Issue 36 • FEBRUARY - APRIL 2016

Renewable Energy in 2015 Pg. 24

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To Buy or Lease A Solar System?

By George Harvey

There are reasons to support each side on the question of buying versus leasing solar systems. Different people have very different points of view.

There is a temptation for many people to lease simply because it is made very easy by some companies. While others take the attitude that any solar power is better than no solar power, leasing has a strong tendency to mask details. So it is best to check the facts and read the fine print!

Perhaps the best way to start on any renewable energy project is to establish firmly what your intention is. Do you want to save the planet? Are you motivated by saving money? Perhaps the ability to weather a storm appeals to you most – or, all of the above? If your real goals are clearly stated, it will simplify your decision making.

The next step is to review available programs. There are many incentives, both from the federal government and from the states. Among them, net-metering is probably the most important for grid-tied systems, and different states have different policies. Want the details? Check the Database of State Incentives for Renewables and Efficiency (DSIRE) www.dsireusa.org.

You should understand Renewable Energy Certificates (RECs). Each REC is proof that a megawatt-hour of electricity was produced using renewable sources and put on the grid. If your system can produce RECs, you can sell them. The problem is that they can then be used by utilities to increase the percentage of renewable power they can take credit for so they can keep old fossil-fuel plants running. If you care about the planet and create RECs, you should consider retiring them instead of selling them.

A long-term power purchase agreement (PPA) might be another option, even for a small system. If you puchase power under a PPA, however, you might pay less per kilowatt-hour than your current utility bill and not have to spend any money up front.

Cont'd on p.28

Net Zero Home in Greenfield, MA. Courtesy of Spartan Giordano

The Snow IS Melting!

Alex Deibold. Bromley Mountain Ski Resort, VT. Dec., 2015

The Chacaltaya glacier has melted at the world's highest ski resort, and so it has closed for good.
Photo: Wikimedia Commons.

Snowboarder Jeremy Jones, Teton Gravity Research, Alaska. Photo: Flickr By Noguchi Porter Novelli.

By G. Harvey and N.R. Mallery

The January-February issue of the Sierra Club's magazine, Sierra, had an article, "Dirtbag Snowboarders Rescue Our Climate." It speaks volumes to the plight of the winter sports business, and by extension all businesses with any dependence on winter weather, as the climate changes. You can find it online at http://bit.ly/sierra-club-snowboarders.

Auden Schendler, the vice president of sustainability for Aspen Skiing Company, is quoted in the article saying, "From the climate science I'm looking at, the ski industry doesn't have a real vibrant future." That is an understatement, because it does not evoke the full image of what is going on. When we speak to troubles for the ski industry, what we are really talking about is something ranging from deep sadness to heartbreak for the scores of thousands who love to ski or snowboard.

Aaron Teasdale, the article's author, wrote it from personal experience. He described a trip he had made to Bolivia to ski the glacier on Mount Chacaltaya. That was clearly an exhilarating experience for him. Sadly, neither he nor anyone else will ever be able to do it again.

With rising temperatures and declin-

Cont'd on p.36

Warning on Investments in Fossil Fuels

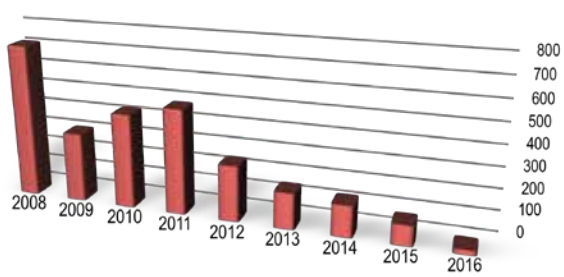
By G. Harvey

We should start with a disclaimer. No one at Green Energy Times is a stock market analyst. Nevertheless, we can see a hand writing on the wall, and what it writes looks a lot like, "Divest – before it is too late."

Oil industry analysts are in a bit of a tizzy. There are a number of market factors whose combination is so hard to explain that a lot of informed people seem speechless. First, here are some facts.

- Oil prices are the lowest they have been in years.

Highs for the Dow Jones Coal Index - 2008 to Date



- CNN reported on November 22 that tankers have lined up off the U. S. East Coast because there is no place to put the oil they carry.
- CNN reported on February 4 that storage facilities in Cushing, Oklahoma are running out of room. This is the largest oil storage hub in the country, and if it runs out of space to take more, oil prices could go much lower.

Cont'd on p.25

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

Solar Power works! … anywhere! under the sun!

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Green Energy Times would like to thank everyone who has submitted articles or helped in any way to make this all a reality. We want to also thank our advertisers & ask that you support them. Say that you saw them in *Green Energy Times*. Now let's all G.E.T. moving ahead towards a clean, renewable future - one where our children & grandchildren will be able to breathe & grow, live & love on this beautiful planet where we live.
Thank you for reading G.E.T. Please send your comments & suggestions to: info@greenenergytimes.org

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Solarize Ammonoosuc

On Sunday, January 24, over a hundred New Hampshire residents and business owners joined the Ammonoosuc Regional Energy Team and O'Meara Solar at the Solarize Ammonoosuc Kickoff to learn how solar could reduce their energy bills and contribute to a cleaner environment. Attendees came from Franconia, Bethlehem, Easton, Sugar Hill, Lisbon, Lancaster, and other areas of New Hampshire.

Over half of the attendees signed up for solar site visits before leaving the event, and even more have signed up since. The program is scheduled to run from the kickoff event until May 1st.

A Solar Open House on Saturday, Jan. 30 was attended by people from around 20 households. A representative from O'Meara Solar gave a complete tour of a rooftop installation. Neighbors had opportunities to chat among themselves about their on-grid, off-grid and other renewable energy and energy efficiency measures.

More events are planned throughout the coming months to help small businesses and homeowners learn about solar and take advantage of this group purchasing opportunity. One will be an open house to give information on a solar photovoltaic pole-mounted array at the Strange home 159 Franconia Mountains Road, Franconia on Sunday February 28 from 1:00 to 3:00 pm.

Solarize Ammonoosuc Kickoff at Polly's Pancake Parlor, Sugar Hill, NH. Courtesy photo.

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Climate Reflections on 2015

"Vermont should introduce a carbon tax this session"

By Alan Betts, http://alanbetts.com/writings

In winter I like to look back on the year that is past. So far the winter has been much warmer than the last two. We have the very strong El Nino in the equatorial Pacific to thank for this. I still had fresh brussel sprouts and kale to eat from the garden until 1st February. My spring spinach and lettuce are alive under glass and on warm days we have been thinning and eating some. The early February thaw meant that for the very first time in my memory, I was able to start digging under the rye cover crop in February!

This past year 2015 set a new record global temperature by a very large margin, shattering the myth that climate warming was slowing down. Globally weather extremes keep escalating. Undoubtedly the best news was the December climate agreement in Paris with the consensus support of 196 countries. Nations made commitments to reduce the burning of fossils fuels to try to restabilize the climate system. This is a daunting task, since we have waited so long, but at least we are now heading in the right direction, with clear targets and progress reviews every five years.

Grassroots democratic pressure helped a lot – many Vermonters went to Paris – and the moral clarity of Pope Francis was on the minds of many leaders. Fortunately these activists realize just how much work lies ahead for the rest of this century. Follow-through will be difficult for many leaders, as they slip back into local politics, election cycles and business as usual. Vermont can play a leading role.

So let us start by facing some truths that were necessarily ignored in Paris – in order to get an agreement. One basic issue is that the developed countries dream that climate change can be dealt with within the global market, and the economic, financial and technical framework that has made them rich and powerful. Yet this is the very framework that has accelerated climate change in recent decades. In addition, the absolute necessity of a fossil carbon pollution tax was not even on the table. Vermont should introduce a carbon tax this session.

The developing countries want to lift their people out of poverty, and their elites think in the same terms of consumer growth, centralized power systems and more cars that have fueled climate change. The rich nations are happy to profit from these expanding markets, and eager to add a lot of renewable energy systems to the mix.

But as Pope Francis said, our increased power has not been linked with deeper moral values, and a true sense of our common home and common destiny. One result is that the exploitation of the Earth and the exploitation of the poor by the wealthy are now intertwined. In Paris, the rich developed countries were reluctant to make agreements to share resources with developing countries. Sharing intellectual property rights on essential renewable technology would reduce their profits. So financial commitments from the rich to the poorer nations were small compared with the scale of the challenge.

Some were surprised at the about-face of China in the past year, but two of the reasons for this are salutary. The air pollution in Chinese cities from burning coal is so unhealthy that urban revolt is brewing. And China has realized that its future economic growth could be based on supplying the world with cheap renewable technologies for decades to come.

Melting Earth by Les James Humor. Image: Flickr

Sitting by the fire and dreaming of spring this January, we need also to dream how to transform our 'buy more' consumer society and growth economy into something sustainable that the Earth can handle. This will take vision, time and real effort for a decade or more.

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

Pipelines - Yea or Nay

By George Harvey

Facts sometimes imply things that are not true. Some facts used to promote natural gas are like that.

Natural gas burns cleaner than coal. Because of this fact, its carbon footprint is said to be only 50% to 60% of that of coal. This suggests that since coal produces almost 30% of our electric power, we can reduce the greenhouse gas (GHG) emissions of electric production by 15% or more simply by refitting our coal plants to burn natural gas and bringing in the gas pipelines to feed them. And it is a fact that we do have plenty of natural gas from fracking.

These facts, however, tell only part of the story. Methane, the key component of natural gas, is 20 to 100 times as bad as carbon dioxide in its planet-warming effects, so we can only be sure it has lower greenhouse gas effects than coal if we know that none of it leaks. So the question is, does it leak, and if so, how much?

Satellite imagery over North American gas fields indicates that an average of 5.4% of the methane is leaking at the source. That little leakage would make natural gas as bad as coal or worse. That, however, is not the end of the problem. Gas also leaks from both storage facilities and pipelines.

Many of us have heard about a gas leak in California. The gas was stored in a depleted oil well in the Porter Ranch neighborhood of Los Angeles. It was compressed to 2,700 pounds per square inch pressure, about a quarter of the pressure in the chamber of a shotgun when it is fired. Several attempts to stop the leak have only made matters worse. Since October, about 1,400 tons of methane have leaked per day, and the leak is not expected to be plugged until the beginning of March. Thousands of residents have been forced to flee, many with such symptoms as nausea and bloody noses.

The extent of the Porter Ranch Leak seems not to have been understood until a pilot flew an airplane with a methane sensor over it. Methane itself is odorless, so natural gas has very smelly gasses added to it to warn people of a leak. The pilot, in his airplane, was made sick by the smell or those gasses.

This is not the only problem, however. There are probably hundreds of thousands or even millions of smaller leaks that go on, often uncorrected. In 2012, a professor and students from Boston University drove a car over all the streets in Boston to locate gas leaks. They covered 785 miles of city streets and found 3,300 leaks. The Conservation Law Foundation duplicated the test and found 4,000 leaks. It is estimated that there are over 20,000 leaks in Massachusetts alone.

Top: Structures are seen burning in No. Blenheim, NY on March 13, 1990; bottom: Firefighters survey the damage as buildings continue to smolder.

These leaks can kill small animals and vegetation. They can cause severe medical problems in human beings. More to the point, however, leaks can fill building spaces with flammable gasses, which can cause fires and explosions. Green Energy Times' editor was near one explosion from a propane pipeline in No. Blenheim, New York in 1990. A cloud of propane rolled into the community, catching fire soon after it got there. Two people were killed, eight houses were destroyed, and there were millions of dollars in damage. The experience is worth knowing about as one considers approving a pipeline in your community. Accounts of this tragedy are at: http://bit.ly/N-Blenheim-1; http://bit.ly/N-Blenheim-2; http://bit.ly/N-Blenheim-3.

Natural gas does not form vapor clouds that flow over the ground the way propane does. What it does instead is hardly better. For example, methane from a pipeline leak sometimes passes through the ground and accumulates in the basement of a building, accumulating until it ignites explosively. Of course, this is not the only way a failure can happen. Gas appliances and household pipes can fail, and such problems develop fairly regularly.

The question of whether we really need new pipelines is worth asking. Last year, an independent study for Massachusetts' Attorney General found the state needed none. It is worth asking whether we should even be using natural gas, a fossil fuel. With the costs of solar and wind power declining, Lazard Associates, whose annual studies of the cost of electricity are well known and respected, says the lowest cost electricity from natural gas is not only beat by wind power, but also edged out by solar.

So in answer to the question: No. We do not need natural gas at all, except for the short term. We are better off ditching natural gas as quickly as we can.

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Is An Electric Car On Your Radar?

Source: www.driveelectricvt.com

Want to purchase an electric vehicle but not sure where to start? Below is a comparison table of plug-in electric car models currently available in Vermont and the northeast.

Comparisons for Plug-in Cars Available In New England

MAKE/MODEL	VEHICLE TYPE	ELECTRIC RANGE (Miles)*	TOTAL RANGE (Miles)	MSRP for Base Model	Federal Tax Credit
Audi A3 e-tron	Plug-in Hybrid	16	380	$37,900	$4,168
BMW i3	All Electric; Plug-in Hybrid	81;72	81;150	$41,350; 45,200	$7,500
BMW X5 xDrive40e	Plug-in Hybrid	14	540	$62,100	$4,668
Cadillac ELR	Plug-in Hybrid	40	340	$65,000	$7,500
Chevrolet Volt	Plug-in Hybrid	53	420	$33,170	$7,500
Ford C-Max Energi	Plug-in Hybrid	19	550	$32,645	$4,007
Ford Fusion Energi	Plug-in Hybrid	19	550	$33,900	$4,007
Ford Focus Electric	All Electric	76	76	$29,175	$7,500
Hyundai Sonata Plug-in Hybrid	Plug-in Hybrid	27	600	$34,600	$4,919
Mercedes S550e	Plug-in Hybrid	12	450	$95,650	$4,043
Mercedes-Benz B Class Electric Drive	All Electric	87;104	87;104	$41,450	$7,500
Mitsubishi iMIEV	All Electric	62	62	$22,995	$7,500
Nissan Leaf	All Electric	84;107	84;107	$29,860; $35,050	$7,500
Smart Electric Drive**	All Electric	68	68	$20,740	$7,500
Tesla Model S**	All Electric	240;270	240;270	$75,000; $85,000	$7,500
Tesla Model X**	All Electric	220;257	220;257	$80,000; $93,000	$7,500
Toyota Prius Plug-in	Plug-in Hybrid	11	540	$30,815	$2,500
Volkswagen e-Golf	All Electric	83	83	$33,450	$7,500
Volvo XC90 T8 Hybrid	Plug-in Hybrid	14	350	$68,100	$4,585

A more detailed version of this comparison table is available on the second page of the Drive Electric Vermont Fact Sheet, which includes battery size, fuel tank capacity, DC fast charging availability, number of seats, cargo capacity, and lease cost. Go to: http://bit.ly/drive-electric-facts.

**These are manufacturer range ratings. Significant reductions can occur in cold temperatures. An all-electric vehicle with 80 miles of claimed range might be reduced to approximately 40 miles on the coldest Vermont days.*

***No Vermont dealerships, but vehicles are available to Vermonters in nearby states or online.*

Several excellent online sources for plug-in vehicle information are also linked below:

- Green Car Reports: www.greencarreports.com/news/electric-cars
- Plug-in Cars: www.plugincars.com
- Consumer Reports: http://bit.ly/CS-EV-Fuel
- Go Electric Drive: www.goelectricdrive.org
- FuelEconomy.gov: www.fueleconomy.gov

Additional details on several models are included in posts on the Drive Electric Vermont.

Blog at www.driveelectricvt.com/blog. More info is available at www.driveelectricvt.com.

Drive Electric Vermont

SMART TRANSPORTATION IN VT

By Jim Stiles

Calling for a ride. Photo by Ildar Sagdeje, Wikimedia.

Lots of Vermonters care about being green. However the unfortunate fact in the Green Mountain State is that lots of Vermonters put lots of miles on their cars. Over a third of total energy consumption and well over half of Vermont's carbon emissions come from the transportation sector. Cars in Vermont drive more miles than those in any other state in New England. Vermont has more registered drivers per capita than any other state in the US. Vermonters are transportation junkies.

There are a few bright spots for transportation in Vermont. Car sharing, a modestly green transportation alternative, is slowly catching on. It looks like there is hope for a new train connection to Montreal. But by far the real stars of green transportation in Vermont are VTRANS and its Go! Vermont program. Go! Vermont provides access to mass and shared transit in Vermont. This includes the full array of conventional mass transit including buses, trains, and ferries. Go! Vermont promotes bicycling, and the web site even offers detailed information on exciting new bicycling options like cargo bikes.

These services are all quite good compared to those in most rural states, but the really exciting stuff is Go! Vermont's car and van pooling, and especially their new "smart transit" tools. Vermont's current car and van pooling programs are basically conventional, but well suited to the needs of Vermont's dispersed populace and services. However with some new services that are being added to the mix, significant improvements are on the way.

These new smart services make use of smart phones, the internet, and big data to figure out how to get people where they need to go. Network researchers have learned how to use smart phones to figure out where their users are traveling from and to. This is a great aid to transportation planners for whom this information is pure gold.

For those of you who are (justifiably) worried about your personal privacy on the internet, don't worry about this work in Vermont – the data is "scrubbed" of personal info at the beginning of the data gathering process and only the minimal, most essential bits of planning information are collected.

One of the hard part parts of the smart transit puzzle is gathering the information about available seating on all of the vehicles out there with seats to share. Fortunately there are internet-based services that make sharing the essential information for arranging a ride easy. For those of you who are interested these services include:

Automatic Vehicle Location (AVL). With an AVL system installed a vehicle knows where it is at the moment and with the help of its driver, it knows where it is going and the route it is following. This service is being launched in Burlington and southeastern VT this year and plans are in place to provide this "real time" tracking info throughout the State.

General Transit Feed Specification (GTFS), was created by Google for capturing information about ordinary transit routes (such as bus routes). This baseline data establishes the specific routes and stops for a transit service, and makes it available to trip planners and scheduling software.

GTFS-RT or "realtime" – an extension to GTFS to allow use of real time information, like the information from AVL systems

GTFS-FLEX – adds the ability to add flexibility in a vehicle route, which is essential for "Demand Response" trips, such as essential shopping or medical appointments. Vermont currently provides 180,000 of these trips each year and with GTFS-FLEX each community could have access to all of these trips for the general public to use.

The way it works is your phone knows where you are and you know where you are going. There is software on the Internet that puts your information together with vehicle information, and then uses your phone to tell you where and when to pick up a ride, and to keep you advised of changes or problems.

It all sounds very complicated, and under the hood it is, but for users it's easy. Vermont is currently testing out the various bits and pieces. Keep your ears open for the new smart transit capabilities that should be starting to make Vermont's generally dismal transportation scene much greener over the next year or so.

Free College Street Shuttle, Chittenden County Transportation Authority (CCTA), Burlington, VT. Photo: Flickr.

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GO! VERMONT is a *free resource* for commuters who want to reduce the cost and environmental impact of driving. The program features a carpool/vanpool matching service and lots of practical information about other ways to get around.

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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.

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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

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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**

The Electric Road

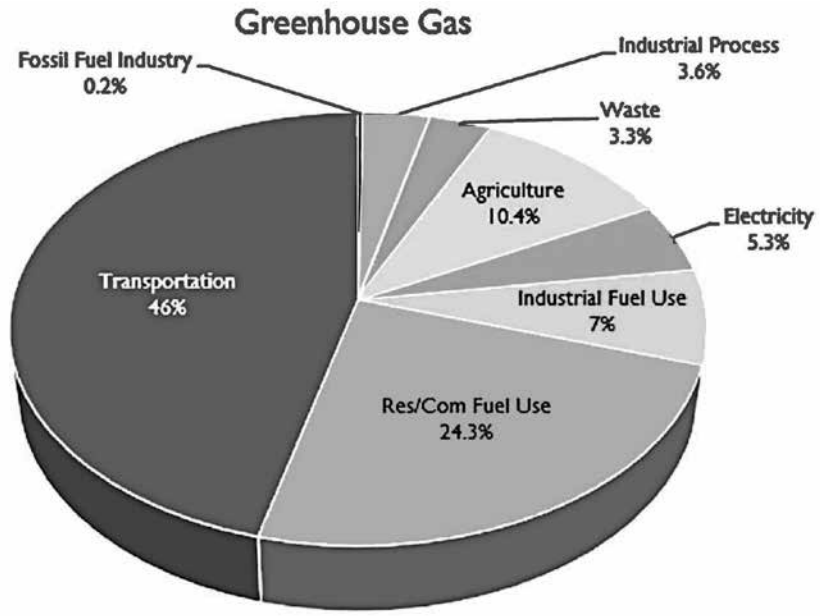
By Karl Kemnitzer

We are in the process of changing how we use our roads. After decades of using technology to move faster, we are starting to look at the quality of our transportation. No longer are "throughput" and "level of service" adequate measures of success, we are now expecting our roads to "multifunction" like the Internet. Online car, bike, and ride-sharing programs, improved buses with arrival status available on cellphones, better walking and biking infrastructure, and better rail service with carry-on bikes are being built for the increasing number of people who don't wish to own a car.

crease the gross regional product by $12 to $18 billion, increase personal disposable income by $10 to $14 billion, and create 91,000 to 125,000 new jobs.

Another regional effort was the 2013 Zero Emissions Vehicle Memorandum of Understanding (ZEV MOU), signed by eight states (CA, CT, MD, MA, NY, OR, RI, VT), with the goal of putting 3.3 million ZEVs on the road by 2025 (about 15% of new vehicle sales). Although Vermont has the highest per capita EV ownership with 943 EVs, we need 34,898 by 2025 to meet goals. At the recent COP21 talks in Paris, this MOU became the International ZEV

Transportation accounts for 46% of Vermont's GHG emissions.



Gross Emissions by Sector. Source: Vermont 2011 National Emissions Inventory.

Most rural people feel they must have a car. The best pollution solution is simply reducing trips with one person driving alone. The VTrans Go!Vermont program has several options to help you with doing this. Another option is an electric car. EVs are becoming very capable -- two of the world's fastest cars, the Porsche 918 Spyder and the McLaren P1- are plug in hybrids, not to mention the all-electric Tesla. Car heating and charging systems are improving, and car manufacturers are working on 200-mile-range batteries. (The batteries I'm using to build my electric bikes have become 40% smaller and 30% cheaper in just five years.)

Oftentimes it seems like EVs are only slowly gaining acceptance, but there has actually been a tremendous amount of support work happening. At the federal level there are the EV Everywhere program, and the Northeast Electric Vehicle Network. One of the first regional programs is the five-year-old Transportation and Climate Initiative (signed by CT, DE, DC, MD, MA, ME, NH, NJ, NY, PA, RI, VT), which just released the report "Reducing Greenhouse Gas Emissions from Transportation in the Northeast and Mid-Atlantic". It found that clean transportation strategies funded by a market-based program or pricing policy would create large benefits for the region. Depending on how strong the programs are, businesses would save $29 to $55 billion over 15 years, and consumers would save $4 to $18 billion. The cost savings from reduced fuel consumption and traffic congestion, better health, and consumer incentives would more than offset increased vehicle costs and fees. Such changes would in-

Alliance when Germany, the Netherlands, Norway, Quebec, and the UK signed on.

The Sierra Club, Conservation Law Foundation, and Acadia Institute released an October 2015 report "Charging Up: The Role of States, Utilities, and the Auto Industry in Dramatically Accelerating Electric Vehicle Adoption in Northeast and Mid-Atlantic States." This report is based on the 3.3 million ZEV target, but Sierra Club's January 2016 report "The RGGI Opportunity" found that 10 million EVs (one third of all cars) will be needed by 2030 to meet climate goals. They also noted that it is important to have strong RGGI caps in place, to prevent EVs from, in effect, running on coal and under the bridge natural gas fuels.

EV charging is usually done at night, at home, but Drive Electric Vermont and GMP have been working to install a charging station network for travelers, and at businesses through the "Drive the Dream" program. A major problem is that dealers are not motivated to sell EVs, and buyers must often take the lead. VTrans and ANR are currently working on an EV incentive program to remedy this and other smaller barriers to a cleaner transportation system.

At the recent "What Does a 100% Renewable Energy Future Look Like?" Dartmouth forum, author Mark Jacobson noted that a 40 kW solar array could provide an efficiency-aware person with all of their energy needs, including transportation. What do you think of making your own fuel?

Karl Kemnitzer is a member of the Upper Valley Sierra Club, and prefers riding his solar electric cargo bike.

Should We Divest?

By George Harvey

Governor Peter Shumlin. Photo: Wikimedia.

When Vermont Governor Peter Shumlin came up with a plan for the state to divest its pension funds from coal stock, he was immediately opposed by State Treasurer Beth Pearce. She took the view of the corporate officer whose task is to guarantee the economic value of the client,

Beth Pearce. Photo: Don Shall, Flickr

regardless of the environmental impact of the investment. The result, however, is precisely the opposite of what she has intended; Vermont may be lose money on dead-end investments in coal and oil.

Many of us are familiar with the Dow Jones Industrial Average (DJI). Dow Jones maintains many indices, however, one of which is the Dow Jones Coal Index. It might be instructive to see how this index, its components, and other large coal companies are performing on the stock market.

The Dow Jones Coal Index hit a high in 2008, just as a recession was beginning. During the recession, it fell, though at a much faster rate than the rest of the stock market. In fact, it fell faster than the DJI did at the start of the Great Depression. But unlike the rest of the stock market, it did not begin to recover after two or three years. It just kept falling, without slowing down. Since 2008, it has lost about 98% of its value.

The coal index has also lost most of the component companies it had in 2008. Some have been delisted. Some have gone bankrupt. The index did not replace them, and only two remain. These two, CONSOL (CNX) and Peabody Energy (BTU) have also lost 94.02% and 99.64% of their values, respectively.

They, however, are the survivors. Arch Coal (ACIIQ), which was responsible for much of the mountaintop removal mining in the central Appellations, saw a share price drop from 73.41 to 0.187, a loss of 99.75% of its value. It removed the tops of hundreds of mountains and dumped the rubble into thousands of miles of valley streams, to get coal. Now it has declared bankruptcy, destroying the investments of its shareholders along with the environment.

And there is Alpha Natural Resources (ANRZQ), which lost 99.98% of its 2008 high value. You might have bought 1000 shares of Alpha Natural Resources at its high in 2008, for $104,440, instead of putting a payment down on a really gorgeous home. The current value of that stock would be enough to buy a modest lunch for two at McDonald's, $16.

People associated with fossil fuels like to blame President Obama, but few of them seem to be willing to talk about the fundamental failure of fossil fuels in the marketplace. They are no longer competitive, and the fact that they get about five times as much government support as wind and solar is insufficient to make them competitive.

We can look to the Levelized Cost of Electricity (LCOE) to see the cause of the decline of coal more clearly. Lazard Associates is perhaps the most cited source, and its figures account for subsidies. The average LCOE of coal is 10.75¢/kilowatt-hour (kWh). For nuclear power, it is about 11.65¢/kWh. The average is 6.5¢/kWh for combined cycle natural gas. The LCOE of utility-scale solar power averages about 6.4¢/kWh for crystaline photovoltaics and 5.5¢/kWh for thin-film. Wind power's average LCOE is 5.5¢/kWh. Both wind and solar are less expensive than fossil fuels of any kind.

Fossil fuels have other problems. Citigroup says that if the external costs of gasoline were paid at the pump, it would raise the price by $3.80 per gallon. That represents hidden costs we all pay,

Bill McKibben, 350.org. Photo: Hotshot977

much of it in medical bills, for our use of fossil fuels. The inherent unfairness of this brings us back to ethics.

Ethics give value to social costs. Though fiscal managers have been taught to ignore them, there are consequences. For example, two of California's state pension funds chose to ignore pleas to divest fossil fuel securities, supposedly because they wanted to protect financial interests of workers. A report released in August of 2015 said they had lost $5 billion in one year on the largest 200 fossil fuel companies.

We are learning, as a society, that we can do what is right and save a lot of money in the process. It is a powerful combination.

Should we divest our interests in coal? That might be simply dumping some worthless stock. Oil and gas, on the other hand, still have almost 50% of the value they had in 2008. Does that bring anything to mind?

Wind in VT Exceeds Expectations

By Green Energy Times Staff

Two Vermont wind farms have reported exceeding production expectations for 2015. They are Kingdom Community Wind (KCW) and Georgia Mountain Community Wind (GMCW).

Kingdom Community Wind

KCW, in Lowell, Vermont, announced that its 21 turbines had generated enough electricity in 2015 to power 26,700 homes. That is an increase of 7% from the previous year.

KCW has a Good Neighbor Fund, part of a commitment by Green Mountain Power (GMP) to provide benefits for the communities near wind farms. Payments to the fund are based on generation, and as generation increases, so do payments. This year, five nearby communities will receive over $201,000 from the fund, up $75,000 from two years ago and $13,000 from last year.

The town of Eden will receive $77,420, Albany will get $69,885, and Craftsbury will have $33,851. Westfield and Irasburg will receive $10,000 each. Lowell, the wind farm's host community, gets benefits in the form of tax revenues, and so is not part of the program.

Most of the towns benefiting from the fund use the payments to reduce taxes or to support local initiatives. The residents of one town, Craftsbury, voted to use its payment from KCW to invest in a 10-kilowatt solar system to help cover municipal electric needs.

"KCW is a key part of GMP's continued commitment to deliver reliable, low-cost energy to Vermonters," said corporate spokesperson Dorothy Schnure, adding that in the last four years, GMP has given customers three rate decreases.

Good Neighbor payments will continue for the first ten years the plant operates. Kingdom Community Wind began generating power in November 2012. GMP's web site is greenmountainpower.com.

Georgia Mountain Community Wind

GMCW announced that its electric production exceeded expectations by more than 22%, putting out over 33,000,000 kilowatt hours in 2015. This is sufficient to power more than 5,500 households. The project in Milton and Georgia produced enough energy to account for 9.5% of the energy demand of the Burlington Electric Department, which buys 100% of the wind farm's production through a long-term contract.

GMCW has four turbines. In terms of production and availability, it is the best wind project in Vermont.

GMCW pays about $92,000 to its host communities in taxes and over $97,000 in Production Tax payments to the State Education Fund, helping all Vermont municipalities with quality education.

The community wind facility is operated

under the leadership of two lifelong Vermonters, renewable energy manufacturer and developer David Blittersdorf and Jim Harrison of the Harrison family of Milton.

"Vermont wind is working," said Blittersdorf. "It's working for our environment, for our local economy, and for our state's energy security."

For more information visit georgiamountainwind.com.

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The TriMetric Monitor: A Gift for Off-Gridders

By N. R. Mallery

Solar power has become a mainstream option today. Battery backup systems are necessary, if you are "off-grid," and an option if you are grid-tied. A generator is recommended, if you are off-grid, to be able to keep batteries charged when necessary. This generally requires the use of fossil fuels.

The TriMetric TM 2030 A

At present, the most widely-used battery systems still use lead-acid technology, which requires maintenance. Neglect will compromise the health and life of the batteries and your investment.

Neglect can happen if the batteries are charged excessively, or if they are allowed to discharge too far. Batteries can suffer because they are allowed to sit with a partial charge too long or from repeated failure to bring them to full charge when necessary.

Maintenance is made much simpler and better by using the proper tools. If the system has lead-acid wet-cell batteries, the electrolyte solution needs to be topped off in each cell, as necessary; a hydrometer should be used to check the specific gravity of the electrolyte.

It is important to get a complete picture of the battery's charge state. A battery that may seem to be at a full state of charge may actually not be. There's more to the picture.

This is where the TriMetric comes into use. Together with occasional use of your hydrometer, it is probably the most important tool available to understand what is going on with your batteries. (Your power is dependent on the health of your battery bank. It is how you are able to have electricity when the sun is not shining.) This handy tool tells the full charge of a battery system by measuring both the voltage, charging current and the amp-hours. It is compatible with lead-acid wet-cell, gel, and AGM batteries, as well as some other types, including some lithium batteries.

It's awesome to look at the TriMetric and see that your battery system is 100% full after just a few hours of sunshine. But, the TriMetric is designed to give you a more in-depth reading and understanding of what is behind the scene. When a battery is charged the amp-hours need to be somewhat higher than what had been discharged. Without keeping track of this information, recharging correctly is guesswork, to a good degree. Because the TriMetric measures the number of amp-hours, in conjunction with the voltage, the information can be used to be able to recharge batteries to the correct amount.

The TriMetric also keeps track of a lot of other useful data such as the time that has passed since the last charging. It can record the length of the charge-discharge cycle. It keeps track of when certain other maintenance procedures were last done. It has low voltage audible alarm,, a display that can be read in the dark, and more features that are helpful for technicians.

I don't know what I would do without it. It not only helps to know how the batteries are doing, but it also tells you how much energy you are using at any given moment. This awareness naturally leads to not wasting the energy that is stored in your batteries, which is what you live by when you are off-grid. It can also help to keep your dependence on fossil fuels to a minimum.

The TriMetric is a product of Bogart Engineering. For details visit bogartengineering.com.

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SOLAR SITING ISSUES

By George Harvey

Vermont state capitol building. Photo: Wikipedia.

Some Vermont communities have been struggling for a long time to get some control over siting of renewable energy systems that would be built within their bounds. This year, their struggles have become newly energized.

The underlying problem is that the Vermont Public Service Board (PSB) has nearly all control over siting approvals, leaving none to the communities where the projects will be built. The idea that local communities should have control over their own territories is perfectly understandable and has very wide appeal.

A problem is that there are two sides to this issue. The movement to ensure the rights of communities has a widespread and real appeal. People all over the state want to maintain the integrity of their communities and their own homes. They want to protect what they have.

The other side of this issue, however, is a need to address far greater threats to the communities over Vermont and the people who live in them. Our forests, our farms, our health, the security of our lives are being threatened by things that are altogether too real, too present, and too powerful. The negative effects of climate change have already arrived and are getting worse. They range from Lyme disease being spread by non-native ticks to increased storm damage, such as what we had with hurricanes Sandy and Irene.

While we know we can lose power for days in a bad storm, we should recognize that such an event is not even close to a worst-case scenario. The Federal Energy Regulatory Commission has warned us that we could lose electrical power over the whole nation for over a year, if a carefully executed plan for terrorists to attack eight largely unprotected sites were successful. NASA warned us that the national grid might have gone down for upwards of three years if a solar coronal ejection that barely missed us had hit.

We will not stop climate change alone, and we will not be able to stop coronal ejections from hitting the Earth, but we can do a lot to protect our way of life. Happily, there is a way to protect ourselves from a large variety of potentially disastrous problems. To do that, we have to implement plans for resilience. And interestingly, the state and federal plans will not work as well as local ones. We have to act on the level of the home, the neighborhood, and the community to do the work best.

The movement to give communities power in siting questions is clearly intended to make it possible to prevent renewable power capability from being installed. Nevertheless, it can also be used to give communities an ability to plan for a resilient future, in which they have no control over long-term system failures.

Fortunately, there may be a way to do this that could cost nearly nothing. We might suggest that communities be given power to prevent renewable energy facilities from being sited within them, but linked to that power should be responsibility to determine how the communities improve resilience and what renewable power systems should be installed. This could be done by having each town meeting annually, have an article on its agenda, required by the state, to vote on its resilience plan, which would be put on record with the state. Cities would be required to act similarly through their city councils or other governance.

This should not be an onerous task. Sending a description of the plan to the state might be as simple as drafting a letter saying, "We have no plan." But it would mean that the issue is before the eyes of every voter, to be discussed annually.

A town meeting in Huntington, VT. Photo: Wikipedia.

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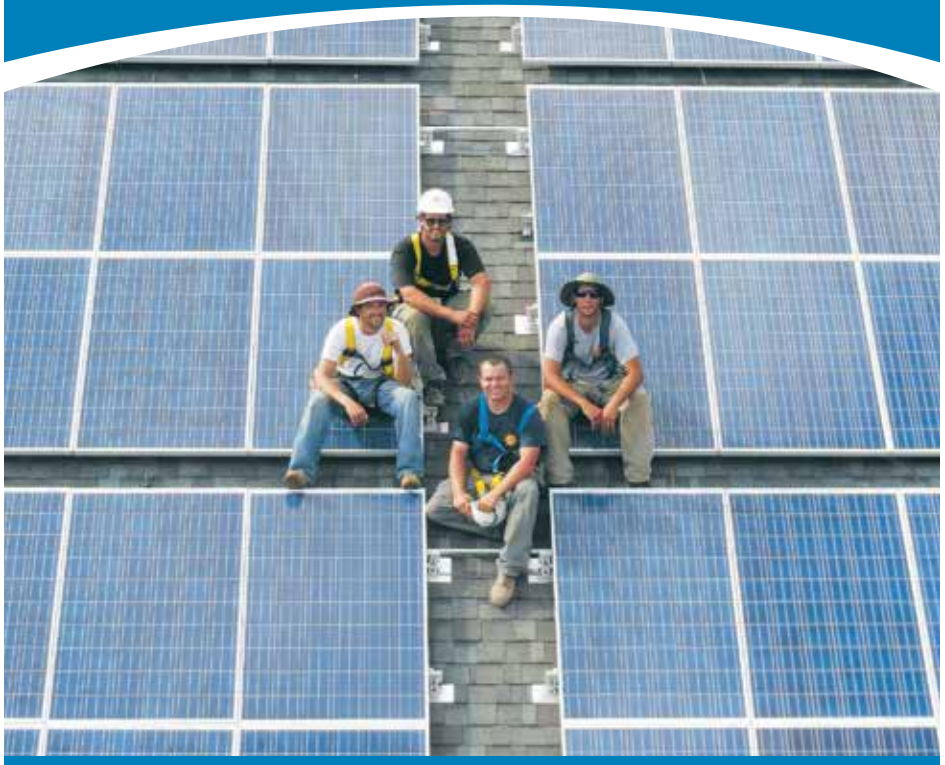

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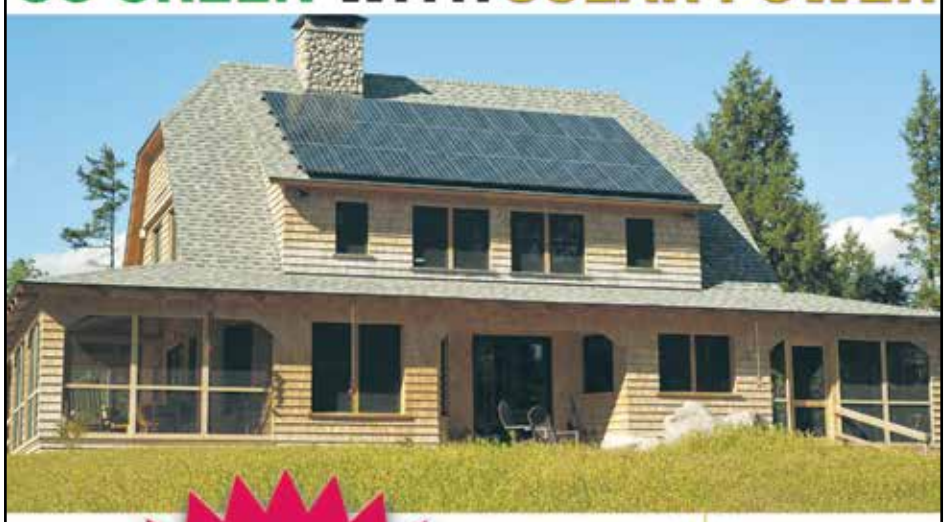

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Largest Solar System in Butternuts, NY

Scot Lueck's family's ground and roof-mounted solar array in Butternuts, N.Y. Photo: Tammy Reiss

Scot Lueck wanted to have his own solar photovoltaic (PV) array for a long time. This January, he finally saw his wish come true. His PV system was installed, with a capacity planned to supply slightly more power than he and his wife use together.

"Ever since I was a teenager I wanted to use renewable energy," he explained. "My wife and I have never been wasteful. This played a part in the decision."

The 13.7 kilowatt array has 54 panels, with 28 on the ground and 26 on the barn roof. He laughed when we asked why they were installed that way. "My wife wanted the panels on the roof. I wanted them on the ground." Life is full of compromises.

Some things are not compromises, however. The Otsego Electric Co-op, which supplies the couple with grid electricity, has no net metering and has not developed a policy that favors renewable installations by homeowners. The result of this is that Lueck buys electricity from the co-op at full retail, but when he has excess power, the co-op will only pay a standard wholesale rate for it. Please note, this is not the spot rate for instant power, which can be high; instead, it is a standard rate that would appear on long-term contracts, about a third of the retail rate.

Lueck said he will take the matter up with the co-op. While it is true that the co-op has to bear the expense of maintaining transmission infrastructure, it is also true that other electric power companies do a good deal better for customers. Many electric providers have yet to sort through the problems that have risen because consumers are becoming what is called "prosumers."

His dream of having renewable power fulfilled, Lueck says he would like to see his next step be to get batteries, so that he can be entirely independent of the grid, if that becomes necessary. This is not because he wants to

Cont'd on p.24

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Fort Drum: Solar Training for Veterans

International network will invest billions of public and private sector dollars in global clean energy markets, accelerating clean energy development around the world.

New York will participate in the U.S. Department of Energy's Solar Ready Vets training program, which will provide military personnel stationed at Fort Drum, NY with technical skills to obtain jobs in the growing solar industry after they transition from active service. This is the first Solar Ready Vets training cohort in New York, and just the eighth offered at military installations in the U.S. The inaugural New York-based class under the program began on January 11, 2016.

"Soldiers and veterans have the experience and know-how to get the job done," New York Governor Cuomo said. "The dramatic growth of solar in New York is creating a demand for highly skilled workers. Offering these heroes valuable training and the technical skills needed to work in this rapidly growing industry, not only helps veterans succeed post-service, but helps all of us create a more sustainable future."

In September 2014, the U.S. Department of Energy launched the Solar Ready Vets program to prepare veterans for post-military careers as solar installers, sales representatives, system inspectors or other solar-related occupations. The program is aligned with the Department of Defense's SkillBridge initiative, which allows military personnel to obtain job training up to six months prior to their separation from military service. To learn more visit: http://energy.gov/eere/sunshot/solar-ready-vets.

The Fort Drum program was created through collaboration among the New York State Energy Research and Development Authority, U.S. Department of Energy, Fort Drum, SUNY Canton and solar installation companies. Instructors from SUNY Canton will teach five-week classes focusing on technical training in solar skills, including hands-on labs. In addition, the program will facilitate job placement with New York solar PV companies for the trained transitioning military

Cont'd on p.13

Solar Garden Freely Spills Power Into City of Amsterdam, NY

An aerial view of the 2,000 panel solar garden that was built on a decommissioned reservoir in Amsterdam, NY. Photo courtesy of John Hodgens.

By N. R. Mallery

On November 30, 2015, the largest solar project to date for the city of Amsterdam, NY started to save the city government one-third of their power costs.

The project was built on a decommissioned reservoir. It is expected to generate enough electricity to power the city's water treatment plant, wastewater treatment plant and the pump station.

The solar garden was built through a power purchase agreement, so the city did not spend any money. "Monolith Solar paid to build the array, with the city agreeing in return to buy power from it for 20 years, at about 30% below prevailing energy rates," said Monolith Solar account manager Tim Carr. "The city expects to save $40,000 in the first year and $1.3 million over 20 years. After that, the city can buy the system, extend the agreement in five-year intervals or end the deal and have Monolith Solar dismantle the array," he said.

"It's good news for Amsterdam, because we're repurposing the property, and the residents will benefit because it's new revenue to the city," Mayor Ann Thane told a local newspaper.

Amsterdam already has smaller, rooftop arrays on a bus garage and public safety building. With the new project, Amsterdam's municipal buildings will get about one-third of their power from solar energy, according to state Assemblyman Angelo Santabarbara's office. State incentives for solar installations were used.

Amsterdam is a city of 18,000 people located at the foothills of the Adirondack State Park, and situated about 35 miles from New York's capital city, Albany. Set on the Mohawk River, Amsterdam was once one of the nation's leading carpet and rug manufacturing centers. It's also the hometown of actor Kirk Douglas and has a park named in his honor.

Monolith Solar Associates is located in Rensselaer, NY. Learn more at www.MonolithSolar.com.

Encore Renewable Energy

By Green Energy Times Staff

Encore Renewable Energy's Misty Knoll Farm project – creating value on the least agriculturally usable portion of the property.

Chad Farrell, the President of Burlington, Vermont-based renewable energy developer Encore Redevelopment has announced that the company is taking on a new name. It is now Encore Renewable Energy.

The company is also taking on a renewed focus, as it transitions from a traditional property redevelopment company to focus more narrowly on developing new sources of clean energy by re-purposing land for commercial, industrial, and community-scale solar photovoltaic (PV) systems.

Encore Renewable Energy has a great deal of experience bringing problematic real estate back to useful productivity. These include brownfields, which often suffer from industrial pollution or similar problems that render them unsuitable for most uses. Many communities have landfills, and solar PVs can give them value they otherwise would not have.

Problem sites require special expertise. Developers need to be aware of shifting soil at landfills, often complicated by the presence of caps, which are underground barriers that cover the entire landfill to trap methane given off as waste decomposes. Brownfields require an entirely different set of skills, as they have problems that are highly variable from one site to another. Many brownfields have poisoned soils that were rendered toxic by industries that used them in the past.

Encore has had a great deal of experience with solar power. They have completed a number of large-scale PV projects, and have several more underway. One particularly pretty site is the 150 kilowatt (kW) Misty Knoll Farm / Middlebury Foods Co-op system, which was installed in 2011. Encore served as a full-service clean energy development company for the project.

Another more recent development is the Whitcomb Farm Solar system in Essex Junction, Vermont, which was completed in 2014. Encore did work on permitting, engineering, and financing for this system. At 3,600 kW, it is the largest PV system in the state.

Some of Encore's best developments are in its own area, near Burlington, Vermont, and they have been coming at what seems to be increasing speed. Green Energy Times, in its issue of May 2011, covered the installation of 150 kW at the Farm at South Village in South Burlington. This was followed by an impressive array of 376 kW on multiple roofs of the Burlington School District in 2012, for which Encore was the turnkey developer. In 2013, Encore developed and installed a 578 kW array at the Burlington International Airport. Now, Encore is installing a 2,200 kW array on the landfill in South Burlington, with engineering provided by Sanborn Head of Essex Junction, Vermont. These, however, are just some developments in the Burlington area.

Clearly, setting the new focus is not entering into a new line of work, but simply a matter of refining the company's already developed area of greatest expertise.

Website: EncoreRenewableEnergy.com.

Fort Drum Solar *Cont'd from p.12*

personnel. Nearly 3,600 service members transition from Fort Drum each year, and this new program will be available to assist them in their transition to civilian life.

NYSERDA provided support for the program's startup costs, including curriculum development and training for the first 125 veterans to participate in five cohorts of 25. There is no cost for Fort Drum personnel to participate in these first cohorts. Service members may use GI Bill benefits to cover the cost of training after this.

According to the Solar Foundation's Solar Job Census 2014, the solar industry is adding jobs at a rate of more than 20 times faster than the overall economy. Solar employment in New York State grew more than 40% in 2014, adding nearly 2,100 jobs. There currently are 359 solar companies in the State, employing more than 7,000 New Yorkers.

In June, Governor Cuomo announced that from 2011 to 2014, solar grew by more than 300% in New York, twice the national average. The significant increase reflects the mission of Governor Cuomo's Reforming the Energy Vision strategy - which includes the $1 billion NY-Sun Initiative - to build a clean, resilient and affordable energy system for all New Yorkers. In the first two years of NY-Sun, a total of 316 megawatts (MW) of solar electric was installed or is under contract, more than the amount installed in the entire prior decade.

Learn more at www.ny.gov/REV4NY.

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HYDRONIC HEATING

With Renewable Energy Heat Sources

By John Siegenthaler

A high performance system must be integrated using well-matched components. Connecting a high performance heat pump or pellet-fired boiler to a water-based distribution system that was designed and installed 50-plus years ago can be like installing a Ferrari racing engine in your lawn tractor.

Older hydronic distribution systems were usually designed around high supply water temperatures. Residential fin-tube baseboard systems are often supplied with water at over 180 ºF. This does impact efficiency in those systems. In systems using alternative energy sources, the impact can lead to disappointing results.

Trending Downward

The efficiency of hydronic heating systems supplied by either solar collectors or heat pumps is critically dependent on the temperature of the water they must supply. Keeping supply water temperatures under maximum load conditions below 120 ºF is a reasonable design requirement.

Consider a flat plate solar collector gathering heat on a sunny winter day. If the fluid entering a flat plate solar collector is at 90 ºF, the outdoor air temperature is 30 ºF, and the sun is bright, that collector can capture about 56% of the solar energy striking it. However, changing the entering fluid temperature to 160ºF would cut its efficiency to about 33%. Similarly, the efficiency of a typical geothermal heat pump rises about 16% if its output temperature drops from 125 ºF to 105 ºF.

Even modern pellet-fired boilers, which can produce 180 ºF water, work better with low temperature distribution systems. Doing so raises the efficiency of the boiler and allows the use of smaller thermal storage tanks, which are commonly used with pellet-fired boilers, since the radiators will work even as the water temperature in the tank drops.

Unfortunately old habits die hard. Higher water temperatures increase the output of heat emitters, such as radiators and baseboards. Therefore few, cheaper emitters will suffice, which reduces their installation cost. However using high operating temperatures decreases the efficiency of heat sources such as solar panels, heat pumps, and pellet boilers. Fortunately there are heat emitters now available that can operate with cooler water (see figure 1 below).

figure 1

Heating Edge baseboard looks much like other fin-tube baseboard, but inside they are very different. Heating Edge baseboard's fins are about three times larger than those of a traditional baseboard, and two ¾" copper tubes run through those fins. Installed properly, this baseboard can release about 290 Btu/hr/ft using 110 ºF water, as opposed to almost 150 ºF needed for standard fin-tube baseboards.

Radiant Living

Another option is low-temperature radiant panels. By embedding hydronic tubing in floors, walls, and ceilings, comfort can be achieved in efficient homes with water temperatures below 100 ºF, even on a cold New England winter night. At least two inches of extruded polystyrene insulation should be installed under heated slabs. Avoid floor coverings, especially carpets. Slabs with stained surfaces work very well and can be beautiful (see figure 2, to the right).

Heated Walls and Ceilings

Walls and ceilings can serve as radiant heating panels, and are indistinguishable from standard interior surfaces. With little thermal mass they respond quickly to changing demands, which is important in homes with low heat loss or significant internal heat gains (see figure 3, below).

figure 3

The infrared image in figure 4, below, shows a radiant wall in operation, which delivers plenty of heat due to its large surface area. Although it looks "hot," it is just warm to the touch, at 95 ºF.

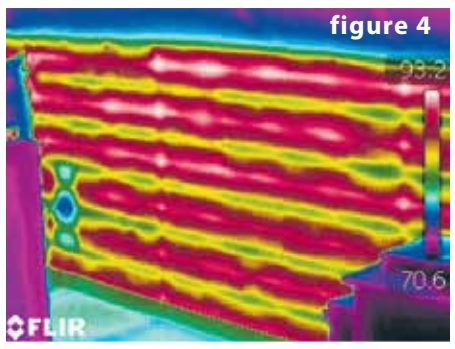


figure 4

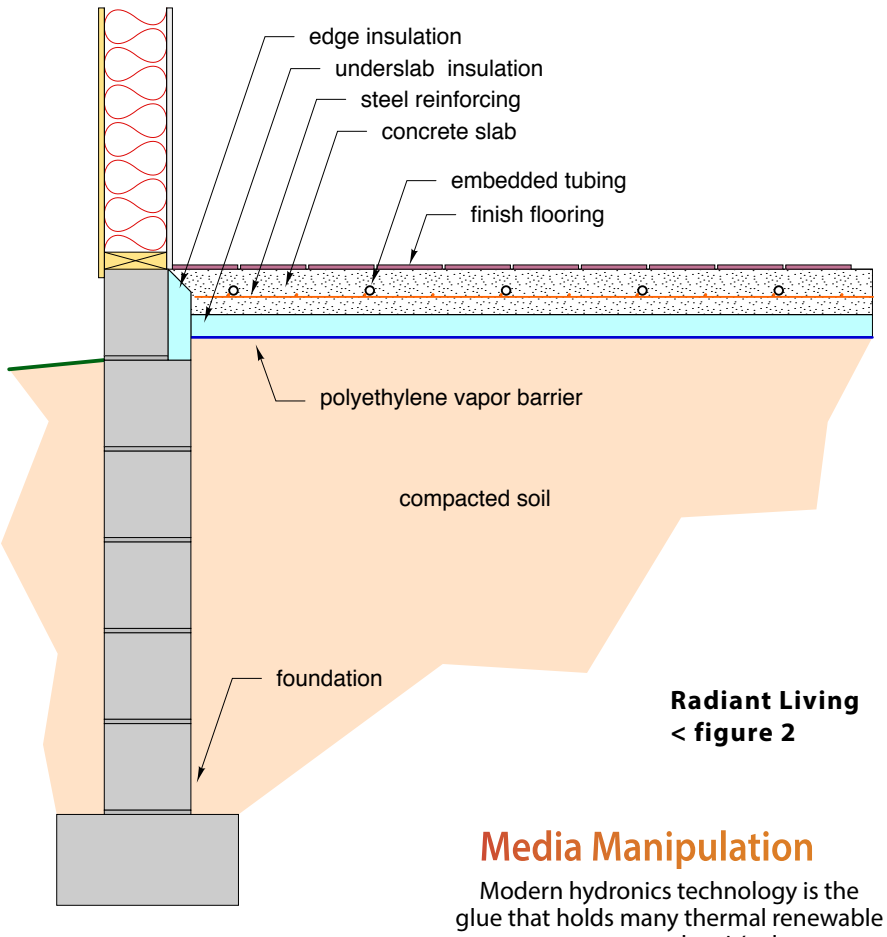
Radiant ceilings use essentially the same construction as radiant walls, attaching to the ceiling framing rather than wall studs.

Panel Pleasantries

Generously sized panel radiators can also provide good low-water-temperature performance. Again, try to size panels to deliver the maximum heat required using supply water at 120ºF or less.

From Here to There

Your hydronic heat source and heat emitter need a distribution system to tie them together. One versatile approach is a "homerun" distribution system. Homerun distribution systems start with a manifold station. Figure 5, to the right, shows a manifold station for radiator panels mounted in an accessible wall cavity, but it could be mounted in any accessible location and used with any type of heat emitter. The supply lines (in red) and return lines (in blue) typically both use ½" PEX tubing. The flexibility of PEX tubing makes routing it easy, which is particularly helpful in retrofit situations.



Radiant Living
< figure 2

Beyond Space Heating

Hydronic systems using renewable heat sources can also provide domestic hot water, and in some cases, space cooling. Systems that use either geothermal water-to-water heat pumps, or air-to-water heat pumps, can produce chilled water in the temperature range of 40 to 60 ºF. This is ideal for summertime cooling. However, hydronic cooling cannot use the same heat emitters that warm the building in winter. Special air handlers are used to control both air temperature and indoor humidity. Figure 6, below, shows a small "high wall" fan coil which cools several hundred square feet.

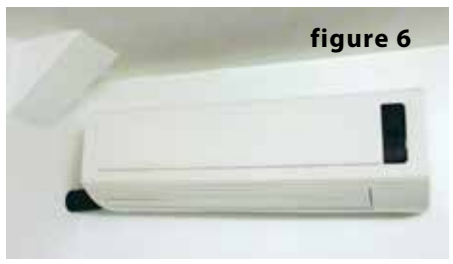


figure 6

Media Manipulation

Modern hydronics technology is the glue that holds many thermal renewable energy systems together. It's also a medium which creative designers can use to create reliable and highly efficient heating systems.

John Siegenthaler, P.E., has over 32 of experience in designing modern hydronic heating systems, including those using renewable energy subsystems. He is a hall-of-fame member of the Radiant Panel Association, and a presenter at national and international conferences on heating and building technology. John is principal of Appropriate Designs, a consulting engineering firm in Holland Patent, NY.

Figure 1: Image courtesy of Smith's Environmental Products.

Figure 5: Image Courtesy of Caleffi No. America.

All other images courtesy of John Siegenthaler

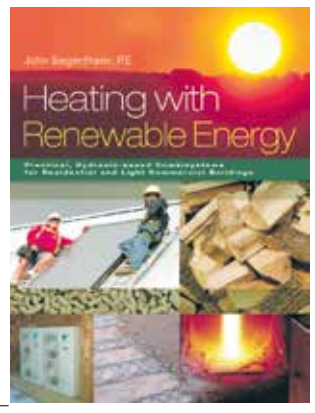


Figure 5 *shows a manifold station for radiator panels mounted in an accessible wall cavity.*

Wind Energy Whispers Ahead

PIKA ENERGY'S T701 WIND TURBINE CERTIFICATION

By George Harvey

Pika Energy's T701 wind turbine has been fully certified to the AWEA 9.1 standard by the Small Wind Certification Council (SWCC). It is the only turbine in its class to achieve full SWCC certification. The T701 is designed to be appropriate for use at such places as residences and businesses in non-urban areas, as well as telecom and other remote sites.

The T701's rated output is 1,500 watts, which is its instantaneous output at 24.6 mph. It starts producing power at wind speeds of 7 mph. A site where the wind averages 11.2 mph should produce about 2,420 kilowatt hours per year. Its survival speed is 148 mph.

A small wind turbine works best in regions with an average wind speed of at least 10 mph at a height of 90 feet above the surrounding landscape. Like most small turbines, the T701 would likely be installed on a guyed tower. This usually requires an area of at least a couple acres. The T701 turbine should be mounted on a Pika Energy-approved tower that it is at least 30 feet higher than any trees and structures within a 300-foot radius.

The rotor diameter is 9.8 feet (3.0 m), and the tower top weight is 93 lbs (42 kg). It can be installed on a tower hinged at the tower base to be raised and lowered. The unit does not need regularly scheduled maintenance, though it might require replacement bearings in ten years, and it is wise to check the blades. Guy wire tension should be checked annually. The T701 is designed to last twenty years or more.

Power from the turbine is fed to an inverter fed by a 12-gauge wire over distances as great as a quarter mile. Line loss is kept to 2% at such distance because of the unit's 380 volt output. Pika Energy has a wide variety of equipment supporting the wind turbine, solar panels, and other energy systems. Combined, they can form a really versatile and resilient micro-grid.

The T701 is very quiet. It was certified by the SWCC to produce 38.3 decibels (dB) at the standard distance for small turbines of 200 feet from the rotor (consequently somewhat less than 200 feet from the base of the tower). This is somewhat softer than a quiet library (40 dB) and much softer than conversational speech (60 dB).

The basic components of the T701's system include an inverter for grid-tied systems, or a charge controller for off-grid systems, and whichever is needed comes with the turbine. These system components require an expense of about $6,000. The tower and installation are additional, as they depend on the nature of the site. The turbine and inverter are warranted for five years, and an extended warranty is available. The system is eligible currently for the 30% Federal Income Tax Credit.

The T701 is manufactured in the United States. Pika Energy is located in Westbrook, Maine. The website is www.pika-energy.com. The phone number is (207) 887-9105.

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Wind Power Continues To Power America

Strong Growth from 2009 to 2016 and Projections to 2025

During President Obama's State of the Union address on January 12, 2016, he stated, "Seven years ago, we made the single biggest investment in clean energy in our history." He went on, "Here are the results. In fields from Iowa to Texas, wind power is now cheaper than dirtier, conventional power."

It's true. American wind power has more than tripled in size and costs one-third as much as it did than when the president took office in 2009. By consistently making your voices heard, U.S. wind energy is stronger now than it's ever been.

Wind is powering nearly 5% of our country's electricity today, and AWEA's goal is to double that number in the next four years.

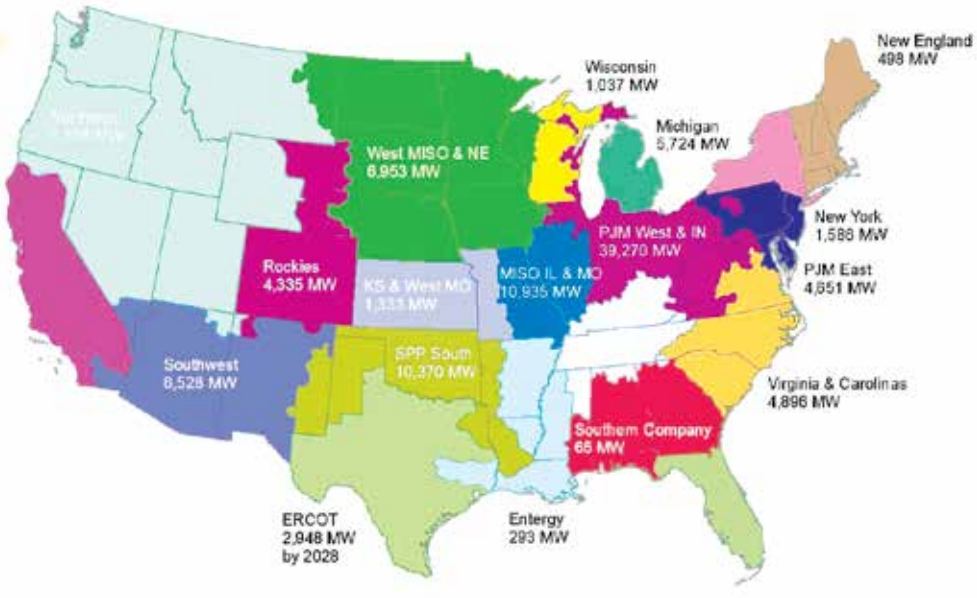
At the start of 2016, Tom Kiernan, CEO of American Wind Energy Association (AWEA) listed the top five things Americans should know about wind power, in his blog.

- With over 70 gigawatts (GW) of installed capacity, there's more than three times as much wind power in the U.S. as there was in 2009. To put that into context, that's enough energy to power 19 million American homes with low-cost electricity each year.
- Wind is also 66% less expensive than it was when President Obama took office. This cost-cutting was possible because of technological advancements spurred by American ingenuity and improvements in domestic manufacturing.
- Building U.S. wind farms has built a brand new domestic manufacturing supply chain in the U.S., spurring well-paying jobs in all 50 states. That includes over 500 factories in 43 states building wind turbine parts and supplies. The U.S. Department of Labor recently identified wind turbine technician jobs as the fastest growing occupation in the country, while the Department of Energy's Wind Vision report says wind could support 380,000 jobs by 2030.
- Wind energy is the biggest, fastest, cheapest way for states to cut carbon pollution and comply with the Clean Power Plan. It already eliminates carbon emissions from the equivalent of 26 million cars. The Energy Information Administration found that wind could generate 57% of the new energy needed to comply with the plan under the lowest-cost scenario.
- New customers are helping fuel wind's growth. Major companies and entire cities are recognizing that wind power helps them save money while also achieving their sustainability goals. Google, Amazon and Procter & Gamble all recently made large wind energy purchases, while cities from San Diego to Washington, D.C. are increasing their share of renewable energy. They appreciate the protection from price spikes in the cost of conventional fuels.

Source: Power of Wind, AWEA. http://www.powerofwind.org. Read more at www.awea.com.

Links: http://bit.ly/70GW-Wind; http://bit.ly/66-percent; http://bit.ly/wind-tech-jobs; http://bit.ly/DOE-Wind-Report; http://bit.ly/57-percent; http://bit.ly/Cities4Renewables.

EIA Projection for Additional Wind Build by 2025



EIA Projection for Additional Wind Build by 2025 under Clean Power Plan (CPP) Scenario, by Region. New England: 498 MW. New York: 1,586 MW.

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

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- 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

- $0.40 per kWh/year for residential and commercial customers
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***special customer category limited to municipalities, non-profit housing authorities, public schools., and non-profit hospitals and health care centers. All incentives are subject to availability and may change.*

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- 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)

Due to exceptional program participation in 2015, Efficiency Vermont has made several changes to LED lamp rebates effective October 1, 2015, with the following program impacts:

- SMARTLIGHT discounted replacement lamp program:
- • LED R/BR/PAR 38, 40 premium rebate decreased from $25 to $17
- • LED R/BR/PAR/MR 16, 20, 30 premium rebate decreased from $17 to $11
- • Globe, A, Candle/Decorative premium rebate decreased from $10 to $6
- In addition, the standard rebate levels for each of the product categories above have also decreased. All program updates are published at efficiencyvermont.com/SMARTLIGHT.
- Other lighting programs:
- • LED rebates at retail locations have decreased in alignment with the schedule above
- • All specialty/directional CFL promotions have been discontinued at retail locations
- • Most standard CFL retail promotions have been discontinued at retail locations

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

Heating/Cooling

- heating systems - see 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 – 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

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

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Public Utilities Commission

Commercial Solar Rebate Program

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 = $0.75/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 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).

Category 2 is closed.

Contact Elizabeth.Nixon@puc.nh.gov

PLEASE NOTE: The program is under review to determine if any changes should be made. For Info contact executivedirector@puc.nh.gov.

For C&I solar program details, go to: http://bit.ly/NHPUC-re-Rebates

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.

Contact jon.osgood@puc.nh.gov

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).

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

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

2. $0.50 per watt up to the lesser of 15% of installed cost or $20,000

Commercial Fossil Fuel Program

3. 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.

Heat Pump Water Heaters

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

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 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

MA State incentives link is: http://www.masscec.com/get-clean-energy

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/nysuniniitiative/dashboard.aspx

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ATTENTION: WELL DRILLERS, GEODESIGNERS, ENGINEERS

You are invited to participate in a Green Mountain Power Co. CEED grant to construct a number of **5 Ton sealed no-bleed Standing Column Geothermal Supply Wells.** These wells are to be drilled in the former CVPSC territory.

The purpose of these wells is to provide an alternative to a standard Standing Column Geothermal Supply Well when any of the following conditions occur:

- Low static – pumping penalty.
- Low yield – insufficient yield for a bleed.
- Poor quality ground water – may cause deposits on heat exchanger or acidity or salt water may shorten life of pump.
- Contaminated ground water – may not return water to the well. UIC rule.
- Sediment – may plug heat exchanger or cause excessive wear.
- Bleed water – no place to recycle or dispose of bleed water.

The CEED grant will provide the following:

- $4,700 per well toward deepening a standard Standing Column Geothermal Supply Well to provide sufficient depth for a no bleed wetted column. To seal this well bore against incoming water and to allow the sealed no-bleed Standing Column Well to maintain a high static.
- $1,000 per well for the well driller to develop sealing methods, to document the work performed, and to potentially participate in reporting the work performed.

If you are interested in participating, please contact James Ashley of Green Mountain Geothermal, LLC at 802.684.3491 or jashley@vermontgeo.com

Froling is Poised for Expansion

By George Harvey

Truck being filled with Precision Dry Chips (PDCs). Courtesy photo.

Froling Energy is working on a million-dollar expansion of its Peterborough, New Hampshire, facilities to meet a growing demand for dry wood chips.

The wood chips are marketed as Precision Dry Chips, or PDCs. The PDCs are sized by screening to exclude any that are oversized and could clog boiler feeding systems. They are also precision-dried to moisture contents of 25% to 30%. The name indicates to buyers a level of quality control.

The current production of wood chips is 1,500 to 2,000 tons per year. With the upgrade, the facility could process 10,000 tons or more.

The PDCs can be burned in dual-fuel boilers which can also burn pellets. These boilers are used in commercial buildings, schools, and other large buildings, including churches. They will be marketed to users within fifty miles of the Froling facility, of which there are potentially many.

Jim Van Valkenburgh, vice president of sales and marketing at Froling Energy explained, "The concept of a dry wood chip is common in Austria and other northern European nations, but not here." Viessmann and larger Froling biomass boilers were originally designed to burn them.

The company's president, Mark Froling, believes that by making PDCs easily available to customers, it will be easier to sell dual-fuel boilers, which he believes could be more important in the company's product line than pellet boilers.

PDCs have the advantage of being inexpensive. They can compete successfully with oil, even with the current low oil prices. Their selling price is the equivalent of $1.50 per gallon for oil. Nevertheless, the boilers are large and are ideal in places where annual consumption would exceed 20,000 gallons of oil.

After developing a wood pellet company, Mark Froling had been a general contractor. He became a mechanical contractor so he could install large boilers as the demand for them increased. Fluctuations in the price of oil meant his business had to develop a new competitive ability, and it was for that reason that they started selling dual-fuel boilers. People would switch away from oil only if there was a savings involved, according to Froling.

The ability to use precision dry wood chips was hampered by a lack of widespread availability. It was for this reason that Froling began manufacturing PDCs.

The wood for the PDCs is grown locally, and it is sustainably harvested. Since they are made locally, they do not require much fossil fuel for transportation to customers. Wood is regarded as a renewable resource in New Hampshire, so Froling's customers may qualify to receive thermal Renewable Energy Credits (RECs), which they can sell for a substantial return.

The New Hampshire Public Utility Commission is considering grants from a fund of $750,000 for furthering development of RECs in the state. Froling hopes for a grant of $300,000 from this fund. The grants are to be awarded early this year.

Woodstoves, Emissions & the Environment

Heating with Wood and the Environment

When oil, gas, and coal are burned, the carbon they contain is oxidized to carbon dioxide (CO_2), the main greenhouse gas. In effect, the combustion of fossil fuels releases ancient carbon (carbon that has been buried within the earth for thousands of years), thereby increasing the atmospheric concentration of carbon dioxide (CO_2). In comparison, wood combustion can be considered carbon neutral because trees absorb CO_2 as they grow. This process is called carbon sequestration.

Approximately one ton of carbon is sequestered for each cubic meter of wood. When trees mature, die, fall in the forest and decompose, the same amount of carbon is emitted as would be released if they were burned for heat. This cycle can be repeated forever without increasing atmospheric carbon. A healthy forest is not a museum, but a living community of plants and animals. When trees are used for energy, a part of the forests carbon "bank" is diverted from the natural decay and forest cycle into our homes to heat them. When we heat with wood, we are simply tapping into the natural carbon cycle in which CO_2 flows from the atmosphere to the forest and back. The key to ecologically sound and sustainable wood energy use is to ensure that the forest remains healthy, maintains a stable level of variously aged trees and provides a good habitat for a diversity of other species, both plants and animals. Ensuring there is a healthy fuelwood market is key to a sustainable forestry plan. Landowners have more incentive to remove low value trees and manage their forests sustainably knowing there is a market for this low value material

The combustion of wood produces small particles that are called PM2.5. Those particles are 30 times smaller than a human hair. They can aggravate certain lung and heart diseases and have been linked with health problems such as asthma. Sources of PM2.5 include combustion under various forms, such as the one used for cars and trucks, wood heating, as well are other industrial processes.

While it is true that old technology like open fireplaces and simple heaters could not burn the wood completely, the new generation of wood-burning appliances are designed to burn particles. They produce almost no visible smoke. The wood-heating industry has evolved. The vast majority of appliances sold on the market now meet the particles emissions limits set by the US Environmental Protection Agency (EPA).

Jotul Oslo stove installed in Vermont. Photo courtesy of Friends of the Sun, Brattleboro, VT.

The EPA limits emissions of certified wood heating appliances to no more than 4.5 grams per hour. In comparison, older conventional wood stoves average 40 grams per hour.

Wood, when burned in an appliance that has been tested to the EPA standards, emits up to 90% less particles. It is a clean, renewable energy source. Furthermore, the reduction in fuelwood consumption reaches up to 33% when advanced wood combustion systems are used. This is because certified wood stoves and fireplaces are 60% to 80% efficient, compared with 40% to 60% for conventional units.

As for appliances burning wood pellets, they have amongst the lowest particulate emissions of all solid-fuel burning appliances. They are manufactured from waste products and other renewable resources right here in North America. They represent a huge source of heating fuel from material that would otherwise be sent to landfills.

Wood Stoves - Old & New

Out of an estimated 12 million wood stoves in the United States, 9 million are antiquated, and belch out more 3 times more dangerous soot particles than new, EPA-approved stoves while wasting vast quantities of wood because they are so woefully inefficient. We need to take a look at what's blasting out of our own personal smokestacks. If you have an old stove (pre-1991), or one that is not EPA-certified, we urge you to go the EPA's Burn Wise site (below) to find out more and to take action.

John Ackerly of the Alliance for Green Heat confirms EPA's findings by citing actual experience with new stoves: "Many people report using one-third to one-half less wood after switching to a modern stove, while reducing the discharge of CO_2 as well as pollutants such as particulates and volatile gases. I would hope a group like the Sierra Club might encourage or educate its members about the benefits of heating with a modern EPA stove vs. the older stoves."

Tax Credit for Wood or Pellet Stoves

The federal tax credit for purchasing a qualified 75% efficient wood or pellet stove has been extended through to December 31, 2016. The credit covers 10% of the purchase and

Cont'd on p. 24

Partial List of Low-emission EPA Certified Wood Stoves

Manufacturer	Model(s)	Emission Rate G/Hr	Heat Output	EPA Measured Efficiency (CSA B415.1)
Hearth and Home	PH35PS, PP60	0.28	9600-25000	Pellet
Hearth and Home	E2	0.50	13900-42200	Pellet
Hearth and Home	Accentra-2	0.62	6253-25210	71 (Pellet)
Jotul North America	F45	2.3	11600-26500	74
Jotul North America	F370	2.6	11000-29000	66
Jotul North America	50TL	2.8	11700-33000	72
Sherwood Industries Enviro	M55, M55C, & VF55	1.0	9300-45500	Pellet
Vermont Castings	Defiant Encore	0.60	6200-32900	Catalytic
Vermont Castings	Encore 1450 N/C	0.70	10600-24000	Non Catalytic
Vermont Castings	Defiant 1910 & 1945	0.80	10600-44400	Catalytic
Woodstock Soapstone	Hybrid 210	1.0	12300-57000	82

Many EPA certified wood heaters with the lowest emissions that are acceptable for our environment are available locally. This table just a sampling of stoves, based on the lowest emissions and local availability. A full list of EPA certified wood and pellet stoves can be found at http://bit.ly/EPA-stoves.

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Forest Biomass, Energy, and the Environment : a Complex Topic!

By George Harvey

The question of the sustainability of forest biomass is perplexing, especially in the northeast, where it is used for much of our heating. There has long been the assumption that forest biomass is carbon neutral, because the carbon atoms in it were recently taken from the atmosphere, and the trees cut would be replaced by fresh growth, which would also take carbon from the air.

This idea has been challenged in recent years for a number of reasons. Questions arise about the amount of carbon in the soil, the amount of carbon emitted in fossil fuels harvesting and transporting wood, how clean-burning wood is, and more. These questions were amplified by a statement from the White House and a report by the Manomet Center commissioned by the Massachusetts Department of Energy Resources. While both of these sources appear to be clear, appearances can be deceptive.

The White House statement related to a bill, HR 2822, before the House of Representatives, which defined "biomass" as carbon-neutral. The statement from the White House said, in part, "The Administration objects to the bill's representation of forest biomass as categorically 'carbon-neutral.'" We should note that this statement cannot be properly understood without taking into account the word "categorically." What is being said should not be represented as "Biomass is not carbon-neutral," which it was by many who commented on it. A sentence with a much closer meaning would be, "The fact that it is biomass does not automatically mean that burning it is carbon-neutral."

The report from the Manomet Center was similarly misconstrued by some in the media. Part of the problem with it is that it was rather

Painting courtesy of Peter Hontoon. A Day in Vermont: Enchanted Forest . www.adayinvermont.com

narrowly focused in a way that reflected some current realities, in terms of wood harvest and use, but reflected neither all currently available methods nor all foreseeable systems. The study might have been good as far as it went, but to consider it definitive for all forms of biomass development and use is a big mistake.

Addressing this issue, Andrew Perchlik, the Director of the Vermont Clean Energy Development Fund (CEDF) said in an email, "The CEDF believes that wood can be used as a carbon neutral heating fuel if harvested and burned with practices that are based on carbon neutrality as the goal. This requires harvesting wood used for energy locally and following certain harvesting principles. It also requires burning the wood as efficiently as possible, which to the CEDF, means only using it for heat or [combined heat and power primarily for heat]."

He continued, "The CEDF believes that by engaging the wood heat industry and stakeholders through collaboration as well as with market incentives it can have the greatest impact on securing a carbon neutral or carbon positive wood energy future.

"It's important to realize that the White House/EPA position is focused on (and is largely a response to) using wood for electric power in inefficient power plants. This was also the focus of the [Manomet Center] study. I don't think we should use any wood for power if it can't reach the high efficiency levels of using it for space heating (>85%) as a fossil fuel substitute."

The bottom line here is that while it is certainly possible to grow, harvest, transport, and use biomass in such a way that it is very dirty, it is also possible to do so in such a way as to be both very clean and carbon-neutral. Clear-cutting an old-growth forest so it can be pelletized, shipped overseas, and burned to make electricity is very different from sustainably growing and harvesting biomass and using it locally in a very clean and efficient energy system. Such a system could be a large, utility-scale installation, but it could also be a really good, efficient home wood stove.

We should mention other emissions from burning wood. Particulates are especially damaging to health but are nearly eliminated in modern, EPA-approved equipment that is properly run. Older stoves are heavy polluters, and this is especially true of the so-called air-tight stoves of the 1970s and 1980s. The EPA advises that these stoves be replaced. If in doubt, check the smoke. It should never be black.

Those who are engaged in the science and ecology of biomass include many who consider these matters, and there is much science that may be developed. It will be interesting to see what they can do in the future.

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BuildingEnergy Boston 2016

March 8-10, 2016 · Conference Highlights

By Matt Root, CLEAResult

BuildingEnergy Boston has the reputation of being a residentially focused conference and trade show. Given NESEA's roots of solar installers and single family home builders this image is understandable. However, it has long since expanded to include larger buildings and systems, or, as one session this year puts it, projects that are "bigger than a breadbox." Attending this conference has become a critical experience for commercial and institutional professionals committed to improving the end product they deliver.

One of the greatest draws is the community. I do not emphasize this aspect in a Kumbaya way. I use the word in the context of a professional network that is committed to excellence. No single person can know everything that must be done to make a job successful. We all need trustworthy partners with different skill sets who are committed to building better buildings. That community is at BuildingEnergy Boston, and it grows incredibly over the course of the three days.

The name of the conference may be BuildingEnergy Boston, but it is about so much more than just buildings. Attendees will also learn how to build stronger communities, plan for future disruptions, and understand the concept of resiliency through a number of highly-anticipated sessions.

- "Cradle to Grave: The Concealed Energy, Carbon and Water Impact of Buildings" will explore the great opportunity to improve sustainability by expanding our lens beyond operational consumption and looking at building life cycles: material production, transport, construction waste, maintenance, and disposal.
- "Buildings Are Not Enough: An Introduction to High-Performance Cities and the Next Step" is a session that will expand our thinking beyond the lot line. Buildings work in the context of a network and this session will go beyond "high-performance buildings" to "high-performance municipalities."
- "Mainstreaming Resilience: Making Resilient Design Part Standard Practice" will focus on resilient design in building codes, zoning bylaws, and voluntary building rating systems.
- Net Zero Energy (NZE) is also a hot topic, and as a general concept seems relatively easy. But if it were that easy, everyone would be doing it. Multiple sessions this year are addressing NZE in commercial buildings. I am excited about these sessions because they are delivered by practitioners struggling with the same issues I am struggling with in my projects:
- "The Challenges of Net Zero Energy When It's Bigger than a Breadbox" will employ a case study of a 190,000 square foot public school to explore what worked, what didn't, and why.
- "Getting to Zero: User Engagement in Achieving Net Zero Energy Buildings" will address how design teams can include occupants to drive down energy consumption and support the NZE target.
- "Aiming at Zero: The Struggle to Get There" will focus on process and an iterative planning and design approach applied at two academic institution projects.
- "Instructions NOT Included: lessons learned operating zero net energy" will use real data from measurement and verification reports on a NZE bank branch to show how to create a highly functional facility management partnership.

A key attribute of all these sessions is that BuildingEnergy Boston speakers know the details and share their failures, and successes. We learn best from mistakes and from those who have already gone through the growth of a hard lesson so that others don't have to. There is a lot of great commercial and institutional content delivered by leading experts who share with refreshing honesty so that all in the field might improve.

I hope to see you at BuildingEnergy Boston, March 8-10 (or at BuildingEnergy NYC in the fall).

John Abrams, CEO of South Mountain Company, speaking at BE15.

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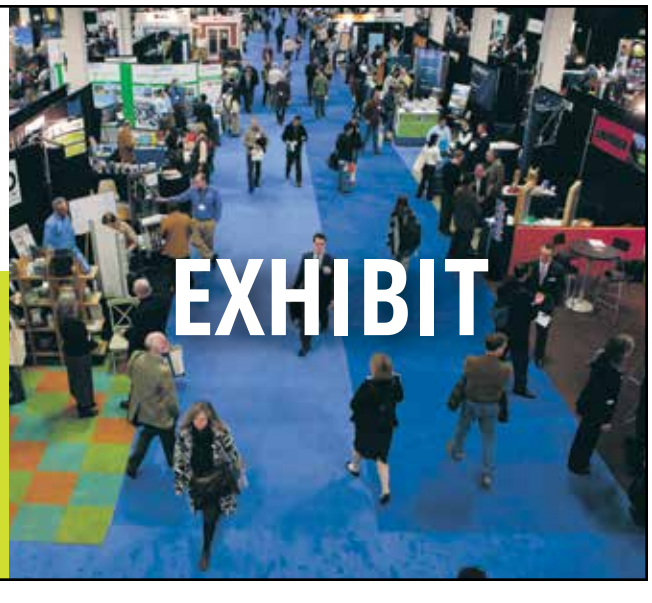


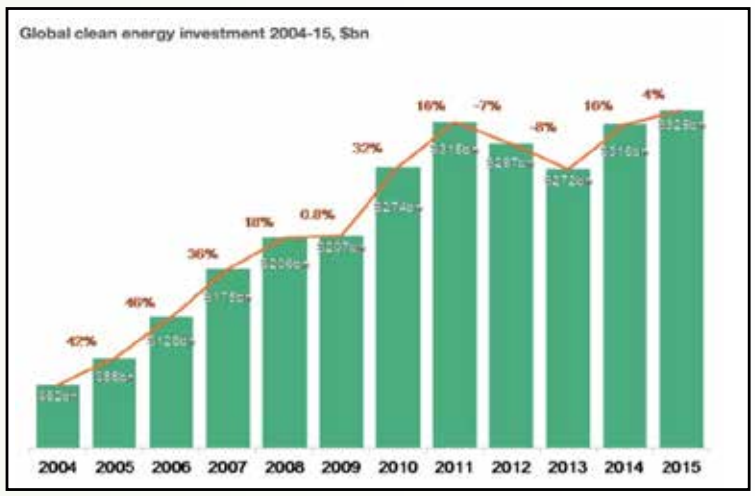
Renewables Saw More Money Invested and Capacity Added in 2015 than Ever Before

By Cole Mellino. Reposted with permission from EcoWatch.

As oil prices continue to drop, renewable energy[1] brought in a record $329.3 billion of investment last year, according to data[2] released today from Bloomberg New Energy Finance (BNEF).

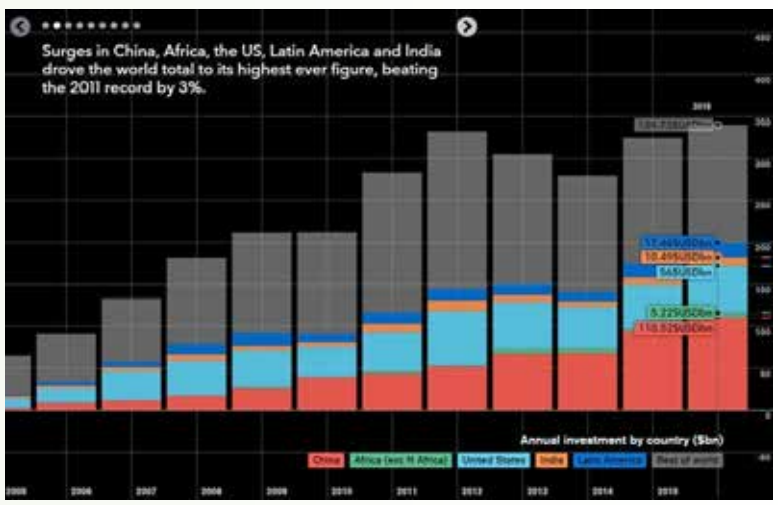
Spending on clean energy technology increased 4% from 2014, due to tumbling prices for photovoltaics and wind turbines, as well as large investments in offshore wind farms[3]. According to BNEF, renewable energy installation in 2015 was up 30% compared to the same period in 2014, setting a record for the most installation of renewable power capacity in a year. Globally, wind[4] and solar[5] made up half of all new generation technologies, including fossil fuels. Around 64 gigawatts of wind capacity and 57 gigawatts of solar were commissioned.

"These figures are a stunning riposte to all those who expected clean energy investment to stall on falling oil and gas prices," Michael Liebreich, chairman of the advisory board for BNEF, said[6]. "They highlight the improving cost-competitiveness of solar and wind power.



2015 set a record for renewable energy investments. Credit: Bloomberg New Energy Finance

Emerging markets saw substantial increases in renewable energy investments. China remained the largest market, increasing investment 17% to $110.5 billion. That's nearly double the $56 billion invested by the U.S., which came in second in BNEF's rankings. India increased its investment by 23% to $10.9 billion. New markets such as Mexico, Chile and South Africa attracted tens of billions of dollars. Brazil was an outlier, where investments dropped 10% to $7.5 billion.



In contrast to emerging markets, Europe saw investments in renewable energy fall 18% to $58.5 billion in 2015, its lowest figure since 2006. Germany and France saw investment levels fall by 42 and 53%, respectively. The UK, however, bucked Europe's overall trend, with investments growing 24% due, in part, to large offshore wind developments, such as the 580 megawatt Race Bank wind farm in the North Sea.

The 2015 renewable energy installation record is "all the more remarkable as cost-competitiveness improvements in solar and wind power mean that more megawatts can be installed for the same price," the report explains.

"Wind and solar power are now being adopted in many developing countries as a natural and substantial part of the generation mix," Liebreich said. "They can be produced more cheaply than often high wholesale power prices. They reduce a country's exposure to expected fossil fuel prices. And above all, they can be built very quickly to meet unfulfilled demand for electricity."

"And it is very hard to see these trends going backwards, in the light of December's Paris Climate Agreement[7]," Liebreich added.

The boom in clean energy investment, as BNEF explains, comes in spite of the low price in fossil fuels[8], which some analysts predicted would restrain investment in renewables.

"Over the past 18 months the price of Brent crude has dropped 67% to below $40 per barrel, while the price of natural gas in the U.S. fell 48% and the price of international steam coal dropped 35% in Europe," BusinessGreen[9] said. On Tuesday, the price of crude in the West Texas Intermediate[10] briefly dropped below $30 a barrel[11] for the first time in 12 years.

Despite low oil prices, renewables saw record investments in 2015. Credit: Bloomberg

Cole Mellino writes for EcoWatch.EcoWatch, http://ecowatch.com/

Source: EcoWatch, http://bit.ly/ecowatch-invest-re-2015

Footnotes:

1. *http://bit.ly/ecowatch-renewables*
2. *http://bit.ly/bloomberg-clean-energy*
3. *http://bit.ly/ecowatch-offshore*
4. *ecowatch.com/?s=wind*
5. *ecowatch.com/?s=solar*
6. *http://bit.ly/bloomberg-renewables-vs-oil*
7. *http://bit.ly/ecowatch-paris*
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Appraising High Performance Homes

To Meet Today's Energy Codes

By Jeffrey Gephart

Appraising High Performance Homes. I speak daily with Vermont builders, architects, home buyers, and do-it-yourselfers who are building new homes. Awareness is growing that net-zero-energy homes, homes that produce as much energy as they consume, are now attainable across all home types. Home performance contractors and owners of existing homes are making comfort, durability, indoor air quality, and energy efficiency improvements too. Newly constructed and renovated homes in Vermont and New Hampshire built to comply with today's energy codes are 33 to 40% more energy efficient than homes built to code a decade ago.

We can achieve comfort, durability, and super energy efficiency with certainty. What is not certain is whether these benefits will contribute real estate value.

Why? If an appraisal is required, market evidence that energy efficiency is valued must be documented. I'm oversimplifying greatly; however, appraisers analyze the recent history of comparable home sales. If your net-zero-energy home is the first, where is the comparable sale? High performance homes are complex appraisal assignments.

High-performance homes have unique features compared to traditional homes.

ack of data makes finding comparable home sales and supporting adjustments challenging.

Without knowledge of high performance home construction methods and their benefits to the owner, it is difficult for appraisers to appraise this specialized property type.

The Appraisal Institute's (AI) Valuation of Sustainable Buildings Professional Development Program and Registry1 provides appraisers with tools and knowledge. AI's Registries provide lenders a source of competent appraisers (six VT appraisers in the Residential and five in the Commercial Registry now, plus an appraiser in both NH Registries working in northeastern Vermont).

How should you document high performance homes or features for appraisal? Build new or weatherize existing homes with Efficiency Vermont2, NHSaves3, and partnering utility and state programs. You get expert guidance, potential for financial incentives, and important home performance documentation that a trained appraiser needs. That data should be entered on the AI's Residential Green and Energy Efficient Addendum4 (the "Addendum").

The Addendum, a tool that enables builders or other parties to provide energy efficiency and renewable energy data to Realtors®, lenders, and appraisers. Homes engaged in new construction and weatherization programs through Efficiency Vermont, NH Saves, state weatherization agencies, utilities, and area non-profits have access to much of the energy data needed to populate the Addendum. The Addendum also provides notification of a complex appraisal assignment needing a competent appraiser.

Appraisal standards require that an appraiser must: be competent to perform the assignment; acquire the necessary competency to perform the assignment; or, decline or withdraw from the assignment (Fannie Mae, Freddie Mac, and FHA require that appraisers be competent or decline the assignment). Among other things, competency requires familiarity with a specific type of property.

Builders, brokers, agents, and sellers can talk with, provide documents, and accompany an appraiser on the inspection. Appraisers cannot be pressured to arrive at a value conclusion or to omit important facts by loan officers or others.

When scheduling an appraisal ask about the appraiser's experience with high performance homes. If their competence is questionable--call the lender as they are the appraiser's client. Challenges to an appraisal must be in writing, based on error of fact(s), omission(s), or inconsistencies, and addressed in a timely manner with the lender.

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Chicago area Realtor® Laura Reedy Stukel, delivers an inspiring keynote presentation to 225 realtors, lenders, appraisers, builders, and home performance contractors from VT and NH at the Green Real Estate Symposium at the Lake Morey Resort in Fairlee, VT last October.

The Vermont Green Home Alliance (VGHA), a group of building, finance, appraisal, and real estate trade associations and businesses will be distributing a new publication from AI and the Building Codes Assistance Project. Contractors, appraisers, lenders, and Realtors®, look for Appraised Value & Energy Efficiency: Getting it Right5.

In late October, 2015, the VGHA with collaborators in NH held the Green Real Estate Symposium6: Appraising, Selling, and Financing Buildings with Energy Efficient and Renewable Energy Features attended by 225 Realtors®, appraisers, lenders, MLS, builders, and energy specialists. Attendees learned that our MLS serving VT and NH, the New England Real Estate Network, now has data on Home Energy Rating Scores and 3rd party verified building certifications (e.g., ENERGY STAR Home, Passive House, LEED for Homes, National Green Building Standard). Efficiency Vermont will soon pilot the Vermont Home Energy Profile to assist existing homeowners to voluntarily share energy information when they sell. The VGHA is seeking to enable automated population (electronic transfer) of high performance home information into our MLS, and to expand the continuing education opportunities and home performance knowledge of real estate professionals. The goal is market transformation, so that all can identify and accurately value energy efficiency and renewable energy benefits.

The author, Jeffrey Gephart, works with Efficiency Vermont and supports the VGHA.

Links:

1. *http://bit.ly/appraisal-institute*
2. *https://www.efficiencyvermont.com/*
3. *http://www.nhsaves.com/*
4. *http://bit.ly/1VQlUzA-report-addendum*
5. *http://bit.ly/1NSnRGV_getting_it_right*

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Renewable Energy, Efficiency, and Insurance

By George Harvey

Solar PV on the roof of a house near Boston, MA. Photo by Gray Watson, Wikimedia.

A renewable energy project can cost a lot of money, and it is important that it be properly insured. The same is true of an efficiency project. Doing either can increase the value of a home or business, and it is best to consult the insurance company on coverage.

An insurance company has to be able to know exactly what it is insuring. This means that the company has to be informed of any a substantial change to a property. It will sometimes require a policy change to cover the change explicitly. Sometimes, it will require a new appraisal. At the opposite end of the spectrum is a small addition that is simply covered, provided it is documented. All of this is, of course, subject to the actual terms of the policy.

One example of an installation that only needs to be documented is a small efficiency addition, such as a window-mounted heat pump. Such an appliance might cost less than $2000, and could be covered by a homeowner's policy. The question of whether it is covered or not will depend on the policy, and it is always best to check with the insurance agent instead of guessing.

A more substantial addition might come in the form of a solar installation on the roof or a ground-mounted solar system. In either of these cases, the value of the property may or may not change, depending on a variety of circumstances. For example, a leased system might not need to be covered, as it is not part of the property until actually purchased. By contrast a purchased system would probably change the value of the property, and this would imply that the policy should be at least updated.

An efficiency project might also change the value of a house, and in some cases could increase it greatly. A badly insulated house that has old, inefficient windows and an obsolete heating system would have a market value well below one that is up to date. The money spent on a deep energy retrofit for such a building could turn it into a very efficient and comfortable home, and that investment should certainly be protected. Again, the policy will have to be updated or the insurance will only cover the house as it used to be, before the change.

Some systems are special cases. If a group of neighbors decide to put up a common solar array in someone's back yard, it should definitely be insured. While professional developers of community systems generally have a pretty good idea of how to deal with such systems, it could be forgotten in a small system.

This brings us to a question of how to get insurance. In all cases, coverage is most likely to be better and premiums lower when the insurance agent is familiar with renewable energy and household efficiency, and is able to help find the best policy.

The bottom line is, when in doubt, check.

Renewable Energy Advancements: 2015

By George Harvey

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

Over 64% of all new electricity-generating capacity added in the United States in 2016 was renewable, according to the Federal Energy Regulatory Commission. This is up from 50% in 2014. The agency only counts utility-scale installations, so new small solar capacity, roughly half of the total for solar, was not counted, and with it, the renewable capacity could be over 69%,

One renewable energy story came from New Hampshire. At the beginning of 2015, it had only ten megawatts (MW) of solar capacity. A large 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 financial 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 for the purpose of gas extraction. 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.

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 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 GrandyOats.

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 year in 2016.

Vermont: #3 for Solar Jobs* in USA

Solar Foundation Jobs Report Positively Impacts State

Green Mountain Power issued the following statement from President and CEO Mary Powell about the Solar Foundation Jobs Report. The report released by the national non-profit found Vermont to be #3 in solar jobs *per capita in the country. Mary Powell serves on the national Solar Foundation Board of Directors.

"The Solar Foundation Jobs Report is great news for Vermont and demonstrates the positive economic impact the solar energy industry is having on our state.

"It is so heartening to see new companies grow and thrive here because of this industry. From contractors and energy auditors to solar installers, we are leading the nation in transforming how energy is generated and used.

"This report marks the third year in a row Vermont has ranked in the top three for local solar jobs. As Vermont's Energy Company of the Future, Green Mountain Power is committed to continuing the important work we are doing to empower customers to save money, use less energy and reduce our impact on the planet. Working together we can achieve a bright energy future."

The full Solar Foundation Jobs Report can found here: http://www.thesolarfoundation.org/fact-sheet-state-solar-jobs-census-2015/.

GMP website: greenmountainpower.com

Bipartisan elected leaders from across NH call for Net Metering cap increase, improved legislation

On Friday, February 12, a bi-partisan group of elected leaders from around New Hampshire, including Representatives, Senators and local executive officials went to the Legislative Office Building in Concord, NH to urge lawmakers to lift NH's cap on net metering and to make improvements to the existing legislation that is before them to ensure that the renewable energy market does not come to a halt. Business leaders, town officials, and others will be on hand to discuss the importance of net metering to all Granite Staters and to testify on HB 1116 later that same morning (10:00am) in the House of Representatives.

Background:

Net metering is a critical tool that enables onsite, renewable energy generation for individuals, businesses, and municipalities to generate electricity and get fairly compensated for the power they contribute to the grid. NH's arbitrary cap on net metering was set 17 years ago, and in 2016 all utilities in NH have reached their cap except Unitil, who is very close behind.

Legislation to lift the cap, including SB333 and HB1116, are important and well-intentioned efforts to do so, but since their initial crafting it has become crystal clear that raising the cap by only 25 Megawatts will be insufficient over the course of the year to keep businesses and consumers able to continue to choose onsite, renewable self-generation with transparency and market stability.

The recently released 2015 Solar Jobs Census (www.thesolarfoundation.org/solar-jobs-census/states/) found that New Hampshire has well-over 700 jobs in the solar sector, and is growing quickly. Most of these jobs are from project installations, and many of which are threatened if a viable net metering program does not continue. As Kim Quirk, owner of the Energy Emporium in Enfield puts it, "We can't grow or sustain a business with such inconsistent [policies]. Net metering is a huge piece of the benefit for home owners and small businesses. The market for a small installer collapses without net metering. It takes many months and many dollars to build the momentum back up if/when net metering comes back. As a business owner, the current bill with another limit on the cap does not allow me to forecast past this summer. I can't hire more people."

In addition to severe potential job loss, an arbitrarily small limit (and insufficient cap increase) to net metering prevents NH businesses and towns from using one of the few tools they have to control and reduce high electricity costs. This is why net metering benefits all ratepayers – through tax savings, through reduced operational costs, and through reduced utility expenditures on long-distance transmission and peak-power centralized generation. Leaders from across the political spectrum agree on this: Net metering is a win-win for the Granite State.

For more information contact Kate Epsen, Executive Director, New Hampshire Sustainable Energy Association (NHSEA) at (603) 777-7700 or email: kate@nhsea.org.

Woodstoves, Emissions

Cont'd from p.19

installation cost, capped at $300. Learn more about this at bit.ly/woodstove-tax-credit-extended.

Incentives to replace wood stoves within all areas of EPA can be found at: http://bit.ly/epa-wood-stove-incentives.

- *Links: Alliance for Green Heat: www.forgreenheat.org/about/board.html*
- *EPA's BurnWise site: www.epa.gov/burnwise.*
- *hearth.com: www.hearth.com/talk/articles/.*

Solar in Butternuts, NY

Cont'd from p.12

One of the ETM solar installers in the man-lift carrying the last of the panels to the top of Lueck's family's barn in Butternuts, NY. Courtesy photo.

disconnect, but because he wants to have a secure electric system. This makes a lot of sense, considering that a solar array will not provide useable electric power when the grid is not operating, unless there is a storage system in place, with the components necessary to operate independently of the grid.

The system was installed by ETM Solar Works, which is a company with a story worth telling on its own. ETM was founded in 1988, making it one of the older solar installers. It is also a woman-owned business. Its president, Dr. Gay E. Canough, was one of the founders of the New York Solar Industries Association.

ETM originally worked doing aerospace consulting for organizations like NASA, but in 1993 started applying its skills on its home planet in the backyards of citizens. Since that time, the company has installed over two megawatts of solar systems. Dr. Canough has also taught scores of courses on solar installation.

Benchmarking CO_2 Reduction in Your Town

Durham, New Hampshire. Photo by Olivier Aumage, Wikimedia Commons.

By Green Energy Times Staff

What do Durham, Hollis, and Rye, New Hampshire share with New York City, Seattle, and Boston? One answer is that all these communities use the same system to measure and manage the energy usage in their buildings.

Local Energy Solutions (LES) is a work group that was founded to provide support for energy committees, municipalities, and other governmental organizations in New Hampshire on energy and efficiency. LES makes a number of good points at its web site, one of which is the well-known adage, "The cheapest, cleanest energy is the energy you do not use!" LES aims to reduce consumption of fossil fuels in the state 50% below 2005 levels by 2025. To that end, it provides a number of services in the state.

LES set up an especially interesting program, Benchmark NH, in 2011. A visit to its page at the LES site brings us to a somewhat less-known adage, "You can't manage what you don't measure!" With that observation, LES launches into a set of easy steps that anyone can use to benchmark the energy use of just about anything.

This, of course, is intended to support the people of New Hampshire. For those who live elsewhere, however, there is no reason to despair. The LES program gives guidance to all who visit on how to set up use of a benchmarking system that is used all over the country, and whose use has spread to other countries, as well. It uses the Energy Star Portfolio Manager software, which will help not only measuring and assessing renewable energy and efficiency projects, but also prioritizing goals and the steps to get to them.

The software is available for free at the Energy Star web site. It is available to anyone who wants to use it. Once an account is set up, which is quite easy, the system can be used to manage energy and water use in any number of buildings. Buildings can be compared to others of the same class in a national database.

The Energy Star Portfolio Manager is widely used for municipalities. It is used in New York, Seattle, and Boston because they have benchmarking laws. It is also used by the Government of Canada as a platform for their national energy benchmarking program for existing buildings. Small users are just as welcome as great cities to benefit from this tool.

The Local Energy Solutions web site can be visited at www.nhenergy.org.

The Energy Star Portfolio Manager is available at http://bit.ly/energy-star-portfolio-manager.

Warning on Investments in Fossil Fuels

Cont'd from p.1

• According to the January 2016 US Energy Information Administration report, "Weekly U.S. Field Production of Crude Oil," the US oil production is near a record high.

So producers are pumping more oil, despite the fact that they are running out of places to put it, and the price they are getting it is at a low. What is going on?

Here are some of the details:

• According to Bloomberg New Energy Finance, in its "2016 Sustainable Energy in America Factbook," growth in the gross domestic product has become decoupled from fossil fuel consumption for the first time. Our economy is growing at a rate many call healthy, but our consumption of fossil fuels is declining. This is extremely significant.

• The Federal Energy Regulatory Commission's "Energy Infrastructure Update for December 2015" shows that new natural gas installations in that year had a capacity of 5,942 MW, down from 9,162 MW in 2014, a decline of 35%. At the same time, new wind power installations had a capacity of 7,977 MW in 2015, up from 5,319 MW in 2014, an increase of 50%. And renewables accounted for about two-thirds of all new generating capacity of 2015.

• Financial advisers Lazard Associates' "Levelized Cost of Energy Analysis," published last December said the costs of renewable power are currently falling below those of fossil fuels and nuclear power, regardless of incentives.

Clearly, the oil and gas companies are in trouble. Investors and banks are aware of this, as we can see from a couple more facts.

• According to a report by Bloomberg on January 20, 2016, 42 US oil companies went bankrupt in 2015, owing a combined $17 billion. In some cases, there were no bidders for the assets.

• A check of current market data shows the Dow Jones Oil and Gas Index is down over 46% from the highs it hit only last year. Astonishingly, the Dow Jones Coal Index is down 97.5% from its highs of 2008.

• A report in the Los Angeles Times of last August 13 said the decline in the value of fossil fuel investments had already cost two state retirement funds in California about $5 billion. This is probably the tip of the iceberg.

For what they are worth, here are a few summary observations.

The oil and gas companies borrowed a lot of money to finance new exploration and develop new infrastructure. This happened just as the market struck peak demand and peak prices, from which it has declined.

The nature of a peak is that it is followed by a decline. Peaking demand was followed by declining demand precisely because of a combination of factors that were set to drive it down. Efficiency and rapidly dropping prices for energy from renewables are increasingly taking their toll; both demand and prices of renewables are projected to continue dropping. That is why so many oil companies went bankrupt.

The option oil and gas companies normally use to deal with declining income is to pump more oil and gas. The fact that the inventories are full and demand is declining means that the prices of their products will continue to be depressed as more products are pumped.

This is a vicious cycle, from which the fossil fuel industries may never recover. They are losing a competitive edge, in a market that is shrinking, while environmental concerns make it clear they should stop bringing their products to market altogether. The term "death spiral" comes to mind.

We could easily see the situation with fossil fuels as a bubble about to burst. If that is the case, it might be as bad as the banking crisis of 2007.

Our advice is "Don't play with fire! Divest now!" And for those who would hesitate, "Do your due diligence!"

See "Should We Divest?" on page 7.

Bold New Strategy Proposed for Vermont's Economy

On February 2, 2016, the Vermont Climate Change Economy Council (VCCEC) proposed a bold new vision and strategy for economic development statewide. With the State House release of Progress for Vermont, the Council is highlighting ways to make Vermont the most desirable location for creative small businesses and innovative entrepreneurs that advance clean energy generation, improve efficiencies, transform transportation and revitalize communities. Many of the state's business innovators are already finding practical ways to reduce carbon emissions and diminish climate risk while providing their products and services around the world. The VCCEC strategies are designed to stimulate this green economy and assure Vermont remains a national leader in this expanding sector.

The VCCEC was formed in 2015 by the Vermont Council on Rural Development (VCRD) following its first Summit on Vermont's Climate Change Economy. This broad-based nonpartisan group spent the past year considering multiple policy options to produce these recommendations to build a strong economic future for Vermont.

"There is an increasing demand in the global marketplace for low-carbon solutions," pointed out VCRD Executive Director Paul Costello. "Vermont is in position to be the friendliest place in the country for creating jobs that build from our values while addressing this enormous challenge. Let's be the small, green Silicon Valley of the Climate Economy."

Among the strategies are:

• Setting up a Model Climate Economy Communities Program to help Vermont towns rapidly expand local energy generation and transportation options while attracting green businesses and younger residents;

• Developing a first-in-the-nation Comprehensive Energy Efficiency Partnership to expand the scope of Efficiency VT and its partners to include home heating and transportation savings;

• Evaluating and advancing a carbon pricing or trading system for Vermont that would reduce carbon emissions and invest in the progress of Vermont's economy;

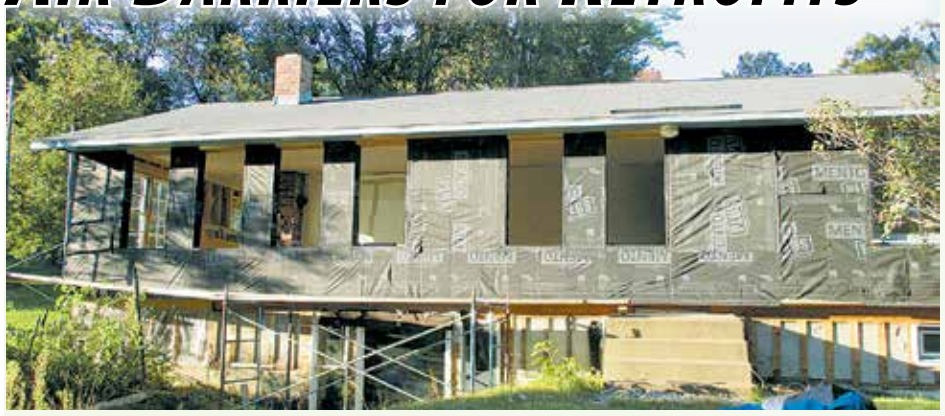
• Establishing a network to attract, support, and cultivate new entrepreneurs and help them grow their enterprises in Vermont.

Progress for Vermont will be center stage at the 2nd Annual Summit on Vermont's Climate Economy February 22, 2016 at the Vermont Technical College in Randolph, VT.

Over 400 business leaders, youth, legislators, the Governor's Climate Cabinet, investors, and other stakeholders will review strategies in the Action Plan and plan the best ways to move them forward.

To download the report and to see the most up-to-date agenda, list of speakers, and topics for the Summit, visit vtrural.org/summit16 . For more information contact info@vtrural.org.

DEEP ENERGY RETROFIT
AIR BARRIERS FOR RETROFITS



Exterior air barrier fabric from foundation to roof. Courtesy photos.

By Michael Goetinck

In order for a building's insulation to be most effective it needs to be in contact with an air barrier. In an ideal world a home's air barrier is continuous. This can be achieved through thoughtful design and construction when building a new home. However, when retro-fitting existing homes it's not always clear where the air barrier is before you start, if there is one, or where to establish it during the course of the retro-fit. While the goal is a continuous barrier, depending on the scope of work the result is often less than continuous, but significant increases in the structure's airtightness can still be achieved. The building can still be durable and comfortable, and the work is still worth doing. For the purposes of this article I'm assuming that the closed cavities will be filled with high density insulation and open attics will have loose fill insulation.

Note that here we are discussing buildings' air barriers which are intended to reduce or control air infiltration, as distinct from vapor barriers or retarders, which are intended to control moisture movement and accumulation, used for instance with fibrous insulation, to prevent problems related to moisture.

An inspection of the building can establish the location of the existing air barrier. Using a thermal imaging camera in conjunction with a blower door allows its effectiveness to be evaluated. Exterior air barriers can be plywood or oriented strand board (OSB) sheathing with taped seams, various air barrier fabrics, and spray or liquid-applied films. Interior air barriers include drywall, plaster, and air barrier fabrics. Some houses have air barriers in the middle of the wall assemblies. Plywood or OSB, plaster, drywall, and air barrier fabrics can be located within double cavity construction assemblies. Sometimes there is no air barrier. Houses are sometimes built with board sheathing (as opposed to sheet goods sheathing like plywood or OSB), or tongue-and-groove interior wall and ceiling coverings, or both, and these materials often do not form adequate air barriers.

More often than not, there's some type of air barrier material somewhere in the house, but it has penetrations (holes and gaps) that reduce its effectiveness and the performance of the insulation.

So, what to do? It depends.

If the plan is to strip the interior of the house down to the framing, then creating a continuous air barrier is relatively straight forward. If the air barrier is being installed on the interior side of the framing then special attention needs to be paid to the transitions from one floor to the next.

Interior air barrier fabric and drywall during a gut rehab deep-energy retrofit.

One way to solve this is to extend the air barrier fabric up into the floor joists and attach it to the sub-floor above. All the seams and cuts in the fabric need to be sealed with a compatible air sealing tape. If the sub-floor is tongue and groove then a high quality flexible caulk should be used to seal any gaps such as those where the boards come together, and any others. The fabric then continues across the underside of the rafters or attic floor joists.

If the building's siding is going to be removed then establishing an air barrier that covers the exterior walls from foundation to roof should be considered. In order to make the barrier continuous it needs to extend above the top plate and over the roof framing or connect with the interior air barrier. This is one of those areas that can lead to a less than perfect continuous air barrier. In this case, the soffits should be filled with a high density insulation such as dense pack cellulose which will reduce air movement to an acceptable level.

If the siding is not going to be removed, the house is not going to be gutted, there is an existing air barrier, or the plan is to make the building as efficient as possible without significant changes to the structure, then the focus should be on finding penetrations and sealing them. If there is not an air barrier (e.g., interior walls and ceiling are tongue and groove boards), but the other conditions are present, then covering or replacing the wood with drywall is a good option.

Tongue-and-groove ceiling below a flat attic. Solution: cover the ceiling with drywall to create the air barrier.

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.*

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Passive House... *at the Crossroads of Sustainability and Affordability*

By Heather Breslin, Steven Winter Associates, Inc. www.swinter.com

Rooted in German efficiency, Passive House has rapidly established itself as the preeminent energy standard in the US sustainable housing market over the past couple of years. As with many green building initiatives, early adopters are typically those with eco-friendly priorities and industry knowledge. If successful, these initiatives move into the mainstream and important things follow: their benefits become tangible, awareness grows, and cost-to-complete lessens. These are the drivers behind the recent proliferation of Passive House, and why the new trend we're seeing is building affordable housing according to Passive House standards. Though not the first program traveling this path, it has much more stringent requirements than its predecessors, and in turn, Passive House yields the greatest reduction in energy and utility costs.

The precise amount of energy savings varies by project. Many sources cite a range of 70-80% savings – or more – over code-required construction. At Steven Winter Associates, we are typically a little more conservative, and tell clients to expect an average savings of 60-70%, though it can certainly go higher. The outcome is heavily dependent on site location, project scope, use of renewables, as well as budget. Even at the lowest end of the potential savings range, designing and building to Passive House standards has huge implications for the affordable market.

In 2015, the Pennsylvania Housing Finance Agency (PHFA) became the first in the nation to incorporate Passive House benchmarks into their Low Income Housing Tax Credit (LIHTC) program. Projects applying for funding do not need to meet the requirements for Passive House Certification, but if included, are awarded up to 10 points for energy efficiency in the development characteristics category. Passive House design was incorporated into 42% of the applications, and eight of the 39 projects awarded funding through PHFA will be built to the Passive House standard. Steven Winter Associates is working with three of the affordable development projects, including senior housing complex, Mann Edge II (pictured), to help them meet the Passive House design and construction requirements. The program has been hugely successful, and similar incentives will be rolled out in six other states this year.

Rendering of Mann Edge II, a 34-unit senior affordable housing complex being developed by SEDA-COG Housing Development Corporation in Lewistown, PA. The project was one of the first eight to receive funding from the PHFA and is being designed and built to the Passive House standard. Image: Architectural Concepts PC.

The increase in development costs for Passive House design and construction averages around 5-10% for design consulting, materials, and testing.2 However, these costs can be offset through affordable housing tax incentives and funding. If we examine the estimated operational savings in actual dollar amounts, the benefits become even clearer. According to Fannie Mae's national Multifamily Energy and Water Market Research Study, the average energy costs for multifamily housing were $1.39/ft2 (including $.14 per square foot common area cost) or $1,182 per year for an average 850 square foot unit.3 If built to Passive House standards, our sample 80-unit development would be projected to save between $56,712 (60%) to $75,616 (80%) annually – lowering the cost for tenants, owners, managers, and the government by decreasing utility allowances for these affordable units.

Aside from the primary benefits of energy and cost reduction, there are social implications of building to the Passive House Standard in the affordable market. Passive House homes are more healthful homes. A focus on air-quality means lower or no harmful allergens and pollutants. And, aside from the general importance of well-being, occupants are less likely to miss work and school due to related illnesses. Passive House standards prioritize durability and occupant comfort, which often leads to a personal investment made by residents into the future of the homes and communities in which they reside.

Passive House focuses heavily on efficient design and construction to achieve buildings that require little energy to operate, and a comfortable environment for its occupants. This is achieved by creating a building envelope as air-tight as possible through superior insulation and advanced air-sealing techniques, using the natural landscape to offset heating and cooling loads, and meeting superior air-quality standards through energy recovery ventilators (ERV). As compared to net-zero construction, the Passive House standard requires that extremely low heating and cooling energy demands must be met, whereas for net-zero buildings the goal is simply to offset a building's energy use to zero (or less in cases where renewables actually produce more than is used). The Passive House requirements for extremely low energy demand result in a super insulated envelope likely to provide superior levels of comfort, a quiet living environment and increased durability due to reduced thermal bridging and less possibility for condensation and mold growth in the building assemblies. In our experience, the requirements set forth by the Passive House standard provide a more rigorous method to ensure goals are achieved.

1. http://www.phfa.org/forms/multifamily_program_notices/qap/2016_allocation_plan.pdf; 2. http://www.treehugger.com/green-architecture/11-great-reasons-why-passive-house-such-good-green-building-standard.html; 3. https://www.fanniemae.com/content/fact_sheet/energy-star-for-multifamily.pdf

To Buy or Lease A Solar System?

Cont'd from p.1

LEASING

Leases differ from one another. They come from different sources, including the manufacturer, the installer, or a finance organization. Each provides different options, and each has its own advantages and disadvantages.

If you lease a system, you have the advantage of not having to worry so much about it. Such details as maintenance, insurance, and warranties are usually (but not always) the responsibility of the entity that leased you the system. You should find out what happens in regard to net-metering and RECs under the terms of the lease. Many leases would have them go to the owner, not the leasee, but a financial institution may see this differently than a solar manufacturer would.

One thing you do have to know, before you sign a lease, is what happens if you sell the house or property where the system is installed. Another concern is what happens at the end of the lease period; what sort of option to buy do you have?

Leases usually give the lowest rate of returns on long-term capital expenses. On the other hand, a lease can be had with little or no cash down and few worries.

Finally, leases often have contracts that include excalator clauses which increase payments in time. You need to read and understand the fine print.

BUYING

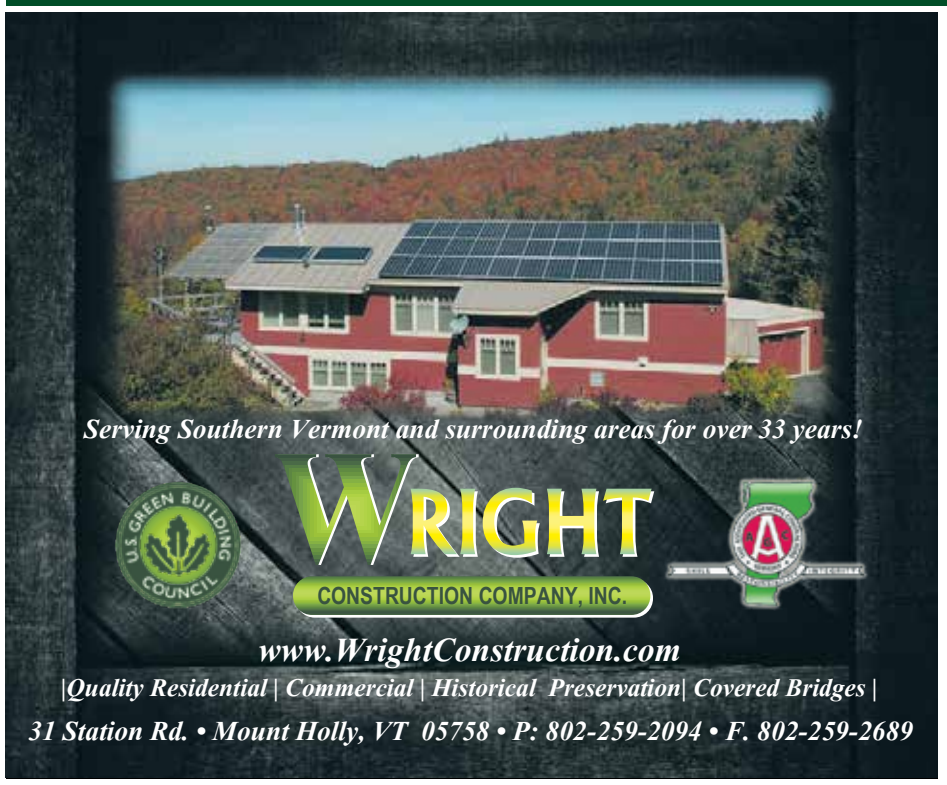
If you purchase your own system, you will have to take responsibility for it, including its maintenance, insurance, and warranties. As the owner, you would probably get the RECs, if there are any to be had. There are different ways to buy, including outright cash purchase, financing through a bank or other commercial organization, and financing through a non-profit organization, some of which are state-run.

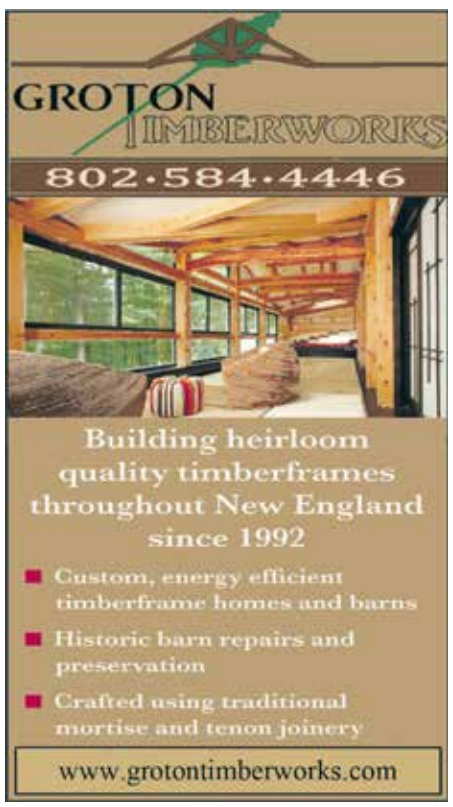
In the final analysis, if you are going to put a solar system at your home, buying for cash is more cost-effective than financing, and financing is more cost effective than leasing.

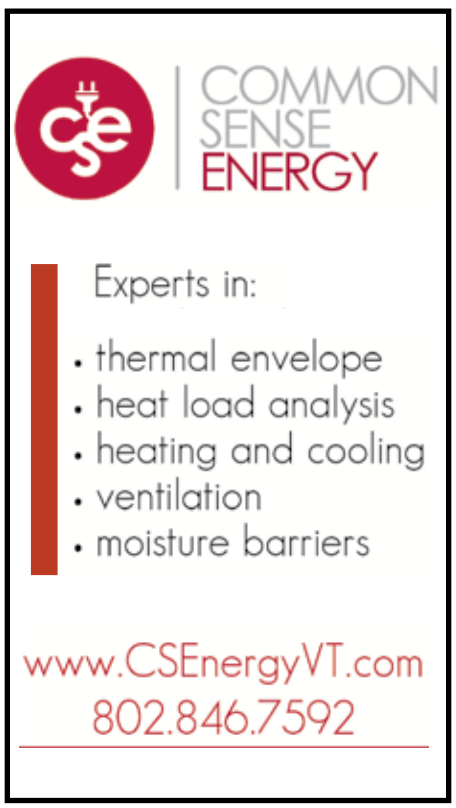
The greatest financial return on a home solar installation is usually from a cash purchase, without financing. Nevertheless, financing is usually more cost-effective than leasing.

Financing can be had at very low rates in some cases, and this is especially true if it comes through a non-profit organization. There have been grants that allow people with low income to finance systems with little or no down payment or, at interest rates that are low to zero. It is always worth finding out what is available, and it is worth recommending DSIRE again as a resource, www.dsireusa.org.

There are a number of tools available online to help with the decision-making process. One is provided by the Institute for Local Self Reliance. ilsr.org/ultimate-solar-calculator.







steps to net zero living

By Thadeus Rumple

Stow MA home built by Transformations, Inc. in 2010. Courtesy photo.

A net-zero energy building produces as much power as it uses. There are a number of ways to do this. One example is a home built to Passive House standards, where costs quickly outweigh the added expense for higher building performance. Another approach is to build to a simpler and less costly high-efficiency standard, and install a renewable generating system, such as a solar array, to make up for any extra energy needed. Either way is worth any initial costs over those of conventional construction, because no heating plant is needed, which offsets the higher cost to build. The cost of renewable power has fallen to the point that a solar system is often less expensive than an oil-burning furnace and a chimney.

Here are the steps we suggest to build a net-zero home:

1. Start with a stated intention of having a net-zero design. Getting to net-zero is much easier if the home is designed to be net-zero from the start. This decision should be made clear to all involved.

2. Choose professionals who are experienced in net-zero construction. This includes architects, engineers, and contractors who will be involved in the project. Everyone must be on the same page. People should not work on the project unless they either have good experience or honestly wish to learn with counsel from someone who is.

3. The home has to be sited properly. Both the site and the orientation of the building need to be appropriate for net-zero construction. Make sure you can use the sun for passive gain. It is also advisable to include thermal masses that can store heat.

4. Determine what kind of net-zero design will be used. Will the design use Passive House standards, high efficiency with solar, or some other approach? Remember that while positioning a home on a property such that the roof is notably shaded is disadvantageous for energy production from the roof, there might be a sunnier site elsewhere on the property to get energy from a ground-mounted solar array.

5. As the design work is being done, have it modeled with a computer, so you know what to expect. Do not make changes to the basic design without re-running the numbers, as a change in design can have effects on efficiency and energy.

6. Super-insulate and super-seal, starting at the foundation, and including all exterior walls, the attic (if applicable) and all penetrations through them. This process should include consideration of any feature that might relate to the walls of the building envelope, including double stud construction, avoiding thermal bridges in framing and other building details, and giving thought to systems that typically run through the walls, such as wiring and plumbing, and anything else.

7. Use super-efficient windows and doors. It is not enough merely to buy the most efficient models available. They must also be installed and sealed correctly.

8. Use blower-door testing to make sure sealing is done properly. Do this several times, starting when it is first possible and ending when construction is completed. Keep a log of changes, as this will make it easier to find the cause of any unsatisfactory results.

9. Use solar electric and solar thermal, as appropriate. Solar space heating is also available and very inexpensive. Photovoltaic panels that supply electricity might supply enough to power mini-splits and other heat pumps for heating space and water.

10. Given a well-sealed building, it is important to manage air quality and humidity. Have an energy recovery ventilation (ERV) system or a heat recovery ventilation (HRV) system installed for those purposes. Humidity is especially important.

11. Use energy-efficient lighting and appliances.

Remember, it is possible to build a net-zero home for about the same cost as conventional construction, eliminating the costs of heating and electricity for the future. A side benefit of this is that the home is more comfortable. *Why would you want to do anything else?*

For further reading on this topic, visit www.zerohomes.org/twelve-steps-to-zero.

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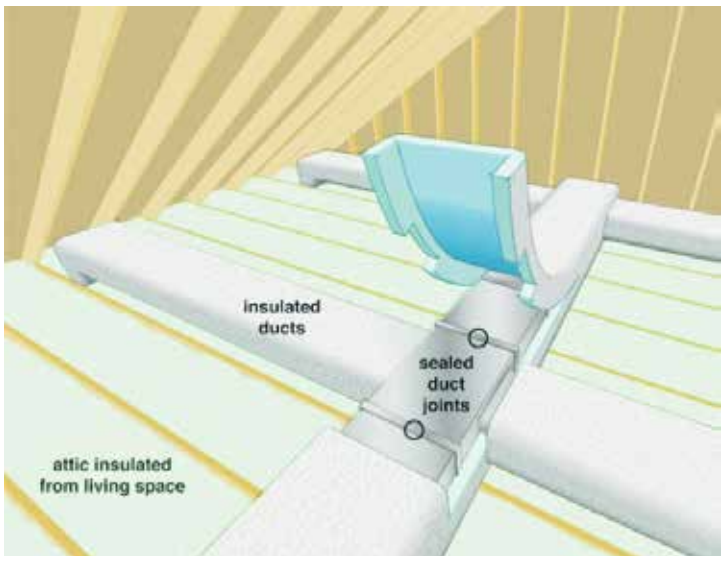

Unsealed ducts in your attic and crawlspaces lose air, and uninsulated ducts lose heat -- wasting energy and money. Image: energy.gov.

The unsealed air ducts in your attic and crawlspaces lose air, and uninsulated air ducts in your home or business lose heat -- wasting energy and money.

Air ducts are one of the most important systems in your home, and if the ducts are poorly sealed or insulated they are likely contributing to higher energy bills.

Your home's duct system is a branching network of tubes in the walls, floors, and ceilings; it carries the air from your home's furnace or central air conditioner to each room. Ducts are made of sheet metal, fiberglass, or other materials.

Ducts that leak heated air into unconditioned spaces can add hundreds of dollars a year to your heating and cooling bills. Insulating the ducts in unconditioned spaces is usually very cost-effective. If you are installing a new duct system, make sure it comes with insulation.

Sealing your ducts to prevent leaks is even more important if the ducts are located in an unconditioned area such as an attic or vented crawlspace. If the supply ducts are leaking, heated or cooled air can be forced out of unsealed joints and lost. In addition, unconditioned air can be drawn into return ducts through unsealed joints.

Although minor duct repairs are easy to make, qualified professionals should seal and insulate ducts in unconditioned spaces to ensure the use of appropriate sealing materials.

Minor Duct Repair Tips

Check your ducts for air leaks. First, look for sections that should be joined but have separated and then look for obvious holes.

Duct mastic is the preferred material for sealing ductwork seams and joints. It is more durable than any available tape and generally easier for a do-it-yourself installation. Its only drawback is that it will not bridge gaps over one quarter of an inch. Such gaps must be first bridged with mesh-type drywall tape or a good quality heat approved tape.

If you use tape to seal your ducts, avoid cloth-backed, rubber adhesive duct tape -- it tends to fail quickly. Instead, use mastic, butyl tape, metal-foil tape, or other heat-approved tapes. Look for tape with the Underwriters Laboratories (UL) logo.

Remember that insulating ducts in the basement will make the basement colder. If both the ducts and the basement walls are not insulated, consider insulating both. Water pipes and drains in unconditioned spaces could freeze and burst if the heat ducts are fully insulated because there would be no heat source to prevent the space from freezing in cold weather. However, using an electric heating tape wrap on the pipes can prevent this.

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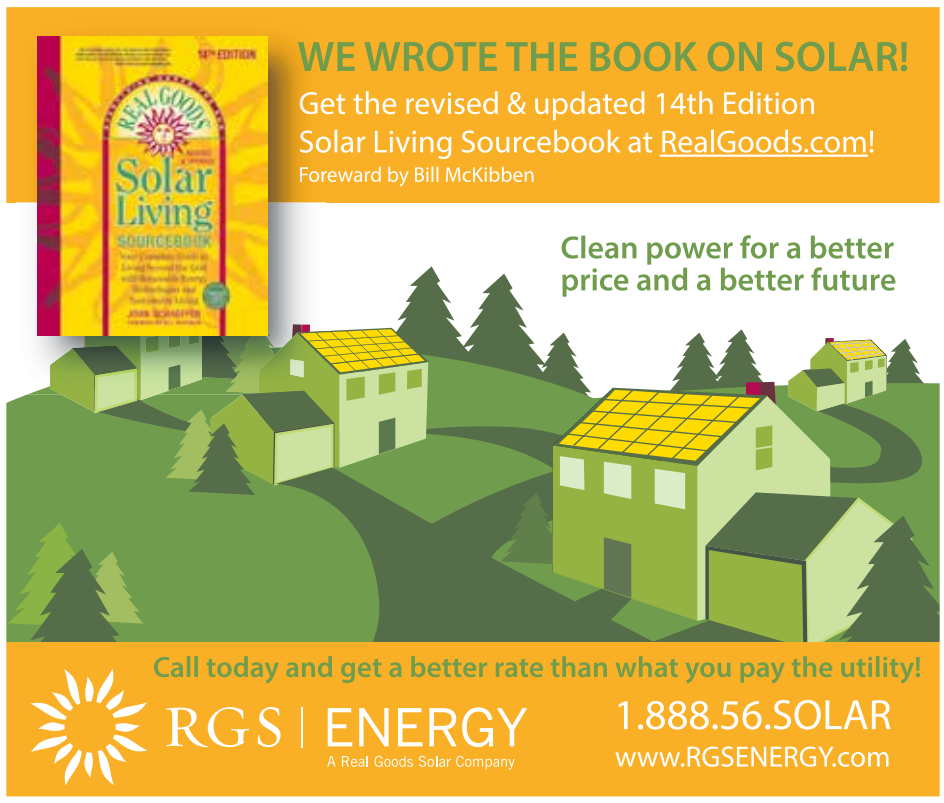

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The Golden Hours: The Impact of Peak Demands on Electric Rates

By Seth Wheeler

They're out there. Each month we'll hit one, usually on a weekday afternoon or early evening. They're called Peak Demand hours, the few occasions when demand for electricity is at its highest. They happen in an instant but peak demand hours are increasingly affecting what you pay for electric service for an entire year.

The cost of moving large amounts of electricity from one place to another, which appears on your electric bill as transmission, is much higher in New England than in other parts of the country. It's so high, in fact, that the Federal Energy Regulatory Commission (FERC) has opened an investigation to explore why transmission costs make up a larger share of electric costs in New England than in other major power grids across the country. In an order issued on Dec. 28, 2015, FERC commissioners wrote that New England transmission rates appear to be "unjust, unreasonable and unduly discriminatory or preferential" and called for an investigation.

While these issues play out on the regional and national levels, there are various initiatives being undertaken by electric utilities that aim to lessen the impact of high transmission costs on electric rates.

REDUCE PEAKS, REDUCE RATES

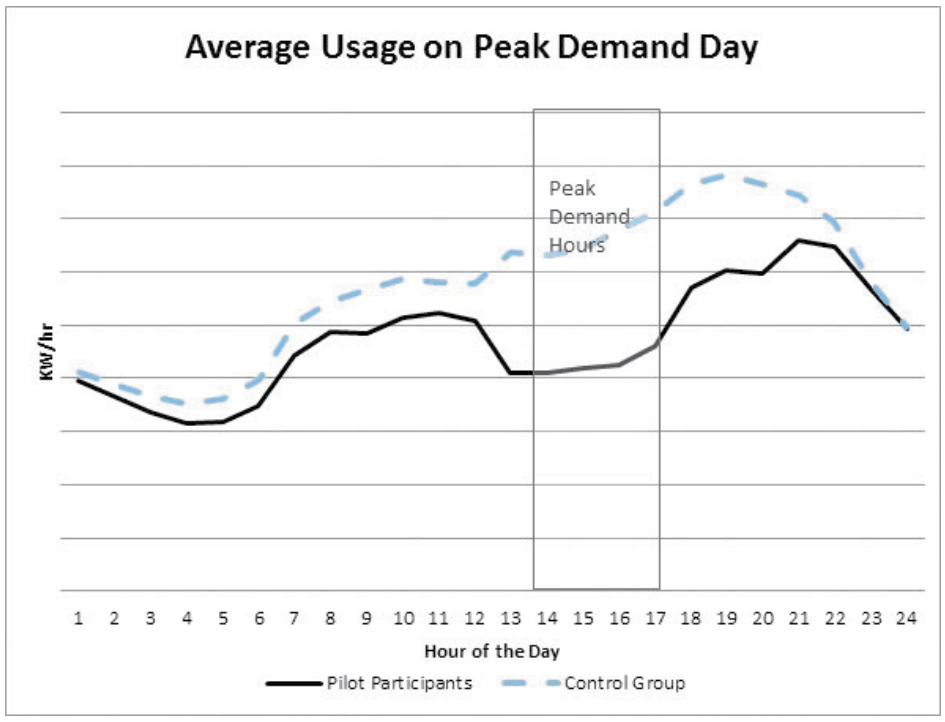
Your electric bill has two big components – the price of electricity and the cost to get it to your home or business. New Hampshire Electric Cooperative (NHEC), which serves 83,000 homes and businesses in 115 New Hampshire communities, does not generate electricity and does not own high voltage transmission lines. Instead, we purchase power for use by our members and pay the owners of the generation and transmission lines that deliver it to our distribution system. While it's difficult for us to affect the cost of wholesale power in New England, there's a lot we can do to lower the costs charged to us to deliver that power. The most effective way is to reduce peak demands.

Peak demands are a relatively small number of one-hour time periods during the year when demand for electricity is at its highest. The New England annual peak demand typically occurs during the late afternoon or early evening of a weekday during a stretch of hot weather. In total, nearly all of NHEC's transmission costs are incurred during approximately 150 hours per year and the cost to members is nearly 2.5 cents per kWh. If we can reduce the amount of power we need delivered to meet the needs of our members during those short time periods of Peak Demand, we can lower electric rates for all members.

Later this year, NHEC will be launching new programs aimed at reducing the impact of Peak Demands on the electric rates paid by members. There will be several ways to participate, ranging from direct load control programs to time-of-use rates that include daily on-peak and off-peak rates. Members will also have the option to be notified by text or email when peak demand events are occurring, so that they can reduce their electric usage. The goal is simple but it's going to take a truly cooperative effort to make a difference.

Seth Wheeler is the Communications Coordinator at New Hampshire Electric Cooperative. Learn more about energy efficiency programs available for members at www.nhec.coop/energysolutions.

Photo: www.refinedllc.com



This chart shows the impact of Peak Demand reduction efforts that were undertaken by NHEC members as part of a pilot program that charged higher rates during Peak Demand hours. It shows that participating members significantly reduced usage during Peak Demand hours, which are shaded in the chart.

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FRANKLIN, NH: A VISION FOR A PERMACULTURE CITY

By Jenisha Shrestha

Set along the Winnipesaukee River where it merges with the Pemigewasset to form the Merrimack River, Franklin, New Hampshire's smallest city, is on a path for a sustainable revitalization. As is typical of cities along rivers, Franklin got its economic start by using the power from rivers to run manufacturing processes in its industrial mills that line riverbanks. As the mills began to close in the 1970s, the city entered a prolonged period of dramatic economic decline.

Franklin has been the focus of several design charrettes for revitalizing the downtown over the last eighteen years. Yet these plans and directives have not transitioned beyond planning into implementation. Todd Workman, Executive Director of PermaCityLife, the catalytic organization focused on bringing the Franklin Falls Revitalization Plan to life, believes that the most recent charrette grounded in the principles of permaculture will bring about the transition the city needs.

Having grown up in the nearby town of Gilford, Workman remembers the glory days of Franklin decades ago, yet he rarely spent any time in Franklin. After buying a home on Webster Lake, he walked around the downtown and wondered why the city so rich in heritage and natural resources never returned to its state of prosperity. He imagined a transformed city—a model of a resilient, vibrant, diverse and sustainable community. So, he began connecting with others who shared a similar vision.

For him, this is not just a revitalization project, but a movement. As Workman states, "we are now positioned to carry forward the vision that has been laid out and supported by the community. We have acquired sufficient real estate to reach critical mass and formed partnerships with local government, private investors, educational institutions, and the philanthropic sector to develop these projects."

New local businesses have occupied the empty storefronts on Central Street. On-going initiatives include a locally-themed restaurant and microbrewery, volunteer-run coffee shop, co-working space, art gallery and music venue, multi-generational mixed-use housing, permaculture-edible landscaping, ecologically-sound storm water management, expanded bike trails and a whitewater park. Future plans under consideration also include: maker space and arts cooperative, performance center, car-reduced downtown with alternative transportation, zero-waste and commercial composting, food hub and farmer's market, holistic health center, aquaponics and mushroom farming, technology R&D lab, market-rate housing and a hostel with function space and café.

Toad Hall, one of the first properties to move from conception to fruition, currently a studio featuring sculpture made from automotive parts, designed by local artist Joseph Kildune, will soon be home to a new local tavern and brewery and a co-working center.

CATCH, a nonprofit housing developer based in Concord, plans to renovate the former home of Franklin Light and Power Company and turn it into 45 affordable units featuring a permaculture design and common spaces such as gardens, playgrounds and art studios.

These initiatives would not have become possible without our partners who believe in the vision for Franklin and have become a part of this movement: Credere Environmental Associates, Franklin Business and Industrial Development Corporation, Franklin Parks and Recreation, Franklin Regional Hospital,

Cont'd on p. 35

Sustainable Schools in the Northeast

By Green Energy Times Staff

The Alan Shepard Boat House solar array is one of six solar arrays at Proctor Academy. Photo courtesy of Revision Energy.

Several schools in the Northeast have been in the news. They included some previously covered in Green Energy Times, and some new projects. This is just a sampling.

1. Proctor Academy, a co-educational boarding and day school in Andover, New Hampshire has six solar arrays on the campus making up one of the largest solar projects of its kind. The total energy generaged from their six solar projects equals 334-kilowatt (kW), generating 389,508 kWh annually. The cost of these projects came to $1,078,189. The most recent installation was commissioned just in time for the winter sports season at the school's privately operated ski area. ReVision Energy installed all of the school's projects. There was no upfront cost to the school, and the electricity is being sold through power purchase agreements (PPAs).

2. The Cornerstone School, a Montessori School in Stratham, New Hampshire, makes sustainability is part of the curriculum. Students learn about the ways their behavior affects the world around them, from small things like recycling and energy use to big things, like how their school has harnessed the sun for most of its energy needs. ReVision Energy, which installed a 62.2-kW solar array at the seacoast school. The array is expected to generate all of the school's electricity needs, approximately 74,320 kWh annually. The switch to solar power will save the school approximately $11,000 each year.

The $216,667 project was financed through a Power Purchase Agreement (PPA) at no upfront cost to the school. ReVision will own and operate the 204-panel system, though the school has a future option to purchase the array.

The school has produced a video of the Head of School, Lee Ann Robertson talking about this school's journey to a solar investment. It can be seen at bit.ly/cornerstone-video.

3. In Rochester, New Hampshire, East Rochester Elementary School has a new 86.8-kW rooftop solar array installed by ReVision Energy. SunRaise Investments financed the $250,000 project at no upfront cost to the school district. The solar system will be owned and operated by local investors through a PPA. The system was turned on in September, and is expected to generate over 81,000 kWh each year, providing 44% of the school's electricity.

4. Keene State College in Keene, New Hampshire, was honored last November by the EPA for its success keeping food waste out of landfills. Keene State was one of 24 organizations in New England issued "Food Recovery Challenge Regional Achievement Certificates" by the EPA. Keene State won the award for the best educational and outreach campaign.

5. Camden Hills High School, in Rockport, Maine, has installed a new solar system under a PPA with ReVision Energy. This is just part of an extensive energy and efficiency makeover that the school administration hopes will reduce electric energy costs by about 85% by the time it is done. Many people have contributed to the program's success, including students, staff, and administrators. After seven years on the PPA, the town may purchase the system, to see over $50,000 per year in electricity savings.

6. In the Town of Mamaroneck, New York, Hommocks Middle School has commissioned a Rocket Composter, distributed by NATH Energy Systems of Tarrytown, NY. A grant from the Mamaroneck Schools Foundation provided for installation. Food waste will be composted instead of being trucked to a trash-burning facility, eliminating costs and environmental concerns.

Also, Sierra magazine rated ten top schools for energy. They included three in the Northeast: Green Mountain College, Poultney, Vermont; Cornell University, Ithaca, New York; and the University Of Connecticut, Storrs, Connecticut.

GET would also like to mention a number of colleges and universities in the Northeast for special interest relative to sustainability. They include Colby-Sawyer College, New London, NH; the University of Vermont, Burlington, VT; College of St. Josephs, Rutland, VT; Castleton University, Castleton, VT; University of New Hampshire, Durham, Concord, and Manchester, NH; Vermont Technical College, Randolph Center, VT; Hampshire College in Amherst, MA; Greenfield Community College, Greenfield, MA; Antioch University New England, Keene NH; and Franklin Pierce University, Ringe, NH.

After a 92-million-mile journey this guest visited The Cornerstone School in NH, where the new solar project is expected to generate all of the Montessori school's electricity. Photo courtesy of Revision Energy.

COLBY-SAWYER COLLEGE ANNOUNCES 3-YR DEGREE IN COMMUNITY SUSTAINABILITY

Colby-Sawyer students conducted research and provided sustainable recommendations to the City of Franklin on four areas of their Master Plan: Waste/Recycling, Water Management, Transportation, and Energy. All photos courtesy of Colby-Sawyer College.

By Jennifer White

In classrooms across the country students are learning about sustainable communities, but at Colby-Sawyer College in New Hampshire, students have stepped outside the class and are using their heads, hearts and hands to create one.

The City of Franklin, New Hampshire, just half an hour east of Colby-Sawyer's New London, N.H. campus, is on the cusp of a sustainable revitalization. And, thanks to community-based partnerships between local organizations and Colby-Sawyer, students are positioned to both learn from and contribute to that effort.

The vision, spearheaded by Todd Workman, executive director of Franklin-based nonprofit PermaCityLife, is to create a model for cities to become more self-reliant and to transition away from their dependence on fossil fuels. The hope, Workman says, is to "pioneer a new approach to building a collaborative and resilient downtown using the principles of permaculture to differentiate how we derive our livelihood, food supply, transportation, energy, shelter, culture, and sense of community." (For more specifics on current and future projects in Franklin see the related article in the Green Life section on page 32.) Supported by an Innovation Grant from the college, funded through the Davis Educational Foundation in 2014, Colby-Sawyer has researched, designed and implemented the Sustainable Learning Initiative at Franklin Falls, a comprehensive curricular program paired with Franklin's revitalization efforts. It is a model for an innovative, collaborative, transdisciplinary, community-based living laboratory that is replicable in other locations, and which addresses the financial sustainability of higher education as well as the sustainability of human institutions.

The initiative is intended to be flexible and modular, allowing faculty to tailor an existing assignment or an entire course to focus on an aspect of the city's revitalization. Students have already contributed to Franklin's Master Plan, developed company logos, created signage for the local bike-trail system, constructed an access database for the upcycled art gallery, and conducted a parking inventory for redevelopment planning. This spring, Colby-Sawyer interns will research information technology solutions, create Geographic Information Systems maps, develop tourism strategies, and explore best practices for commercial compost. Environmental Studies major Emily Earnshaw '16, says that her experience working with the City of Franklin during her junior year "provided many opportunities to grow academically and professionally. My teamwork skills evolved, as well as my abilities to effectively interact with city officials."

Faculty who received funding from the Campus Compact for New Hampshire's (CCNH) Environmental Stewardship sub-grant program have generated service-learning courses based in Franklin, including brownfield mitigation through biogeochemistry with the Lakes Region Planning Commission, City of Franklin, the N.H. Department of Environmental Services and Choose Franklin; consumer behavior and market research project for CATCH Neighborhood Housing (a regional housing provider based in Concord, NH); and attitudinal surveys and sociological research for a community-based film project. And, faculty across the curriculum have proposed other diverse topic ideas, including aquatic species biodiversity; interpersonal skills for physicians; community ceramics classes and student-run art exhibits; exercise prescription using urban green spaces; calculating timed-release of river volumes;

Cont'd on p. 35

Top: Silas Miller from Credere Associate discusses the Phase 1 brownfield site assessment for the Stanley Mill Building in Franklin, N.H. with students from the Community-Based Research Project class;. bottom: Todd Workman, Executive Director of PermaCityLife, joins students as they observe the utilization of a Geoprobe to identify environmental contaminants in the soil.

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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
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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
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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**
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PERMACULTURE

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GUIDE TO ADVERTISERS

Ingredient of the Month

By Larry Plesent

WHAT IS NATURAL?

From the Soapman Blog

The FDA is looking for industry guidance in defining "natural" as it relates to consumer products. Here's a perspective from the Soapman.

With the coming of the counterculture in the sixties and seventies a new paradigm for the concept of natural arose as applied to consumer products. This sub-culture elucidated a bio-based frame of reference for deciding which products were natural and which were not. Natural in this context came to mean plant-based rather than petroleum based, and this provides a solid starting point to work from.

Products that are more bio-based are by default more natural. To me this leads to the suggestion that perhaps natural like "organic" needs levels of naturalness. Following the lead of the National Organic Program we could perhaps have categories such as: 100% natural, 95% natural, and made with natural (70%), all relating to the percentage of bio-base content. Something to consider.

While this conveys the gist of the issue there is clearly more to the concept of natural than plant-based content alone. Natural is also a code word for safe and nontoxic. This is the consumer expectation. Ingredients that are suspected carcinogens, even when bio-based, must by definition be excluded from products designated as natural. Pthalates, phenols, chlorine compounds, hydroquinone, steroids, synthetic detergents and anything petrol based would thus be excluded.

Coal tar-derived colors such as Lake and FD&C colors are by definition, source, and toxicity not natural. Similarly, artificial fragrances and scents (often the same molecule) are not natural.

Heavily processed materials are not considered natural, while lightly processed products and ingredients are. Processing methods are part of consumer expectations of natural. Cold-pressed, citric acid or clay- refined oils are natural. Hydrogenated or hexane-refined oils are not.

Lightly processed clays, muds and salts and natural. Highly processed mined minerals are not. Mineral colors, while marketed as natural, are not natural and some may even be dangerous.

Ethanol is natural. Other forms of alcohol are not. Methanol might be the fuel of the future but it is toxic to humans and thus not natural for personal care product marketing claims. Isopropyl is a petro-based product and thus not natural.

Hybridized and heirloom seed stock is definitely natural. Genetically modified seeds and food products are not. GMO products have yet to prove their safety over time to the majority of natural-minded consumers who think about these things. Hybrids are natural, bio-engineered plants are not.

Radiological minerals are found in nature. But they are neither safe nor non-toxic and thus are excluded from the natural in products designation. So uranium in your shampoo – not natural.

To summarize, natural care products are by definition plant-based, safe and nontoxic, non-GMO and lightly processed. Or to put it another way, "natural" means as close to original form as is feasible and effective.

Is the FDA listening?

The headquarters of the U.S. Food and Drug Administration in Silver Spring, Maryland. Photo Reuters

Plastic Bag Facts!

Heron eats fish in plastic bag. Photo: greencaucus.org

- Did you know that the amount of petroleum used to make a plastic bag would drive a car about 126 yards. It would take only 14 plastic bags to drive one mile! Also the production of plastic bags requires petroleum and often natural gas and chemicals. Its production is an air pollutant.
- Scientists estimate that every square mile of ocean contains about 46,000 pieces of floating plastic. Researchers have found that plastic debris acts like a sponge for toxic chemicals, soaking up a million-fold greater concentration (than surrounding water) of such deadly compounds as PCBs and DDE. This plastic debris laden with chemicals becomes highly toxic poison to marine animals which frequently consume these particles.
- Plastic bags can take up to 1,000 years to break down, so even when an animal dies and decays after ingesting a bag, the plastic re-enters the environment, posing a continuing threat to wildlife.

For more facts go to: http://bit.ly/bag-facts.

FRANKLIN, NH: A VISION FOR A PERMACULTURE CITY

Cont'd from p. 32

Franklin Savings Bank, Healthy Eating Active Living, Nobis Engineering, CATCH Neighborhood Housing, Lakes Region Planning Commission, Outdoor New England, The Franklin Studio, and Take Root NH.

Another key collaborator in this movement is Colby-Sawyer College's Sustainable Learning Initiative along with its new three-year Community-based Sustainability major—an experiential learning opportunity for students to assist the various stakeholders in this movement. (For information about the Colby-Sawyer's new three-year major and the Sustainable Learning Initiative at Franklin Falls, see the Sustainable Education section on p. 33.)

Positive energy has been generated around saving valuable historic buildings and protecting the natural heritage with the Franklin Falls Historic District to contribute to the economic stability of the greater city of Franklin and surrounding region.

Learn more at: www.permacitylife.com or contact Todd Workman at toddworkman1@gmail.com, (603) 731-4219.

Jenisha Shrestha, Community Development Assistant, PermaCityLife; Campus-Community Liaison for SLI@FF at Colby-Sawyer College

Late Breaking News:

Franklin Savings Bank made a donation of $30,000 to PermaCityLife to assist with our revitalization efforts.

Pictured from l to r: Jordan Urquhart,Toad Hall Tavern, Chef and Owner; Marty Parichand, Outdoor New England; Jenisha Shrestha, PermaCityLife; Colby-Sawyer College Liaison for Sustainable Learning Initiative; Todd Workman, PermaCityLife; Oscar Gala Grano, Take Root Coworking; Jim Aberg, Franklin Business & Industrial Development Corporation; Tim Morrill, PermaCityLife, Dave Savastano, Franklin Savings Bank Vice President; Jo Brown, The Franklin Studio; Mike H. Mullavey, PermaCityLife; Ron Magoon, Franklin Savings Bank President & COO; Joe Kildune, Art Director, PermaCityLife.

COLBY-SAWYER COLLEGE

Cont'd from p. 33

efficiency and renewable energy; recreational event planning; and best practices for community gardens.

In fall 2016, Colby-Sawyer will welcome its first cohort into a dynamic three-year community-based sustainability major that creates experiential learning opportunities for students to explore, design and develop sustainable solutions to real and evolving community needs. The curriculum gives students valuable professional work experience while they are still in school and encourages them to discover and develop their talents and passions. Graduates will pay 20% less for their college education and can start their careers or enter graduate school one year earlier by participating in January and May intensives—students will go outside the class and into the businesses and community organizations that are doing the real work of energy sustainability, local food production and zero waste. Through this unique partnership and its hands-on courses, students will have the opportunity to develop relevant skills for creative and complex problem-solving, work directly with regional stakeholders and potential employers, and do their part to help create a resilient, vibrant, diverse and sustainable community in Franklin.

Learn more at: www.sli-franklinfalls.com.

Jennifer White is the Director of Sustainability and Assistant Professor of Environmental Studies, and Sustainable Learning Initiative Program Coordinator.

Air Ducts

Cont'd from p. 30

There may be some pipes more prone to freezing than others, due to their location. Generally speaking, do not bury pipes in insulation in the basement. Check with a professional contractor.

Hire a professional to install both supply and return registers in the basement rooms after converting your basement to a living area.

With cooling ducts, be sure a well-sealed vapor barrier exists on the outside of the insulation on to prevent moisture condensation.

If you have a fuel-burning furnace, stove, or other appliance or an attached garage, install a carbon monoxide (CO) detector to alert you to harmful CO levels.

Be sure to get professional help when doing ductwork. A qualified professional should always perform major changes and repairs to a duct system.

Install a Carbon Monoxide Detector

Carbon monoxide (CO) detectors are required in buildings in many states. They are highly recommended in homes with fuel-burning appliances such as natural gas furnaces, stoves, ovens, water heaters, and space heaters. An alarm signals if CO reaches potentially dangerous levels.

Learn more about minimizing energy losses in ducts and insulating ducts and other areas of your home at energy.gov/energysaver/articles/tips-air-ducts.

The Snow IS Melting!

Cont'd from p.1

Andrew Newell, Olympic cross-country skiier from Shaftsbury, VT. Courtesy photo. Rt: It's sugaring season in Vermont. Photo Flickr, By Deborah Lundbech.

ing precipitation, Chacaltaya's glacier finally melted completely in 2009. Scientists tell us that it is almost certainly gone forever. Also very nearly gone is Lake Poopó, whose waters the glacier fed, and which had an average total area of about 250,000 acres. The thousands of people who lived along the lake's shore, many supporting themselves by fishing, have nearly all moved away. One thing that remains is a fleet of fishing boats, lined up along what was once a shoreline, but is now an arid plain.

The Sierra article describes a growing group of young people who have discovered that the winter sports they love passionately are threatened. One of them, perhaps their "elder spokesman," is Jeremy Jones, who has been filming snowboarding movies since 1995. Since then, he has become one of the world's best known snowboarders. He has been voted Snowboarder magazine's Big Mountain Snowboarder of the Year eleven times.

A game-changing event really opened his eyes to some stark truths. Jones is quoted in Sierra, "I was with a bunch of guys in their early 30s. … They were so proud, showing me where they learned to ski. I asked why it was closed and was shocked when they said it just doesn't get enough snowfall anymore."

Jones was so disturbed about the changing conditions and his inability to find a climate group focused on the winter sports community, that he founded an organization to fight climate change through education for winter enthusiasts who want to see it be around for our kids. The organization is called "Protect Our Winters" (POW). It can be found at protectourwinters.org. Its members include a large number of ski and snowboarding athletes, including many from the northeast, that are fighting for our winters.

POW's Riders' Alliance includes prominent athletes from all over the world. Olympian Kelly Clark and Andy Newell two of several who are native Vermonters. Others who are from the Northeast are Alex Deibold, Devin Logan, Jack Mitrani, Benji Farrow, and Seth Wescott.

POW has been turning into a real powerhouse, lobbying politicians in Washington, DC, and elsewhere. Told that they needed to show numbers, such as numbers of jobs and contributions to the economy, to substantiate the issues and influence the politicians, it began some serious work doing research.

In 2012, POW partnered with the Natural Resources Defense Council to commission a report, Climate Impacts on the Winter Tourism Economy in the United States. This showed that over the ten years starting in 2000, the winter tourism industry, which had averaged $12.2 billion per year and supports 211,900 jobs, lost revenues of $1.07 billion in low-snow years. At the time of this writing (January, 2016), most of the ski resorts in the Northeast only have a portion of their lifts operating and trails are covered with mostly man-made snow.

The effects of climate change go far beyond winter sports and rising seas. As the world warms up, it does so unevenly. Different places warm by different amounts, at different times of year. For example, Brattleboro, Vermont, where only 20 years ago the lowest winter temperatures on the coldest winter nights frequently reached to -20° F, may get through this winter with the coldest temperature seen not below zero.

The hardiness zone maps gardeners use work just as well to predict what pests will live in an area. Pests that used to be killed off in the cold winter nights of the Northeast find it easy to survive in the warmer environment.

Deer ticks, and the Lyme disease they carry, have moved farther north than ever before; ticks are killing moose through fatal anemia and causing many other health issues for people and pets. The host of insects also moving farther north with the changing climate includes wooly adelgids, which has killed entire forests in some places, and a variety of pests that destroy fruit and vegetable crops. This past summer many blueberry farms in the area experienced huge crop loss from the Spotted Wing Drosophila, which is just one example.

The maple syrup industry has already been suffering from climate change in the Northeast, but for different reasons. Maple syrup is highly dependent on weather, which is getting harder to predict. Sap is often running over two weeks early, but has also run two weeks late, or more, in unpredictable weather conditions. Insects and fungi that attack the trees are increasingly a problem. Air pollution damages trees, but not nearly so much as increasingly damaging weather, from hurricanes to ice storms. These problems have been increasing slowly for many years, and the situation for US syrup producers has been made worse locally by competition from Canada, which has seen its climate change to favor syrup production. Many years ago, Vermont was the biggest producer of maple syrup in the world, but now 75% comes from Quebec, and Vermont's share is down to 5.5%. It is sad to think that those who follow us may never taste fresh flowing sap from our maples.

We want our children to enjoy what we have enjoyed, and that includes the thrill of playing in the snow. So we tell all who will listen, "Ski, snowboard, and save winter sports while you still can." But winter sports are just a poster image for the problems of climate change.

Slopes are rated with symbols, and a double-black diamond is one of the toughest and most dangerous. In reference to the times we live in, Sierra quotes Schendler, "This is a double-black-diamond moment. This is the place where we cannot fall."

Kelly Clark, a native Vermont Olympic snowbaard champion, is a POW Alliance rider. Mt. Snow, her hometown mountain has received minimal snow this year..

A Wooden Toothbrush is Born in VT

REDUCING PLASTIC WASTE AND INCREASING ORAL HEALTH

Green Energy Times Staff Article

A Vermont start-up company, Wood Brush, is taking on the problem of plastics in landfills by offering each of us a better solution. After two years research and development, the Wood Brush Company is ready to begin production of high quality toothbrushes with a much-reduced environmental impact. The first product will be a toothbrush called "The Natural."

Michael F. Kane, a sustainability entrepreneur and Wood Brush's founder, has worked with both the dental industry and Maple Land Mark, a Vermont-based wood toy manufacturer, to develop the world's best natural toothbrush.

Wood Brush will employ a local workforce in Vermont, and will use local natural resources for 98% of the product. The toothbrush has a handle made from sugar maple and the bristles are BPA-free.

The plastic toothbrush industry produces 3.5 billion toothbrushes annually. Dentists recommend individuals get a new toothbrush every three months. Following this recommendation, a household of four throws out sixteen toothbrushes every year.

Nearly all of these toothbrushes are made of plastic, but almost none can be recycled. The problem is that the plastics that work for handles require one set of characteristics and those for the bristles have a different set; toothbrushes are made of plastics that cannot be recycled together. The result is that nearly all of them properly go to landfills when they are disposed of. This is approximately 200 million pounds of plastic per year.

Addressing this problem is somewhat complicated by a need to accomplish two different things at once. It is not enough just to reduce the amount of plastic used. We need to do that without compromising oral health.

By using hardwood for the handle, 98% of the plastic in a toothbrush is replaced by a renewable, compostable material. Having it locally-sourced means that Wood Brush has much more control over the sustainability and quality of the materials than would be achievable using such imported materials as bamboo. The handles may have natural coatings or be just plain wood.

Local entrepreneurs have initiated a kickstarter campaign that hopes to bring jobs and solutions related to brushing your teeth! Photo: Michael Giogio.

In a worst case for proper disposal, the Wood Brush toothbrush goes to the landfill, just as plastic ones do. Unlike the plastic toothbrushes, however, 98% of the Wood Brush toothbrush will decompose naturally. Alternatively, the head can be cut off and sent to the landfill, while the handle is re-purposed, burned, or composted.

Wood Brush will continue to use a special, BPA-free, dental-grade nylon for bristles at present. Kane's research found no material on the market that is superior to it for dental hygiene. He is, however, continuing research on delivering a vegetable-based fiber bristle, and he has hopes of achieving that goal in the near future. With that, the toothbrushes would be 100% free of plastics.

Learn more at www.woodbrush.net.

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Gale River Motel Goes Solar

A Green Destination in Franconia, NH

By Kevin Johnson

Almost done. The fifty-two panel system at Gale River Motel in Franconia, NH has a peak power of 13.8 kW and is expected to produce a yearly total of 15,220 kWh. Photos courtesy of Gale River Motel.

In January 2016, the Gale River Motel, located in Franconia, NH, completed the installation of a photovoltaic roof-top array which will provide energy to satisfy the year-round electrical-power demand of the property. The fifty-two panel system has a peak power of 13.8 kW and is expected to produce a yearly total of 15,220 kWh.

The system will be directly wired into the power grid by means of an AC inverter that will allow electricity to flow to and from the power grid as necessary. During periods when the energy produced exceeds the demand of the motel, power will flow into the grid causing the motel's electric meter to run in reverse, effectively crediting kilowatts to the motel. As demand surpasses production, during cloudy days or evening hours, the electric meter will draw kilowatts from the grid using up any electrical credits that have accrued. The generation and consumption of electricity has been designed to produce a "net-zero" effect, where over the course of the year, electricity produced will equal the electricity consumed.

The system costing approximately $40,000 is financed in part through Federal Tax Credits and a New Hampshire C & I rebate funded through the New Hampshire Public Utilities Commission Sustainable Energy Division.

"The Gale River Motel has been a leader in the introduction of environmentally thoughtful technology and practices in New Hampshire's lodging industry for several years." stated Kevin Johnson, owner of the motel. "Several years ago, a solar hot water system was installed that paid for itself in less than two years. An aggressive campaign installing energy efficient doors and windows has helped reduce bottom-line heating and cooling costs throughout the year. The installation of a photo-voltaic system, while taking a bit longer to pay off makes lots of sense from a business perspective," adds Johnson.

The system was installed by Renewable Energy Development Associates (REDA) of Portland, Maine. Will Kessler, of REDA, states "By going solar-powered, the Gale River Motel is shrewdly managing energy costs while reducing their carbon footprint by about 227 tons over the lifetime of the panels. Not only that, but as New Hampshire's climate warms, and air-conditioning demand increases in the summer months, solar electricity produced at the motel helps to offset peak grid usage at times when customer need is greatest. We are happy to be doing business with Kevin and Gale River Motel, as they are the vanguard of clean energy in New Hampshire. Hopefully the future holds possibilities for continued partnerships. Tax incentives that had been scheduled to expire at the end of 2016 (but have now been extended to 2018) and recent threats by the New Hampshire legislature to re-direct PUC funding targeted towards solar-powered thermal and electrical projects prompted Johnson to act sooner rather than wait any longer to move forward on the installation of the system."

The New Hampshire legislature is also struggling to renew the state's policy of net-metering, despite the fact that net-metered solar systems are only one to two percent compared to the total grid load. "By keeping the net metering cap fixed at just two percent, the risk is the state's solar industry becomes stagnant, or stunted" says Kessler. "Other states in the region have moved their net metering caps up as high as 15%, and seen tremendous growth of the solar industry in response."

The system is designed to provide real-time information regarding the production and consumption of electricity through a computer monitoring interface. Johnson will be able to track electrical consumption and production on a minute-by-minute basis.

For more information or to schedule a tour of Gale River Motel's solar initiatives, contact Kevin Johnson at 603-823-5655 or info@galerivermotel.com.

Kevin Johnson, owner of the Gale River Motel since 2002, has been working steadily on projects to increase the sustainability of the property. The Gale River Motel was the first motel in the state recognized by the New Hampshire Sustainable Lodging and Restaurant Association as an Environmental Champion.

Winter Cooking 'with the Sun!'

Blue sky, fresh snow, and sunshine… winter days are meant for outside play. And why not outside cooking, too? Solar cooking works on the rays of the sun, not the ambient outdoor temperature. Snow on the ground? All the better – it actually works like a big reflector. So strap on snowshoes, set the solar oven out to cook, and come home to a steaming bowl of piping hot Solavore Smokin' Chili!

Smokin' Chili

INGREDIENTS:

2 tablespoons olive oil
3 1/2 pounds ground chuck beef
Coarse salt & freshly ground pepper
1 large white onion, chopped
3 cloves garlic, finely chopped
1/2 habanero, seeded, finely chopped
1/4 cup chili powder
1 tablespoon dried oregano
1 1/2 teaspoons ground cumin
1/4 teaspoon chipotle pepper
4 (14.5-ounce) diced fire-roasted tomatoes, coarsely chopped with juices
1/3 cup chopped fresh cilantro
1 (12-ounce) bottle amber beer
2 (15-ounce) cans kidney beans, drained and rinsed
Tortilla chips, for serving
Shredded cheddar cheese, for serving
Chopped tomatoes, sour cream, & lime wedges, for serving. Garnish with cilantro.

DIRECTIONS:

In a large skillet, heat 1 tablespoon olive oil over medium-high heat. Working in batches if necessary, add beef and cook until no longer pink, about 3 minutes. Season with salt and pepper; drain in a colander, discarding fat, and set aside.

Add remaining tablespoon olive oil to skillet and reduce heat to medium. Add onions, garlic, and habanero; season with salt. Cook until translucent, about 5 minutes.

Combine beef, onion mixture, chili powder, oregano, cumin, and chipotle pepper; stir to combine. Add tomatoes, cilantro, and beer. Divide evenly between two Solavore Sport Granite Ware pots. Cover, set in sun and cook for 5 hours. You may wish to use reflectors if you are getting a late start (noon or later) or there are passing clouds. (Chili may be frozen at this point and re-heated at a later date. Thaw completely before proceeding to next step.)

Add kidney beans and season with salt and pepper. Continue cooking for an additional hour or until beans are heated through. Garnish with cilantro and serve with desired toppings.

See more recipes at LocalSavour.com.

Interiors green Shots!
THE HOME AND LIVING STORE

Bringing Nature and Organically Inspired Elements into Your Interiors

by Jessica Barber Goldblatt

Interior of a modern hand-hewn post-and-beam home. Photo: Wikipedia, Creative Commons.

Choose natural elements that incorporate your style and connect you to your home. Examples of natural elements of decor are wood, cotton, stone, clay, brick, wool and seagrass.

Wood as a finish has the ability to transform your mind and soul.

For many homeowners wood is one of the few materials that can be finished to look like shiny marble or can be left raw and unstained to reveal its gorgeous imperfections of knots and grains. Wood is one of the easiest and warmest of natural materials to bring into your interiors, and comes in a very wide variety of finishes, species and applications. From flooring to ceiling beams, wood also can be reclaimed and refinished from older buildings to extend its life for years in your home. Wood furniture is one of the most popular because it is durable and beautiful. Look to artisan-crafted furniture or to antique wood, to bring back the nostalgia of turn-of-the-last-century home living.

Bring nature to every room of your home

Bringing natural finishes into your home is not a new concept. The concept of bringing nature to every room of your interiors is a game-changer for many homeowners. Whether you look to organic sheets and bedding in your bedroom or enjoy a bubbling Zen fountain, Nature can find itself into any space of your life.

Sustainability never looked as good in your home

With the reemergence of green living and conserving the Earth's precious resources there has been a renewed interest by homeowners in finding building products that have been recycled and used in new ways, reclaimed from other building projects or repurposed into new functions. Old doors, sinks, tubs, decorative elements, and reclaimed and locally sourced wood products – think of these ideas when remodeling your home.

Floral inspiration does not have to be artificial

Nature is finding its way into more and more interiors in the real and natural state as flowers, potted plants such as succulents have created easy ways to bring natural appeal. Planting indoor bulbs, or keeping low maintenance plants such as succulents, cactus, or just adorning your home office desk with a fresh bouquet can instantly cheer up any room. And help with indoor air quality, too.

Bring in natural sunlight as a design element

One of the beautiful natural elements that many forget about is sunlight. Natural daylighting can make any room come alive, it makes colors pop, it makes people feel healthy and inspired. Whether you use windows, borrowed light from solar tubes extended from your roof into closets or dark bathrooms, natural light can have an effect like no other throughout your interiors.

Natural elements for every home remodeling budget

Many homeowners complain that natural materials are expensive and tend to ditch the idea of using it in their home remodeling projects. Instead of scrapping the idea, why not use less of it? An accent stone or clay plaster wall can be just as gorgeous as an entire room adorned with the same product.

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

Green Grocery Environmental Leaders

Three green grocery businesses have been designated as environmental leaders in Vermont: Healthy Living Market in Burlington, Hunger Mountain Coop in Montpelier, and Commodities Natural Market in Stowe have been named as Vermont Green Grocery Environmental Leaders by the State of Vermont for their environmental stewardship and sustainability efforts.

The standards to meet this designation were developed by multi-state environmental agency work group members of NEWMOA (Northeast Waste Management Officials Organization, as part of the Northeast Sustainable Grocery Environmental Leader program). The criteria that must be met for this honorable status include energy efficiency, water and waste reduction, recycling, environmentally preferable purchasing, and facility operations.

The State of Vermont's Green Business Program is a joint effort between the Department of Environmental Conservation and the Vermont Small Business Development Center. It is voluntary and free of cost to participating businesses. This program provides assistance to businesses desiring to "green up" their operations and recognizes businesses of all sizes for meeting a set of environmental best-management standards, going beyond compliance with existing environmental regulations.

These standards are posted on the program's website www.vbep.org.

Healthy Living Market has had a store in Burlington, Vermont, since 1985, and has opened a new store in Saratoga Springs, New York.

Commodities Natural Market opened one year ago in Stowe, a one-stop shopping experience for the whole community. They are a certified Vermont Green Grocer, work with Grow Composting and a myriad of local producers. Commodities Natural Market is opening in Winooski in August, 2016.

Below is the Hunger Mountain Co-op in Montpelier, Vermont. The co-op has 20,000 square feet of store space and over 7,000 members.

GrandyOats: Green & Yummy

By George Harvey

GrandyOats co-owners Aaron Anker and Nat Peirce are never too far from their 'real granola' roots. Courtesy Photos

We have great news from GrandyOats, in Hiram, Maine. The company is a certified organic and kosher food producer, specializing in grain products, including hot cereal, trail mix, granola, and nuts. Their products have long been hand-made and GMO-free. Now they are processed with no energy from fossil fuels in a net-zero facility.

GrandyOats was founded in 1979. In 1997, Nat Peirce purchased it from its founders, Sarah Carpenter and Penny Hood. He was joined by long-time friend Aaron Anker, who became a business partner in 2000. Both had backgrounds in the food industry, so GrandyOats was a natural for them.

As operators of a company specializing in healthful food, they have always been very environmentally aware. Their thinking has gone far beyond improving building efficiency and adding renewable energy. They understand the importance of reusing, re-purposing, and recycling wherever possible. When it came time to find a larger place to do business they looked for a good, used building. They were excited to find a closed elementary school.

They called in ReVision Energy to help make their energy as healthy as their granola. They did not want to make a token effort at renewable power, however. They wanted to do more. As they consulted with ReVision, they realized they had more opportunities than they had thought. And they were soon thinking, Aaron Anker said, "It would be really cool to go to 100%." Very quickly, the goal was changed from one of solar power for electricity to solar power for all energy, including heat, processing energy, and more. They would not just add a few panels and do some insulation and weather sealing, they were going all-out.

This was not a simple proposition. GrandyOats used a lot of propane for their baking, and their ovens would have to be replaced with electric models. They had a propane-powered forklift. Heating could be done with electric heat pumps, improving comfort and reducing costs as side benefits. Of course, converting each of these things to electric power would require another increase in the size of their photovoltaic (PV) system.

The site for their array was part of what had once been an 8.5-acre ball field, pressed into service to provide space for their own solar system. ReVision Energy put 288 solar panels on the field in an 80.64 kW system. It is expected to produce an average of 95,622 kilowatt hours of electricity annually, reducing their costs below what they would have been, even with financing.

That array now supplies all of GrandyOats' energy needs: lights, outlets for computers, heating, cooling, ovens, and even a battery-powered forklift. They are 100% powered by the sun, and 100% net-zero energy users. Their energy system offsets over 145,000 pounds of greenhouse gas emissions.

GrandyOats is the first net-zero food producer in New England, according to Phil Coupe, ReVision Energy's co-founder. Aaron Anker commented on this with an obvious sense of satisfaction, "It's really nice to do the right thing for our business and for our staff and our kids and the people in the community." He went on, "I hope we can educate other producers out here to do the same things."

GrandyOats products are available in stores all over the country. Among the stores carrying them are the Littleton (NH) Food Co-op and Middlebury (VT) Food Co-op, two Green Energy Times sponsors.

Both Nancy Rae Mallery, our editor, and I have tested GrandyOats products, and we agree. "Tasting the maple cashews is a moral imperative! … *Yummy!*"

GrandyOats website is grandyoats.com.

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