide for them, and include them in your plans. Remember to be sure they will thrive in your garden's growing conditions, considering its sunlight, soil, moisture, neighboring plants, and other conditions.

- When reviewing the potential harvest for next year, consider gaps in last year's harvest of greens, herbs, and berries and fruits. Even in late October, it is possible still to be harvesting Asian pears, apples, kousa fruits, raspberries, strawberries, and gojiberries. You can have a harvest almost throughout the year, if the garden is designed well.


A front garden instead of a lawn, complete with perennial greens, annual veggies, culinary herbs, medicinal plants, flowers, & berries such as honeyberry, gooseberry, alpine strawberry, & gojiberry. Photo Credit Kay Cafasso.

- Consider planting some lesser known fruits that are hardy in our cold northeastern climate.

- Learn more about the soils on your property. Gather garden soil samples and have them analyzed. Many leading agricultural colleges have laboratories and will give you information on the soil samples you send them for a small fee. This will guide you with improving the soil.

- Familiarize yourself with the seeds for medicine, tea and spices that you would like to grow, and note when they should be sown.

- Map out your property and keep notes through the seasons, reading clues from the existing vegetation, getting to know the site even better at all seasons, and seeking best locations for any new landscape elements.

You might benefit from a local permaculture designer's support with planning and planting. A designer will help with learning the big picture and studying the whole system of the property. This should help you design for greater ecological sense, as well as economics, efficiency, productivity, and lower maintenance practices. A designer should help with the water flow on the property, the pathways and access routes, compost systems, management strategies, and more. You should also get information on how your land can fit in with the needs of the area around you and whether you can create unique services or products to help the resilience of your local community.

You might consider attending a permaculture design certification course to learn these skills for yourself. In a certification course, you can practice ecological design alongside leading designer, learn from visits to permaculture demonstration sites, network, and gather many sustainable living skills.

Autumn and winter are important times for developing your landscape. This is the perfect time to create the vision for next year.

Kay Cafasso is a lead instructor of the Permaculture Design Certification Course and an ecological garden designer with Sowing Solutions Permaculture Design & Education at www.PermacultureSeries.org

Growing through the Winter

By Kathleen Puffer

AERO Mobil garden is designed to bring a fresh harvest of vegetables, herbs, and fruits to the kitchen from the convenience of a patio or porch. All photos by Anne Coleman.

Winter is coming. It is time for the annual hibernation to begin. Squirrels bury the last few nuts to last through the winter. Bears head off for their long naps, gardeners curl up in their blankets, waiting for the arrival of seed catalogs as their very early sign of spring.

At Hudson Valley Vertical Farms, the winter is no time for rest. There are CSA members to feed through the winter months. Despite the freezes and flurries, things are always growing with the benefit of several indoor vertical aeroponic growing systems that were conceptualized by the farm and designed and built by Aero, Rethinking Growth. Hudson Valley Vertical Farms, Inc. is a member of Rondout Valley Growers Association and Stick to Local Farms. It shares some helpful tips from its chances and mistakes made over the years from germination to harvest.

Successful indoor growing starts with the seeds. Heirloom and organic varieties that have a high germination rate of over 90% rate are a good beginning.

The farm chooses seeds from the Hudson Valley Seed Library, because they are locally sourced. The Hudson Valley Seed Library also supports affiliated programs, including the artists who design their seed packets.

The weakest link for any growing cycle is germination. This is the two-week period that starts when we plant the seeds in rock wool and add water. A growing mat and thermostat is used for germinating seedlings at their ideal temperature.

When they sprout, plants growing in an inert medium that provides no nutrition require food, light, and wind. The sooner these three elements are added, the more successful the growth will be later. An ideal electrical conductivity reading for seedlings is 0.8, half of the amount of food that is needed for full sized plants.

The seedlings don't need just air, they need moving air. They may grow just fine with the nutrients they need from light, water and air, but indoor plants are weaker than their outdoor cousins, because they don't get blown around. The wind helps the plants' resilience on a cellular level, helping them grow stalky and bushy. So once the plants sprout, run a small fan on them for their first two weeks to simulate the blowing of the wind outdoors.

Within a couple of weeks, we transfer the seedlings from their trays over to the aeroponic vertical columns where they will complete their growing. The plants' roots growing out of the rock wool are constantly bathed with water and nutrients, which helps the plants grow faster and fuller than by regular gardening methods. These vertical aeroponic structures contain no soil, eliminating the need for weeding and cutting down greatly on pests.

Temperature is another key ingredient. For hydroponic growing, the ideal water temperature is approximately 70°F, which can be adjusted with a simple aquarium heater.

Sunflower sprouts provide us with protein and are a healthy snack or addition to any salad. Sprouts can easily be grown in trays in a sunny window all winter long.

As for lighting, it all depends on the daily light needs of the plant. While house plants grow happily in a sunny windowsill (and some of them need less than that), produce being grown indoors will need varying levels of supplemental lighting.

Herbs need those windowsills, too, but a simple lamp with a grow light will give an extra boost.

Lettuces will flourish with a florescent light placed about one foot away from the plant, and we run them on timers for 13 hours a day (or night, when the off-peak power is cheaper). If window light is available, we set timers to turn on our lights for four hours in the early morning and four hours in the last evening.

Flowering and fruit-

cont'd on p.35

CLIMATE CHANGE IMPACTS ON AGRICULTURE , LOCAL FOOD, & VULNERABLE COMMUNITIES

By Jennifer Wilhelm

NASA scientists report that 2015 is expected to be the hottest year on record. The summer and the months of September and October were the hottest recorded, but what does a global temperature increase of half a degree mean for the food system? Most of us have heard about the dire predictions for moose, public health, and extreme weather events, but few have heard about the ways climate changes will affect the agricultural industry and the food we consume.

On November 23, the New Hampshire Sierra Club organized a roundtable discussion about food system challenges related to climate change. Individuals from New Hampshire organizations and businesses gathered at Dimond Hill Farm in Concord, NH for the discussion that covered a wide range of topics, from extreme weather events to food insecurity. Additionally, Jane Presby, owner of Dimond Hill Farm, gave a tour of the farm to illustrate specific examples of how climate change has affected her operation.

An extended warm period followed by hard frost can lead to crop loss and is one example of how climate change can affect agriculture in the Northeast. Other threats to northeastern agriculture include extreme precipitation, drought, and pests. Erin Lane, Director for the USDA Northeast Climate Hub explained, "In our synthesis of assessed vulnerabilities in northeastern agriculture and forestry, we found that perennial crops, such as tree fruit, are among the region's most vulnerable products." Presby has seen some of these changes on her farm and notes that "climate change is creating new challenges for the sustainability of food production in our region, our country, and our world."

Credit: Cooper Phyllis, U.S. Fish and Wildlife Service

In addition to the direct effects of climate change on agricultural production, food insecurity can intensify with increased agricultural instability; when crops fail and food prices increase, those who are most vulnerable are at greater risk. According to Jessica Carson, a research scientist at the Carsey School of Public Policy, "recent estimates show that one in ten Granite Staters are food insecure, meaning that about 132,000 of our families, friends, and neighbors do not have access to enough food for an active, healthy lifestyle." Catherine Corkery of New Hampshire Sierra Club also points out that "New Hampshire is not immune to the impacts of climate – though at times the most catastrophic impacts happen far from our communities. The effects of climate change do not take holidays off; rather, during the holidays it amplifies the hardship."

Local efforts are underway to address these issues and improve the connections among our local farmers, producers, and consumers so that products can reach a diversity of markets effectively and profitably. The NH Food Alliance is a growing network of stakeholders collaborating to build a food system that is good for people, businesses, communities, and the environment. Their work focuses on connecting the successful efforts already underway as well as proposing a systems approach to solving the many pressing issues food producers and consumers face. Their first initiative centers on advancing farm, fish, and food enterprise viability in New Hampshire, with the knowledge that local solutions to issues as diverse as climate change and food insecurity can be achieved by supporting local farms, fisheries, and food producers.

To learn more about the NH Food Alliance, visit www.nhfoodalliance.com.

Jennifer Wilhelm is a research associate of the NH Food Alliance and a doctoral candidate at University of New Hampshire's Natural Resources and Earth Systems Sciences program.

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
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 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. i.e. window overhangs, sun angle & path…

BUSINESS LISTINGS

PIKA ENERGY

Contact: Chip Means at (207) 887-9105.
35 Bradley Drive #1, Portland, Maine.
Pika Energy's products capture and manage clean power, from home wind turbines to microgrid electronics.
Email: sales@pika-energy.com
http://www.pika-energy.com

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SECONDHAND SOLAR

Sunnyside Solar Store's Secondhand Solar
"There are Always deals!" Consignment and preowned renewable system equipment - We are selling on consignment out of Sunnyside Solar Store: 20 new Solargy PV panels 230W 24V plus 5KW Inverter plus PV switch 6 string combiner box - All new - $9,8000 for package. 15 new PV panels 230W 24V - $299.00 each. Century 21-inch Wood Stove with glass door and electric blower, heat screen, fireplace tools, cast iron Tea Kettle. $455 for all. Sunnyside Solar Store, 499 Marlboro Road, West Brattleboro. (802) 376-3838 <carol@sunnysidesolar.com>

PERMACULTURE

Permaculture Design Certification Course with Sowing Solutions July 18th-28th in 2016 at Snow Farm New England Craft Program, Western MA. Learn about edible landscapes, community resilience, water harvesting, energy efficiency, natural buildings, and ecological design practices for your own home. Attend this inspirational summer event! (Five Colleges credit is available/ optional). www.PermacultureSeries.org.

WIND TURBINE FOR SALE

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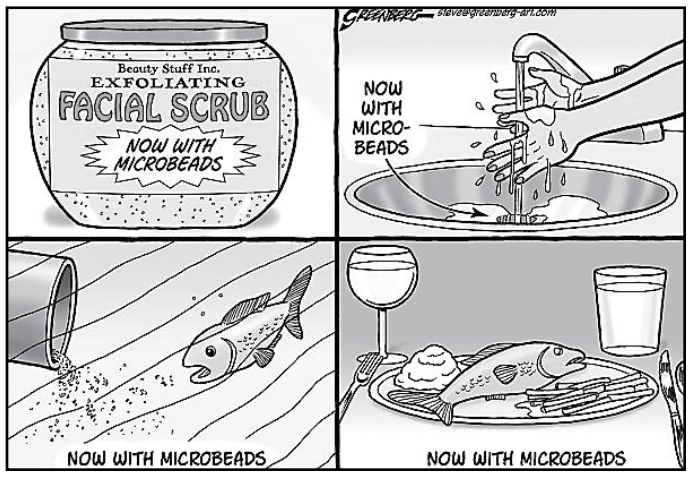
GUIDE TO ADVERTISERS

Ingredient of the Month

By Larry Plesent

MICROBEADS ARE IN THE NEWS!

Imagine over one trillion non-biodegradable tiny plastic beads going down drains across America each and every day. That's 3,650,000,000,000,000 beads washed down the drains of America just in the past decade. These microbeads are not biodegradable in water and will remain underground and in our waters long after America is a mere wisp of memory and a brief footnote in time.



Cartoon courtesy of Steve Greenberg from www.autossustentavel.com

Maybe we could justify it if these plastic beads cured cancer or ADHD, or any of the other banes of our modern convenience lifestyle like the inability of teenagers to do chores. But no, microbeads are used to help remove dead skin, a function that used to be taken up by reusable washcloths and loofa-type sponges, now brought to you by trillions of tiny skin-scrubbing balls.

If you are rolling your eyes in wonder at this, just one tiny component of our modern world, then you are not alone. How is it that such things are allowed to exist without any long term environmental testing? Isn't every new innovation subject to long term safety testing already? I mean, the government wouldn't allow unsafe products that might degrade our planet loose, especially if those products were not critical to the survival of our economy our species and our way of life…right?

The sad truth is that we the people almost NEVER conduct long term safety and environmental testing on new and novel technologies. Food additives, yes. Plastic balls in shampoo, no. Because plastic balls in your shampoo will not immediately harm you, and there is no solid evidence that turning our oil reserves into plastic soil and our lakes into plastic soup is harmful. There is ALSO no long term proof that it is safe, or even sensible to try to turn oil into soil and soupy lakes. After all, regular old organic soil and lakes worked just fine before we came along.

The idea that a new technology must be proven safe before it is let loose upon the planet is called The Precautionary Principle. If you have never heard of it that is because TPP is a dangerous terrorist weapon designed to destroy our economy. Pundits of capitalism routinely take years off of their lives by ranting loudly against the TPP threat. Imagine having to wait twenty years before your revolutionary new technology could be marketed. Why that would devastate the stock markets. Our competitive edge would be destroyed. It would be a financial disaster and America, Hollywood and major banking centers would take a hit.

After all, it's not like our energy-inefficient petroleum centric lifestyles have changed the planet's climate or ecological cycles and caused the die-off of untold species or anything, right? Right?

This is the *Soapman,w*ishing you ALL the Best during this beautiful season.

Contact Your state representative here: http://legislature.vermont.gov/people/

Micro-bead nurdles. Photo from Wikipedia.

Micro-beads in Toothpaste

Micro-beads May be Lurking in Your Toothpaste or Other Cosmetic Products

By GET Staff

Plastic micro-beads can be used as very gentle abrasives, and are soft enough that they wind up being used as abrasives in toothpaste.

Many of us might ask why anything so benign could be a problem. Actually, the fact that they are so small is itself part of the problem. When we use them in toothpaste, they get between the teeth and the gums. They do not degrade easily, and most do not biodegrade at all. In addition to the fact that they do not decompose, they offer homes for bacteria to thrive. Dentists can remove them in normal cleaning, though this may require extra care.

Microbes also cause environmental damage. The largest micro-beads are mistaken for food by fish. The smallest, which can be as small as five micrometers, can be consumed by single-celled microbes. Some of the plastics absorb poisons and hold them in the food chain, concentrating in and leaching the poisons into larger predators, such as salmon and trout, the very food we like to eat.

We might think that the little bit of toothpaste we use should not be a problem. But if a dab of toothpaste contains a thousandth of an ounce of micro-beads, when hundreds of millions of people each spit down the drain, the tiny portions add up to tons. According to the state's Attorney General, New York releases 19 tons each year. And where does the water from our drains eventually end up?

Crest MultiCare Whitening toothpaste. Photo by Scott Ehardt.

Some states are banning micro-beads in toothpaste, and some companies are ceasing their use. Crest has announced they will give up micro-beads in March of 2016. Other companies given sufficient reason, will,follow suit.

Many other products also contain micro-beads such as Aveeno daily scrub, AXE Scrub with Vitamin C, Ayurmedic Anti-bacterial Wash with Exfoliating Beads, Bliss scrubs and body buffs, Caress, Clean & Clear, Clearasil and Clinique scrubs and cleansers. See lists of products that do and that do not contain these plastic beads at beatthemicrobead.org.

A recent article in the Washington Post noted that up to eight trillion micro-beads enter aquatic habitats in America each and every day! That's enough to cover 300 tennis courts! California and Connecticut recently banned these unnecessary beads, and with your help Vermont can be next. Let your state senators know that you support a ban on micro-beads. You can also sign a petition to support a ban on micro-beads in Vermont from VPIRG at http://bit.ly/ban-the-beads.

GROWING THROUGH THE WINTER

cont'd from p.33

The AERO Kitchen Garden is ideal for small-scale gardening which Kathy uses as a demonstration unit for growing food with bioslurry from her aenerobic biodigesters

ing plants usually need a high-pressure sodium light for about 13 hours a day to produce fruit due to the thicker cell wall of fruiting plants.

Winter may have frozen the parasites and pestilence outdoors, but that ADT home protection sign is not going to keep wee beasties from trying to get your produce. Insects and fungus are the most common culprits to bring your indoor growing season to an early end.

Powdery mildew is often due to a combination of overwatering and a deficiency of beneficial microbes. Microbes in Foliar Pack enjoy eating downy mildew, a natural fungicide that works very well and causes no cellular damage to the plants while increasing nitrogen pick-up as a bonus! Many organic growers on a commercial scale employ hungry lady bugs to feast upon aphids, but they are not always the best solution for the small scale indoor grower due to their tendency to wander and get "lazy" over the winter months. Thus,we are excited about microbial helpers for organic pest management.

If hydroponics seems like something you are not ready for, sprouting using soil trays may be your indoor growing match. Sprouting sunflower seeds and wheat grass in grow trays is a simple process of soaking and spouting the seeds in mason jars followed by patting the seeds on top of a grow tray of damp soil and simply adding sunlight from a sunny window. Sunflower sprouts are a plant-based source of protein and are easy to cut and toss onto your salad or enjoy as a snack.

So, there really is no need to wait for the ground to thaw. The indoor gardener can look forward to thick bunches of herbs and fresh, flavorful lettuce over the long winter.

Kathy Puffer is a special educator, permaculture designer, and certified hydroponicist living in Ulster County, NY. Kathy works as the Chief Communication Officer for the not-for-profit Solar C3ITIES. Her business, Hudson Valley Vertical Farms is dedicated to serving the Hudson Valley with exemplary products and knowledge for all who wish to live a holistic, sustainable lifestyle. hvvf.net.

NETFLIX FOR TOYS

The sharing economy is reaching those who are still learning how to share.

By Avital Andrews

Two years ago, Ranan Lachman, whose kids were then three and five, was spending thousands on Legos. His children would take two hours to build a $100 set and be done with it. Then they'd want a more challenging one.

Even though Lachman was a Wall Street investment banker at the time, he winced at spending that much and figured other parents did, too. Seeing an opportunity, he raised $17 million and moved from Manhattan to Silicon Valley. He brought on a former Netflix COO, and in 2013, Pley was born.

Toy-sharing recycles what your kids no longer want. Photo courtesy of Tyler Gross, Gross Illustration. www.grossillustration.com.

The concept is simple. For $20 a month, you choose from Pley's 350 Lego sets, which show up on your doorstep. Keep each as long as you want, and send it back when the kids are done with it. Another set arrives within three days. (Between rentals, each Lego is cleaned with an environmentally safe sanitizer.)

A study of 1,500 U.S. families Lachman commissioned found that the average parents of a 10-year-old had spent $11,000 on toys. Those 10-year-olds owned 248 playthings but played with just 12 of them. What's more, 50 percent of the toys had broken or stopped working within 30 days of being purchased.

"These are shocking numbers," he says. "We're cluttering our houses with things our kids don't want."

Taking the whole supply chain into consideration, each Pley rental creates 10.5 fewer pounds of carbon emissions than buying a new set, according to Lachman. Maybe more important, the 180,000 children who receive and return Pley sets are learning to share. Often, they enclose a note for a toy's next recipient.The Pley website is pley.com.

"It's amazing to see kids connecting," Lachman says. "Parents tell me, 'This is the only toy my kid actually cares about. He knows it's going to another kid, so he makes sure to take care of all the pieces.' " (If a piece does get lost, Pley doesn't penalize.)

Pley is not alone in the toy-sharing sector. Sparkbox ($20 per month) focuses more on babies and toddlers, working with more than 25 vendors, including Fisher-Priceand LeapFrog, to rent 268 educational toys to more than 1,500 families. Their website is sparkbox-toys.com.

Both companies do well around the holidays: As gift-shopping parents realize that a single Lego set can cost $400, Pley starts to look attractive at $192 for a full year. Lachman says that Pley will soon rent out other toys, including robots, Hot Wheels, and K'Nex.

Is it hard for little ones to return a toy? Not really, Lachman says. "Kids understand very quickly that if you let this one go, another will come. They'll give it up."

This article appeared as "Netflix for Toys" in the November/December 2015 print edition of Sierra, the official magazine of the Sierra Club.

Recycling and Its Expense and Emissions

By Doug Moss and Roddy Scheer

Americans generate about 254 million tons of trash and recycle and compost about 87 million tons of this material, which adds up to a 34.3% national recycling rate. Recycling and composting prevented the release of approximately 186 million metric tons of carbon dioxide in 2013, according to the U.S. Environmental Protection Agency, comparable to taking over 39 million cars off the road for a year.

Aluminum cans are currently recycled more than any other beverage container in the U.S, which is good for business and the environment, says the Aluminum Association, because making a can from recycled aluminum saves not only aluminum but 92% of the energy required to make a new can. A 2015 analysis by the Aluminum Association and the Can Manufacturers Institute determined that if all of the aluminum cans in the U.S. were recycled, we could power four million homes and save $800 million per year. Aluminum cans are also the most valuable to recycling companies, with a value of $1,491 per ton compared to $385 per ton for PET plastic. "Cans are recycled at the highest rates, and drive recycling programs across the country because of the high value of aluminum compared to other packaging materials," said Heidi Brock, President and CEO of the Aluminum Association.

In recent years, however, recycling companies are struggling with higher processing costs, due in part to newer, larger recycling bins that don't require user sorting and thus become increasingly contaminated with garbage. When the District of Columbia replaced residents' 32-gallon bins with ones that were 50 percent larger last year, the extensive amount of non-recyclable material put into the bins drove up the city's processing cost for recyclables and cut profits from selling recyclables by more than 50 percent.

"Our biggest concern and our biggest challenge today is municipal solid waste and contamination in our inbound stream," James Delvin, CEO of ReCommunity Recycling, which operates 31 facilities in 14 states, told Green is Good Radio. "It's an economic issue if you think about we go through all this effort to process this material, and roughly 15-20% of what we process ends up going back to the landfill. It's incredibly inefficient to do that." In a 2014 survey by the National Waste and Recycling Association, nearly one in 10 Americans admitted to throwing their waste in recycling bins when trash cans were full; one in five said they will place an item in a recycling container even if they are not completely sure it is recyclable.

"People refer to this as 'wishful recycling,' that's just when in doubt, put this in the bin because there's an outside chance they might be able to recycle it," Delvin notes. "So you see Styrofoam. You see PVC. You see batteries and those types of things…." This mixing of waste with recyclables, he says, makes it very difficult to extract the true recyclable commodities that are there that have value.

Improved education regarding the proper materials to recycle is needed to allow recycling plants to remain economically feasible. The pros and cons of recycling are heavily debated, but there's never an argument over the environmental benefits of limiting disposable packaging and utilizing more durable reusable goods, like shopping bags, coffee thermoses and water bottles, to name a few, in daily life.

Contacts: Aluminum Association, www.aluminum.org; Can Manufacturers Institute, www.cancentral.com; Green Is Good Radio, www.greenisgoodradio.com; National Waste and Recycling Association, www.wasterecycling.org; ReCommunity Recycling, www.recommunity.com.

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Holiday Cooking 'with the Sun!'

A day of blue sky and sunshine in the middle of December is to be celebrated. And you've never celebrated the sun like you do when you cook with a solar oven. Even as we approach the shortest day in the year, there's still enough sun for this month's quick-prep, no-fail recipe. As tasty as they are colorful, your holiday guests won't believe they were made with sunshine!

Cranberry & Goat Cheese Toasts

Servings: 10-14 servings
Prep Time: 5-10 minutes

INGREDIENTS:

- 12 ounces fresh (or frozen) cranberries
- ½ cup brown sugar
- ½ cup orange juice
- 2 tablespoons water
- ¼ teaspoon kosher salt
- 6 ounces goat cheese
- 1 medium baguette or crusty bread, sliced and toasted
- 1 sprig fresh rosemary

INSTRUCTIONS:

- Place cranberries, brown sugar, orange juice, water, and salt into a solar-oven-safe pan and cook for three hours or until cranberries are fork- tender, stirring them at the halfway point. (You can add 1-2 T brown sugar if it's too tart for your taste.) Remove from the oven and set aside to cool.
- Lay toasts out onto a serving dish and smear each one with a tablespoon of goat cheese. Next, top each one with a dollop of the cranberry mixture and a couple of fresh rosemary leaves chopped fine, and serve.

Solar chef, Elizabeth Van Huffel, blogs about cooking in her Solavore Sport solar oven on LocalSavour.com.

West Hill House B&B

A Green Destination in Vermont

By Michelle Harrison, GET Staff

Left: West Hill House B&B owns 26% of the array totaling just under 30kW peak power, meeting 100% of their electric power needs. Below: Solar hot water panels that supply 2/3rds of their hot water demands; Bottom photo: This West Hill House B&B sign leads guests back to the B&B.

Vermont is a beautiful state with many areas to explore. As a reader of Green Energy Times, finding locations with a sustainable focus for lodging, a retreat, or special event is of high interest. If your travels bring you to the Mad River Valley in the center of the state, the West Hill House B&B is the perfect choice. You should feel great staying here as it is recognized as a Green Hotel in Vermont since 2008, has received the distinction as a Green Leader at the Gold Level by Trip Advisor and has been voted as one of New England's best repeatedly by BedandBreakfast.com. West Hill House B&B is a member of Select Registry's Distinguished Inns of North America and is part of the BedandBreakfast.com Diamond Collection. Innkeepers, Peter and Susan MacLaren take environmental stewardship very seriously in their daily operation.

The West Hill House B&B is an historic 1850's home which was made into a bed and breakfast in the early 1980's. In 2006, Peter and Susan MacLaren purchased the home. For the past eight years, Peter and Susan have introduced major initiatives to improve the energy efficiency of the property such as:

- Installing a high efficiency condensing propane boiler to replace the oil boiler and propane water heaters.
- Adding a rooftop solar hot water pre-heating system which supplies two-thirds of the hot water demand year round.
- Installing complimentary EV charging stations for guests. There are two 240V 80A chargers for Teslas and a 240V J1772 at 40A for other EVs. An EV can be completely recharged overnight. The implementation of the Tesla chargers allows the West Hill House B&B to be a great destination for people traveling from afar.
- Becoming the largest private investor in the Poultney, VT solar farm which is designed and built by Same Sun of Vermont. West Hill House B&B owns 26% of the array totaling just under 30kW peak power. This covers 100% of their electric power needs including the EV chargers!

Taking advantage of a group net metering opportunity was ideal, as the West Hill House B&B is surrounded by many trees. A solar PV system on their property would not be very efficient. It is estimated that the payback period for the solar project is less than ten years with the tax credits. Over the twenty-five year life of the system, the West Hill House B&B will offset approximately 470 tons of carbon dioxide.

"It's very important for us to reduce our carbon footprint as much as possible. An investment of this scale into a solar farm is a great complement to our Tesla-designated charging stations. It's very important to our many Tesla driving guests to know that when they are charging their vehicle and enjoying overnight hospitality, a minimal impact on the environment is being made," said West Hill House B&B Co-Owner Peter MacLaren.

"We also hope that we can set an example for other Vermont businesses and show that not only do green technologies make sense economically and environmentally, but you can also support local green energy companies," MacLaren said.

The West Hill House B&B has also made many other initiatives throughout the years. Main entrances have an air-lock entry (double door system) to minimize drafts. Food waste is composted through a service where it is processed and sold to farmers and gardeners. High efficiency light bulbs are used throughout the facility. The Handsome Red Barn on the facility is used for events year round thanks to insulation improvements. A shuttle bus is provided in the winter for those guests wishing to ski at the local resorts.

Another perk of staying at the West Hill House B&B is the complimentary, reusable water bottles given to every guest. Peter and Susan encourage visitors to use the reusable water bottles and drink the beautifully tasting water from their spring-fed well instead of using bottled water.

The West Hill House B&B has a well-established environmental policy and environmentally-friendly purchasing policy which are shared on its website. Whether you come from within the state or far away, the West Hill House B&B can accommodate your needs with sustainability in the forefront.

Greening Our Holiday Celebrations

by Doug Moss and Roddy Scheer

LED lights use 1/50th the electricity of conventional holiday lights and can last for three decades. Credit: Paul Barrows, FlickrCC.

Sipping eggnog, listening to carols by the fire and enjoying the beauty of colorfully decorated homes are all warm memories the holiday season conjures. Yet with the rising popularity of Black Friday and Cyber Monday, millions of people are now increasingly absorbed in the season's commercialism. The National Retail Federation estimates that holiday sales this year will add up to $630.5 billion. All of this shopping generates a lot of trash. According to the U.S. Environmental Protection Agency (EPA), Americans throw away approximately one million extra tons of trash between Thanksgiving and New Year's Day.

"Simplify the Holidays," an e-booklet from the Center for a New American Dream (CNAD), reports that nine in 10 Americans believe holidays should be more about family and caring for others, not giving and receiving gifts, yet the average U.S. consumer plans to spend more this year—about $805—on holiday shopping than last year. To help provide meaningful ways to have fun with less stuff this season, "Simplify the Holidays" includes ideas for simple gifts, low-waste wrapping, ways to connect with your children during the holidays, and more. Readers are asked to "consider creating holidays that instill more meaning into the season and encourage more sharing, laughter, creativity and personal renewal."

"It's not about depriving yourself of things during the holiday season," Wen Lee, director of online media and engagement with CNAD, emphasizes. "It's about refocusing on things that really matter, and reducing stress."

Additional easy, stress-free ways to respect the environment during the holidays include carrying reusable totes when shopping for gifts, and using LED lights, which last 20 to 30 years and require 1/50th the electricity of conventional lights for decorating your tree or home.

According to CalRecycle, the 2.6 billion holiday cards sold each year could fill a football field 10 stories high—fortunately, the multitude of e-cards available on the web today provide a no-waste alternative.

Further, the 33 million Christmas trees the U.S. Environmental Protection Agency (EPA) estimates are sold in North America each year don't have to end up in landfills—some areas have recycling programs that turn Christmas trees into wood chips and mulch, and some companies will home-deliver full-size, potted live trees and pick them up after New Year's and re-plant them. And with nearly 60 percent of Americans admitting they receive unwanted gifts during the holidays, asking friends and family what gifts they really need or want is an easy way to save waste and minimize time-consuming returns.

Greening your holiday season certainly helps the environment, but research shows it is also good for personal and family well-being. The 2002 study, "What Makes for a Merry Christmas?" by psychologists Tim Kasser and Kennon Sheldon concluded that "family and religion provided the greatest benefit to holiday well-being." Kasser recently told the American Psychological Association (APA): "[Our study] found that to the extent people focused their holiday season around materialistic aims like spending and receiving, the less they were focused on spiritual aims…we also found people reported 'merrier' Christmases when spirituality was a large part of their holiday, but reported lower Christmas well-being to the extent that the holiday was dominated by materialistic aspects."

Contacts: CNAD, www.newdream.org; EPA, www.epa.gov; APA, www.apa.org.

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MORE RESULTS FROM COP-21:

Rise & Shine: Lighting the World with 10 Billion LED Bulbs

Lighting accounts for 15% of global electricity consumption and 5% of worldwide greenhouse gas emissions. At the same time, 1.2 billion people lack access to modern energy services, including reliable lighting. For many, hazardous energy sources like kerosene are the only option.

To address these immense problems, today at COP21 in Paris, the Clean Energy Ministerial (CEM) launched the Global Lighting Challenge (GLC) -- a race to deploy 10 billion high-efficiency, high-quality and affordable lighting fixtures and bulbs (like LEDs) as quickly as possible.

Including the U.S., 13 countries and the European Commission have already endorsed the GLC and are actively contributing to the 10-billion-bulb goal. The next step is for participants to commit to stock, sell, promote, finance or implement policies encouraging the sales of advanced lighting fixture and bulbs. These would be big and small businesses, retailers and manufacturers, regional and global development agencies, and local and national governments, to name a few.

The Energy Department is advancing programs to accelerate adoption and use of efficient lighting towards the GLC goal, including R&D investments and public-private partnerships. These efforts, which bring down costs, ensure product quality and benefit consumers, include:

- Better Buildings Outdoor Lighting Accelerator is working with dozens of municipalities over a two-year period to accelerate the deployment of high-efficiency outdoor lighting, with the conversion goal of more than 1,500,000 lighting fixtures, while developing best practice approaches to system-wide street lighting upgrades.
- Lighting Energy Efficiency in Parking Campaign was launched in 2012 with the goal to plan or install energy efficient lighting in at least 750 million square feet of parking space.
- Interior Lighting Campaign is a new effort with a goal to replace 1 million office lights (the equivalent of approximately 100 million square feet of lighted space), with high-efficiency lighting by May 2016.

Population growth and increased urbanization are expected to drive a 50% rise in lighting demand by 2030. However, if we accelerate the global transition to advanced lighting, such as LEDs (through campaigns like the Global Lighting Challenge), we have the ability to cut electricity consumption from lighting in half over that same time period. That's 50% more light, using 50% less electricity!

These initiatives demonstrate the leadership and commitment that will help the U.S. and the world meet our climate goals. A global shift to highly efficient LED lights could avoid 800 million metric tons of CO2 emissions a year, equivalent to 684 coal-fired power plants. Massive changes like this take time and investment, so the GLC's mission to accelerate efficiency in lighting is a critical piece of our efforts to secure a low-carbon future.

Source: http://energy.gov/articles/rise-and-shine-lighting-world-10-billion-led-bulbs

Interiors green Shots!
THE HOME AND LIVING STORE

Snuggling In for the Winter

By Jessica Barber Goldblatt

Photo: shutterstock.com

I have been thinking a lot this fall about how to get through our long northern winters. How do we bare the weather, seal drafts, ski some and just get through until the spring comes? Then the Norwegian word koselig came to mind:

Koselig: More than anything else, koselig is a feeling: that of cosiness, intimacy, warmth, happiness, being content. To achieve the feeling of koselig, you need koselig things.

As the days get darker and colder in much of the northern hemisphere, it's easy to indulge in gloom. For the next few months, you will be shivering. You will be battling foul weather. There will be no chance to see the sun after work.

The gloom leads to a common question: What can I do to cope with the dark and cold?

If you truly want to be happy during winter, though, this is the wrong approach to the season. Changing your mindset can do more than distracting yourself from the weather.

First, celebrate the things one can only do in winter. Getting outside is a known mood booster, and so keep going outside, whatever is happening out there. There is a saying that "there's no such thing as bad weather, only bad clothing."

Create a sense of coziness. It's like the best parts of Christmas, without all the stress. Light candles, light fires, drink warm beverages, and sit under fuzzy blankets, snuggle, make yummy food, hang out with friends, play games (so many good ones to play) sit on the couch watching Netflix. Be enamored with the sheer beauty of the season, deep in the winter, the snow sparkles, when it's sunny the sun it is so bright, and it's so still

A MINDSET SHIFT. One of the things we do a lot of in the States is we bond by complaining about the winter. This is easy enough to change; simply refuse to participate in the Misery Olympics. Talk about how the cold gives you a chance to drink tea or hot chocolate all day. Talk about ice skating, or building snowmen. Bundle up and go for a walk outside, knowing that you will likely feel warmer and happier after a few minutes. Better yet, go with a friend. Social plans are a great reason to haul yourself out from under the covers. Or just try to observe winter without much love or hate and know like all things it will pass and come again.

"And as they sang, the fear and the suffering of the long winter seemed to rise like a dark cloud and float away on the music. Spring had come. The sun was shining warm, the winds were soft, and the green grass growing."

Jessica Barber Goldblatt is the owner of Interiors Green -- the Home and Living Store at 2021 Main Street in Bethlehem, NH. www.interiorsgreen.com

Ask the Soapman

Dear Soapman,
Which is better for my drains, your bar soap or your shower gel? In other words, which makes less scum? Sorry for this bizarre question, but I can't decide which one to purchase. Thanks.

Hello Pat,
Thanks for writing.

Best to order your soap products based on your skin type rather than how often you have to scrub the tub. Soap scum is a mixture of soap and minerals. Filtering your water will reduce the minerals. That's probably the best way to avoid the issue. Clean soap scum with vinegar (acidic vinegar cleans alkaline soap), with Bon Ami the unscented scrubby cleaner, or with Liquid Sunshine nontoxic cleaner.

Our organic bar soaps are for sensitive skin, especially dry sensitive skin. The soap based shower gels and body foams are for all but the most dry and sensitive skin types. And liquid castile soaps are for oily skin people. Look for the skin type graphic on our website and on many of our products. http://vermont-soap.com/about-our-soap/test-your-skin-type/

All the Best!
Soapman