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WHEN ACTIVISM meets BUSINESS

World's Largest Investor-owned Utility Goes 100% Renewable

By George Harvey

Desmond Tutu, an Anglican bishop in South Africa, achieved a fair amount of fame as an anti-apartheid activist. Now he is calling on businesses to cut their ties with the fossil fuels industry.

Bill McKibben, a Schumann Distinguished Scholar at Middlebury College, has gained a lot of press recently as the leader of 350.org, which is calling on investors, especially colleges and universities, to divest of their holdings in the fossil fuels industry.

Many others have been pushing the cause for renewable energy, as well. Though it has been slow, the activist-propelled movement away from ties to the fossil fuels industry has been gaining ground. At least, it has been slow until now.

On November 30, 2014, E.ON, the largest investor-owned utility in the world, announced that it is spinning off a company to take all its nuclear and fossil-fuel-burning power plants. The parent company will focus entirely on renewable power, primarily from wind, solar, and biomass. In effect, E.ON is answering the call of Bill McKibben and Desmond Tutu. The largest publicly traded utility on Earth is distancing itself from fossil fuels.

This is about as radical as a change can be. E.ON will be giving up nearly all the traditional power generating facilities on which its business was built. Instead, it will work on a forward-looking set of sustainable systems that are as yet not entirely developed.

The German government has already committed the country to closing down

E.ON coal-burning plant in Rostok District, Mecklenburg-Vorpommern, Germany. Photo by Jan Rehschuh.

cont'd on p. 14

CARBON POLLUTION TAX BENEFITS VERMONT

Future storms similar to Irene are inevitable. We must take bold steps, like the carbon pollution tax, to help to slow climate change. This photo was taken in Pittsfield, Vt., during Hurricane Irene. Photo: Barb Wood

By Fran Putnam

The recent launch of an effort to put a price on carbon pollution in Vermont is a forward-looking, smart economic strategy. A growing, diverse coalition of businesses, low-income organizations, environmental groups and citizens have looked hard at the benefits, costs and potential policy framework for taking this step.

The coalition commissioned an economic analysis to understand the impacts of a carbon pollution tax; an analysis recently undertaken by the independent Regional Economic Models (REMI), a firm often hired by the State of Vermont. The results of the study show that a well-crafted policy can reduce Vermont's fossil fuel use, add jobs and stimulate our economy in a way that is equitable for all Vermonters.

On the surface, it might seem odd to believe that an assessment on carbon pollution could stimulate our economy. Understanding how this tax would work is crucial to understanding how that can be true.

Currently, most of the money Vermonters spend on fossil fuels goes out of state to large corporations, doing little for our economy. The report highlights that in 2012 Vermonters bought over $1.2 billion worth of gasoline with only about 25% of this value remaining in the state through retail sales and distribution.

That equates to a loss of $900 million to imports from other states, countries, and continents (nearly 3% of gross state product). The independent REMI analysis states, "Reducing these imports could 'keep more dollars local,' grow the Vermont economy, and create more jobs."

cont'd on p.3

HARD DECISIONS – EASY SOLUTIONS

"Everything is impossible until it is done"

By George Harvey

Every once in a while you have an outstandingly good day. October 29 was one of those days. Its news had four stories about a world moving to renewable power – something some people are reluctant even to try because they insist it will be too hard – and all four stories show how well that move has gone.

First, I read about Bertram Fleck, chief administrative officer of the German district of Rhein-Hunsrück. He was featured in an article in the Edmonton (Alberta) Journal, as he talked to people there about renewable power in his district about the truly impressive things that had been done there. "Everything is impossible," he said, "until it is done."

Rhein-Hunsrück started to address issues of renewable power in 1999. There were several goals, including cutting various types of pollution while improving the economy. The district started by promoting efficiency in buildings. This was followed by encouraging people to add solar PVs and put wind turbines on the grid. These are often owned by farms, towns, small businesses, and co-operatives. Biomass plants were also added, providing grid power with waste heat going to schools, business, and homes.

Now, Rhein-Hunsrück produces 177% of the power it needs, and the excess is exported. Carbon dioxide emissions have been cut by 64% from their 1990 levels. The economy has $50 million more going through it each year, providing employment and income for the district's 102,000 people.

Then, on the same day, I read about the latest solar power auction in India. First Solar presented bids for two blocks of 40 MW at $0.086 and $0.087 per kilowatt hour (kWh). This is particularly interesting, because the lower limit at which electricity generated by imported coal can be competitive in India is about $0.09 per kWh.

The price of solar power has achieved full grid parity in India,

cont'd on p.24

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Thank you all for your help!

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Green Energy Times is produced by 100% solar power, off-grid with a 3.8 kW PV system. We live and know that Energy Independence is indeed possible - with clean, sustainable renewable energy along with reducing your needs. We walk the talk!

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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G.E.T.'s Carbon Footprint Disclosure**. Green Energy TImes is printed on as high of a recycled content paper as one can get - locally. The printing process uses eco-friendly water-based inks. There are not any totally green printers in the area that we are aware of, so it would mean trucking them MUCH further to have G.E.T. published in a totally green manner, thus increasing carbon emissions, as a consequence. We chose to move from printing that used soy based inks because the soy is only used for the colors - not black, which is the most prominent color.... G.E.T.'s distribution emissions are also kept to a minimum, as well. With the wonderful help that we g.e.t. within many communities, it keeps our carbon footprint a bit lower. Hopefully our footprint is offset because we are 100% solar powered! Our Graphic designer, Amy Niebel, who owns and operates Double Plus Green, in Brookline is also Solar-powered. Because all of our employees work from home, our carbon footprint is kept to a minimum. We all grow and harvest organically and live as sustainably as possible. We DO walk our talk! ***Peace!

Wishing you all a sustainably peaceful holiday

LETTER FROM THE EDITOR

As I look outside at the foot of snow on the ground today, the day after Thanksgiving, it appears that winter has arrived early. Is it going to be another extra long, hard winter? The seasons seem to be changing in front of our eyes. The week's weather is forecast to be unseasonably cold and then warm, up and down all week - which seems typical these days.

As I put another log in the wood stove, it reminds me of our feature section in this issue of G.E.T., Sustainable Forestry. I pondered this as I glanced at a holiday card I received, printed by a local Tree-Free Greeting Card company. The card and envelope are made from 100% post- consumer recycled paper that was made with wind power, printed with soy-based inks, is green e-certified and made in the USA. Wonderful!

This led me to think about Green Energy Times and the fact that we choose to print, in addition to offering each issue online. Why? Because we reach so many more people with our printed edition. Many still do not use the Internet, for one reason or another: construction workers, many farmers and elderly see no need to do so. It is just as important to reach them as it is the owners of the construction companies or farming suppliers. G.E.T. is a resource publication with solutions. Paper IS natural and renewable, and with sustainable forestry, is an important part of our solution. Our forests are necessary for carbon sequestration, for the air we breathe, for heating, for soil, for paper, and even maple syrup. It is important for us to reach everyone with our information. This is why you are most likely to find G.E.T. in the supermarkets or local diners -- everyone eats. We do this as responsibly as we can and still 'keep it local.' G.E.T. is printed on paper with recycled content that is as great as possible, with water-based inks that can be washed down the drain. It is printed locally and distributed with the lowest carbon footprint we are able to achieve.

Happy holidays to you all and may 2015 bring in an even more awareness of why we need to each reduce our own carbon footprint from the little things that we touch upon in our "It's a Green Life" section in the back section of G.E.T. Even more important are the bigger things that are happening all around us: many, many homes are going solar along with larger community-scale solar that is being developed.

Wind is still our least costly means to generate the power we consume and need as a society, so please support this industry. Wind power is also renewable and every bit as reliable as fracked and natural gas which is not renewable and adds to the problem, increasing our greenhouse gases. Solar now has costs on par with gas, but is renewable and reliable -- a much better move for an energy-independent, sustainable future. The means of storage capacity for the clean energy we can affordably produce confirms that we indeed do have the means to become energy independent and responsible inhabitants of the planet we all reside on.

While it is frightening to hear the reports and warnings from the IPCC, this awareness should move us all to become even more responsible for each of our own needs, as we enter into this New Year. Let's all become energy-independent with clean renewable energy and live our lives so that we can meet those needs. Let's button up our buildings, drive less and with smarter, thoughtful ways to commute, and let's live every moment of our lives responsibly - for our children's sake, and our own. Let's leave them a place that they will be able to survive on. Let's have a responsibly Happy New Year!

- Nancy Rae

LETTER TO THE EDITOR

Nov. 10, 2014

When there is a huge solar energy spill, … it's just called "a nice day."

Dear Nancy Rae,

First of all, I love Green Energy Times. It is so right on with the information that it provides. I have some ties to Vermont which I am glad I have. I am on the alumni board of Green Mt. College and love the direction the college has taken since I was there. (long time ago, that is all I will say, it was a two year, all girls school)

I am a self proclaimed energy "nut" , I teach PV at Hudson Valley Community College and host a monthly meeting for Capital Region NYSES (New York Solar Energy Society) . I am a subscriber of your newspaper and my husband and I fight over who gets to read it first.

My question is would it be possible to add a New York State column or do a NYS version of your newspaper? It is such beneficial information and I would love to see a presence of Green Energy Times here in NYS. I was interviewed a while back by one of your reporters when I had an Earth Day event at the high school I taught at and was demonstrating how I made biodiesel. I think there would be a demand for the the information that you provide here in the Capital Region. Your website is great too.

Thank you for your good reporting and keeping us up to date on the latest information.

Here is a link of a recent video that NYSERDA did of our home if you would like to get to know about Paul and me a little: https://www.youtube.com/watch?v=J7WD9ai1Cec&feature=youtu.be

Sincerely, Joanne Coons

Link to the video: https://www.youtube.com/watch?v=J7WD9ai1Cec&feature=youtu.be

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David Blittersdorf's View from the Top

LETTING GO OF CARBON

The 5 Stages of Loss

Stick season is conducive to introspection. This year, after leaves have fallen but before the snow has really arrived, I feel more sad than usual. The reason? I have worked personally and professionally for over 30 years to advance renewable energy, but I have yet to see a decrease in either carbon emissions or fossil fuel use. Americans still consume over one-quarter of the world's resources while making up 5% of its population. We have to do much more, and quickly, or our complex industrial society will crash.

Change can feel like death, because change always involves loss. There is no way we can continue the current American lifestyle. Energy transition is the biggest challenge humanity has ever faced, because it requires us to plan a voluntary change. To my mind, humanity first needs to move through the five stages of grief (denial, bargaining, sadness and regret, resentment and frustration, and acceptance) over the coming changes before we can move forward.

Unfortunately, after decades of discussion, we still seem to be stuck in the first stage. At the national level, we are living with a deficit of actionable ideas and leadership, brought about by denial. Both ends of the political spectrum are prone to mischaracterizing or minimizing the challenge before humankind. Climate-change deniers refuse to believe there is a problem, and those who do accept the scientific realities of peak oil and climate change are still in denial about the lifestyle shifts required to meet this challenge and survive. Renewable energy will be essential to weather this transition, but it is not a panacea that will enable us to continue to pursue endless growth on a finite planet. Even with significant increases in our renewable energy infrastructure, we will not be able to continue our current levels of energy consumption. We will need to change where and how we work and live, eat and move. We will not be able to drive personal automobiles, even if they are all electric.* This problem is bigger than any one individual, but it is solvable by individual actions under collective leadership.

It is imperative that we plan an 'energy descent' for our culture, beginning right here at home. Our only chance of surviving is to cut energy use to 20% of today's levels, and switch to renewables such as wind and solar. This requires us to drastically change almost everything we do, and how we do it. The first step is to tax carbon emissions, which will decrease fossil fuel use and generate funds for alternatives – and thereby stop the proposed natural gas pipeline, build a viable mass transit system of buses and trains, accelerate wind and solar farms, resettle ourselves into villages, towns and cities to facilitate walkable lifestyles, support local food systems and electrify our economy. Let's get out of denial, lift our heads and begin moving in the right direction.

Vermont should lead the U.S. by passing a carbon pollution tax, as soon as possible. Why? Because we can, and because it will benefit us, long-term. A state carbon pollution tax will provide the necessary group incentive toward a much-needed goal. British Columbia has had a carbon tax for years, with positive effects, and can serve as a model. We are now living within a narrow window of opportunity that grows narrower every year – immediate steps are necessary to take action to prepare for and adequately fund a transition away from fossil fuels that will prepare our society for the years to come. Vermont is uniquely positioned to spearhead this transition effort. We are a small state that values independence and resilience, and Yankee preparedness and thrift are still valued here above the average American trends of overconsumption, deficit spending and expanding personal debt.

* See the essay "Six Myths About Climate Change that Liberals Rarely Question," recently posted to Resilience.org by the Milwaukee chapter of the Transition Towns movement.

David Blittersdorf is the President/CEO of AllEarth Renewables in Williston, VT — a company that specializes in the design and manufacture of the grid-connected AllSun Tracker solar energy system. He founded NRG Systems in Hinesburg, VT, and is the managing partner of Georgia Mountain Community Wind.

The DOE/Sandia Scaled Wind Farm Technology (SWiFT) facility at the Reese Technology Center in Lubbock, Texas. Photo by Lloyd Wilson.

Total Energy Study says:

We CAN Do It!

Vermont CAN achieve both 90% renewable energy and a 75% or more reduction in greenhouse gas emissions while maintaining or increasing our economic prosperity.

The Public Service Department just announced the availability of the final report from its two-year "Total Energy Study" (or "TES"). This study examines how Vermont can achieve its greenhouse gas emission reduction and renewable energy goals through modeled combinations of technology deployment and novel policy structures. The report concludes that these goals are both achievable and affordable.

"I am pleased that this very thorough study shows we can meet both our climate and energy goals while not only keeping Vermont's economy strong, but also while enhancing the segment of our economy that is deploying renewable resources throughout the state" said Christopher Recchia, Commissioner of the Vermont Public Service Department. "It shows we are on the right track with our policy of advancing Vermont-based efficiency and renewable resources for our energy security, economy and our environment" he added.

The TES shows that by 2050 Vermont can achieve both 90% renewable energy and a 75% or more reduction in greenhouse gas emissions while maintaining or increasing our economic prosperity. However, to do so will require significant changes in energy policy, fuel supply, infrastructure, and technology.

The TES process depended on the input from more than 100 Vermont energy experts and interested stakeholders, as well as contracted assistance from Dunsky Energy Consulting and the Regulatory Assistance Project.

The final Total Energy Study report is available on the PSD's web page:

http://publicservice.vermont.gov/publications/total_energy_study

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CARBON POLLUTION TAX

cont'd from p. 1

One of the reasons pricing carbon pollution in Vermont would work well is that all of the proceeds from it would stay in Vermont.

As currently conceptualized, a full 90% of the revenue would be returned to Vermonters in the form of rebates and tax relief; half to individuals and half to businesses, governmental agencies and non-profits.

The remaining 10% would be dedicated to helping Vermonters and Vermont businesses make investments in clean energy solutions, such as weatherization improvements, renewable energy, efficiency of transportation, etc.

Special attention would be given to lower income Vermonters to address the fact that they spend a higher percentage of their income on gasoline and fuel oil compared to other Vermonters. The proposal currently envisions twice as many dollars going back to lower income Vermonters, potentially partially as a rebate and partially as more immediate dollars.

Importantly, this plan would be phased in over a 10-year period, giving people the opportunity to adjust and make the energy-saving investments that will, ultimately, save them far more over time. The maximum cost of one scenario would have the pollution price rise to 45¢ in the tenth year; that's far less money than we expended recently, when the cost of gasoline was near the $4 pergallon mark.

Should Vermont be the first state to put a price on carbon pollution? If we believe that economic stimulation is good for our state, and we want to help Vermonters make the homes, businesses, and vehicles more energy efficient, I say yes. This is a plan to take seriously.

It's also important to note that this is not a new approach. Places like British Columbia have had such a policy in place since 2008, and they are meeting their objectives. It is also a policy that a growing number of high profile conservative economic experts are promoting. For instance, Henry Paulson, treasury secretary under George W. Bush, supports it. Republican strategist George Shultz, who served as Ronald Reagan's Secretary of State and Richard Nixon's Secretary of Labor, also supports such a tax.

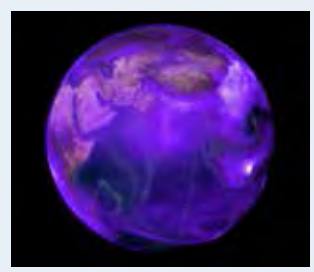
The REMI study and the carbon-pricing proposal is a good starting point for a far-reaching discussion. I hope those debating its merits will look at the details, including the REMI study, which can be found by clicking on the REMI logo at the following website www.energyindependentvt.org/

This is a bold approach, but we cannot afford to wait. As leading scientists and entities like the Pentagon and the World Bank have noted, unless urgent action is taken very soon, it will become extremely costly to reduce emissions fast enough.

So we must let facts – not fear – drive this important conversation. Vermont is already experiencing major climate changes, and we have experienced the costly wrath of storms like Irene. Future storms are likely to be worse without substantive action.

Business as usual is not working. It's time to tackle this problem at the policy level, and a serious discussion about putting a price on carbon should be part of the mix.

Weybridge, VT resident Fran Putnam is active at the local level on efficiency, renewable energy and climate solutions.



Soot put into the atmosphere by fossil fuels can be seen from space. NASA photo

Cyan Magenta Yellow Black

COUNTY TIRE ACCOMMODATES HYBRID TIRES

GET HIGHER GAS MILEAGE IN YOUR HYBRID VEHICLE

By George Harvey

Those of us who drive hybrid vehicles should be aware of the importance of low rolling resistance (LRR) tires. Having LRR tires can improve gas mileage by over 4%, and even in a hybrid vehicle, which already has good mileage, this can do much better than just to pay for any difference in cost over the tires' lifetime. And any saving at the pump helps save our environment.

Steve Dupoise, owner of County Tire Center in Middlebury, Vermont, gave us a few tips and observations on low rolling resistance tires for hybrids. These tires are a specialty of his business; both he and his service personnel have been trained and certified for them. First, of course, is to use them instead of standard tires by all means. The first generation of LRR tires got a somewhat bad reputation because they wore faster than regular tires. Some people also felt they did not grip the road quite as well. The current generation of LRR tires has addressed those issues.

Beyond that, he advises any driver to meet the standard for tire pressure that is posted on the car's door tag, rather than on the sidewall of the tire. Since the large batteries in hybrids make them heavy, compared with other cars, they may require slightly different pressure in the tires than standard cars.

He has some specific suggestions about what good brands and models are. Bridgestone makes LRR tires, and the B-381 is one. Bridgestone Ecopia tires are also designed and manufactured specifically to be as kind to the environment as possible. These come in a number of different types, including snow tires.

Another tire company he suggests is the Nokian R2, which is a snow tire without studs. For those who need studs, the Hakkapeliitta R8 fits the bill. Dupoise says either of these tires can do well with a Prius because they have good grip. Nokian has been working on a new substance for tires, a blend of silica, canola oil, and natural rubber it calls Cryosilan.

Other tire companies are moving to producing LRR tires, as well. This is true not only for those tires that are used on hybrid vehicles, but for all vehicles. Standards are changing, and that includes those required by the government. We see both federal and state governments discussing requiring LRR tires on all cars to improve fuel mileage.

Learn more about County Tire Center at countytirecenter.com or (802)388-7620.

County Tire Center, of Middlebury, VT specialize in h0ybrid efficiency.

THE COST OF A LITTLE IDLING COMFORT

IDLE-FREE VT INC.

By Wayne Michaud

On a cold winter morning, from his living room, Jason presses the start button on the remote vehicle starter of his pickup truck. Outside, the engine starts up and runs for the next 15 minutes until he finally drives the truck away.

On a hot afternoon, Rebecca arrives ahead of dismissal at her daughter's elementary school. Her car engine idles with the air conditioner on as she emails and messages on her smartphone.

Why do people let their parked vehicle engines idle? These vehicles are designed to be conveyances, but they are just sitting there going nowhere, wasting gas. So, why? The answer is that typically, their occupants seek comfort. On cold days, many of us insist on warm vehicle interiors before departing. On hot days, we want to avoid the discomfort of feeling hot and sweaty as we wait in our parked vehicles.

Unfortunately, a high price is paid for a little idling comfort:

1. **Idling costs money**. Passenger vehicles (cars, pickups, SUVs, vans) on average consume about 0.4 gallons of gas an hour when idling. Depending on engine size, idling for 10 minutes daily while parked can cost $50 to $200 annually. And excessive idling causes engine and component wear, including carbon soot buildup, and shortens the life of engine oil, spark plugs and the exhaust system.

2. **Idling wastes energy and contributes to climate change.** The University of Vermont Transportation Research Center recently conducted a comprehensive study on vehicle idling. Their report findings estimate that Vermonters voluntarily idle their passenger vehicles (while parked) for 9.6 million hours annually, consuming 4.1 million gallons of fuel and emitting 36,500 metric tons of CO_2 into the atmosphere.

3. **Idling has a negative impact on air quality and health.** Despite emissions controls, vehicles emit harmful exhaust chemicals such as benzene, carbon monoxide, nitrogen oxides and hydrocarbons, especially when idling. Extreme weather exacerbates these toxins. They cause cancer and respiratory illnesses, such as asthma. Vermont has elevated levels of asthma. Children and the elderly are particularly susceptible to these toxins.

Be smart and responsible by limiting idling when parked! Sacrifice a little idling comfort to save hundreds of dollars anually, conserve energy, reduce carbon emissions, and improve our health. *Cont'd on p. 6*

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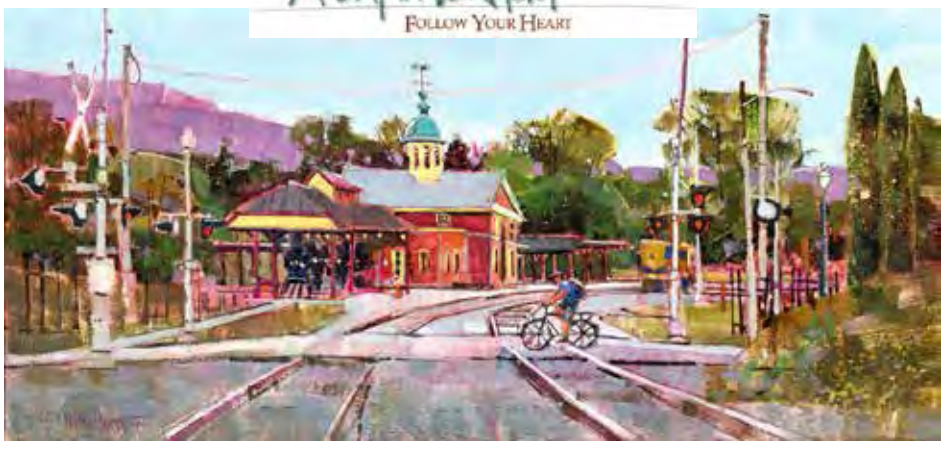

Rail Station in White River Junction, Vt, with bicyclist crossing over the RR tracks -- two modes of transportation that help to reduce our carbon emissions. Courtesy of and painted by Peter Huntoon. www.ADayinVermont.com.

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PARK UNDER SOLAR

By Green Energy Times Staff

A 17.55 kW photovoltaic installed as a carport at Bill Maclay Architects office building in Waitsfield, VT. It was the final touch in a decade-long process of bringing the offices to net-zero. Photo courtesy of Bill Maclay.

We have seen a lot of articles about solar installations, and have published on a number of different kinds of installations. There is one we have not been saying much about, and it is time to rectify that. It is putting solar panels above areas where people park.

The Minneapolis-St. Paul International Airport is installing a three-megawatt array on its Terminal 1 parking building. The array will not occupy any land that is available for any other purpose. It will provide some shade for cars on the top level, but will not get in the way. A few problems with reflected glare getting into the eyes of pilots momentarily have been anticipated, but this is being remedied by adjusting the panels so they are not all aligned exactly the same way, and the slight misalignment will not alter efficiency appreciably.

We have also seen residential and business structures in New England getting solar systems on carports that also provide a place to park that is out of the weather. The advantage of combining land use for cars and solar power is increased by the fact that it is possible to use the panels as a weather shield for cars and people accessing them.

It is easy to see other places where solar can be used in combination with other uses, increasing the utility of land without reducing the use it currently has. The large parking lots (Park 'n Ride lots) used by towns, schools, factories, and large stores very often have no trees in them, meaning that they get full sun. Solar panels that allow parking beneath can shade the road surface while making carbon-free power. Another idea can be taken from the past when sidewalks were once roofed over for the comfort of pedestrians; perhaps this could be done again with solar roofs in some places. A number of colleges have already done this, as well. We have an abundance of opportunities. Perhaps we should use them.

PROTERRA ALL ELECTRIC BUS
charges in ten minutes

By George Harvey

Photo: Proterra.com

While a lot of attention has been given to Teslas and Nissan Leafs, we should really look at electric buses. One company in particular, Proterra, is making a lot of progress with such vehicles.

Proterra is not just building electric buses. They are setting records. Earlier this year, Proterra had an electric bus go 700 miles in one 24-hour period, and they believe this is a record. It did stop for recharging along the way, but the bus recharges in about 10 minutes, an amount of time a bus might typically stand idle at a terminal while the driver takes a break. And, the air conditioning was on for the test.

There is more to be said about the Proterra, however. For one thing, it can compete successfully with buses powered by diesel and compressed natural gas (CNG). The initial cost of the Proterra is a bit high, compared to conventionally powered buses, but this is more than made up for by reduced maintenance and fuel costs.

The Proterra has a much simpler drivetrain than is required by either diesel-powered or CNG-powered buses. Motors are far simpler than internal combustion engines, and getting power from the motor to the wheels requires a much simpler mechanical system than a typical transmission. Because maintenance is simpler, its cost over the life of the vehicle is far lower.

The cost of electricity to drive a mile is very low, compared to the cost of CNG or diesel fuel. Proterra says the cost of fuel to drive a diesel bus a mile is about $1.03. By choosing the more complex hybrid technology, this can be cut to $0.76. A bus running on CNG costs about $0.71 pre mile to run. By contrast, the Proterra costs about $0.19 per mile.

Overall, the lifetime cost of a Proterra bus is $365,000 less than that of a diesel bus, and $225,000 less than that of one powered by CNG. These figures do not take into account the difference in costs of pollution, and those are far lower for electric vehicles than for those powered by fossil fuels.

Another problem with conventionally-powered buses is that they are noisy. On the other hand, the Proterra is not. And since noise is a serious problem in urban environments where buses are used a lot, the issue is important.

Proterra has been making buses since 2004, but in the short time of ten years the company has established a broad customer base, mostly in the South and on the West Coast. Six buses have been put on the road in Worcester, Massachusetts, however, and these seem to be doing well, despite the winter weather. We might think they could do well in Vermont and New Hampshire.

...AND THE BIKES WIN!

L to R: Charlotte Jeffreys, Bethany Fleishman, Sharon Racusin, Marcia Cassidy, Martha McDaniel, Scot Drysdale, and Hilde Ojibway. Photo: Aaron Brown

Courtesy of Vital Communities

A chilly autumn morning greeted five volunteers and three Vital Communities staff members who met in front of Dan and Whit's to test an interesting question: Is it fastest to get from downtown Norwich, VT to the Hopkins Center at the south end of the Dartmouth Green in Hanover, NH during rush hour by taking the bus to the bus stand in front of the Hop, riding a bike there, or driving, finding parking and walking to the destination? It was October 21, a normal Tuesday workday, and traffic was heavy while the competitors waited for the bus to arrive. Three cyclists with varying levels of equipment were there. Scot sported a recumbent bicycle, which is an exceptionally efficient converter of pedal power to speed. On the opposite spectrum was Hilde's used purple Schwinn, an unassuming but serviceable machine.

Vital Communities Transportation Program Manager Aaron Brown had cyclists and drivers sign a pledge to follow all traffic laws while participating – no speeding cars, no bikes running red lights or stop signs, etc. This would be a fair and legal race. Then the familiar sight of a white and blue Advance Transit bus turned right at the Norwich Inn at little after 8 am.

Valley News reporter James Patterson joined Aaron, Bethany, and Charlotte on the Advance Transit brown route bus. The race began when they boarded. The two drivers – Martha and Marcia – headed off in pursuit of the lots where they normally park for work, one at Dewey Field on NH Rte 10 north of the Dartmouth campus, and the other at Thompson Arena on South Park Street. Riding on the bus, it was hard to keep track of the two cars due to the steady stream of other vehicles in the left lane. The cyclists, however, were easy to spot. Scot blazed ahead with his safety flag flying above his bike.

The bus and bikes traded the lead a few times heading towards the Ledyard Bridge . But, right after passing under I-91, the bus hit traffic. It was clear early on that the bikes would win. The bus riders continued to look for the cars but couldn't see them.

The bus riders arrived at the finish line at the Hopkins Center about 11.5 minutes after boarding at Dan and Whit's. Scot, Hilde, and the third cyclist, Sharon, were all waiting for them. Scot had arrived there first. His ride took little more than nine minutes. Hilde barely beat the bus, but she made sure to "keep the results neat and clean" by keeping all cyclists in the winner category.

The group waited for the drivers to arrive. And waited. And waited. Finally, after the 20-minute mark, Marcia emerged from the Hopkins Center, to which she had walked from Thompson. The group enjoyed coffee and pastries and waited for Martha to arrive. It took her more than 30 minutes to join the group!

We had guessed that the bikes or bus would win, but we didn't think the differences would be so drastic. Thanks to good bus service, the marked bike lane, and no need to find parking, biking and taking the bus are the fastest, most convenient ways to get into Hanover at rush hour.

Zipcars, vehicles which can be rented by the hour or day, are available on Dartmouth's campus. This additional transportation option means one can bike, walk, or take the bus and still have access to a car during the day for errands.

Learn more at: www.vitalcommunities.org/blog/index.php/and-the-bikes-win/. Learn more about Darthmouth's Zipcars at: www.zipcar.com/dartmouth.

Motor vehicles are the greatest contributor to American air pollution.

Cont'd from p.4

IDLING COMFORT

Tips to limit idling are as follows.

• In all but sub-zero temperatures, limit warm-ups to 30 seconds - many vehicle owner's manuals recommend avoiding prolonged idling; driving slowly to moderately is the best way to warm up (make sure defrosting is adequate before driving).

• If sitting in a parked vehicle for more than 10 seconds, shut the engine off as restarting only uses 10 seconds worth of fuel.

• Comply with Vermont's idling law that limits idling to five minutes in any 60 minute period.

To learn more, visit idlefreevt.org.

Wayne Michaud of Bristol, VT is director of Idle-Free VT Inc. a non-profit organization that raises awareness of unnecessary vehicle idling in Vermont. They are currently implementing Vermont Idle-Free Schools, a High Meadows Fund-supported project that is providing idling awareness and eco-driving education in classrooms during the 2014-15 school year.

SMART COMMUTING IN NH & VT

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

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

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

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

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

IN NEW HAMPSHIRE

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

ADVANCE TRANSIT (AT) – Free weekday bus for Lebanon, Hanover, Enfield, Canaan, NH, and Norwich and Hartford, VT. Dartmouth and DHMC Shuttles. ADA Services. 802-295-1824. advancetransit.com CARROLL COUNTY TRANSIT - Services and connections to Belknap County. 888-997-2020 tccap.org/nct.htm

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

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

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

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

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

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

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

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

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 - Buses from Randolph and Fairlee to Dartmouth, & local village. 800-427-3553 **stagecoach-rides.org**

Thetford Volunteer-Assisted Weatherization Program

By Bob Walker

In 2013 the Thetford Energy Committee wanted to develop a program to assist those whose homes were in need of weatherization, but who could not afford it and did not qualify for Vermont's free Weatherization Assistance Program. . Here is a report on the steps we took to help one Thetford homeowner.

We decided to create a Volunteer Assisted Weatherization (VAW) program that would use grant money to pay for materials and a Home Performance with Energy Star contractor to:

Do test-in and test-out Home Performance with Energy Star assessments

Develop a work scope and materials list

Train and oversee, as needed, a team of skilled volunteers installing the measures

Submit a final Home Performance report to Efficiency Vermont

We got approval from Efficiency Vermont that work done through this initiative would qualify for financial incentives through the Do-It-Yourself track of the Home Performance with Energy Star program. Incentives from the improvements were redirected into the Thetford VAW Fund for future jobs.

We worked with Capstone Community Action (formerly Central Vermont Community Action Council) to establish income guidelines for qualifying to participate in the program and then sought participants in the program through the local churches, food shelf and Capstone. We had two candidates for this first pilot outreach effort and ultimately chose to work on the home of Lorraine Carbino in Thetford Center, Vermont.

We recruited 11 skilled carpenters and weatherization contractors who contributed 107 hours picking up materials, preparing the site and installing improvements. . Improvements installed include:

Foam board on the kneewalls, foundation walls and rim joists

Plexiglass (acrylic plastic glazing) interior storms over basement windows

Sealing air leaks in the basement, attic and hot air ducts

Properly venting the clothes dryer

This fall, volunteers built and installed interior storm windows to reduce air leakage and increase R-value in five poorly performing windows.

The labor and materials costs for this work, paid for by grants from the Vermont Community Foundation and Ben and Jerry's Foundation, totaled $2,770. Efficiency Vermont paid $970 in incentives, so the net cost of the job was $1,800.

The audit test-out report determined that these efforts reduced air leakage in the house by just over 10% and will reduce energy use by more than 21%, saving Lorraine an estimated $488.50 on her fuel bills annually. So energy savings will pay for the cost of improvements in less than four years and the house will be much more comfortable. In addition, the reduced fuel use will cut CO2 emissions by an estimated 2,800 lbs. per year. .

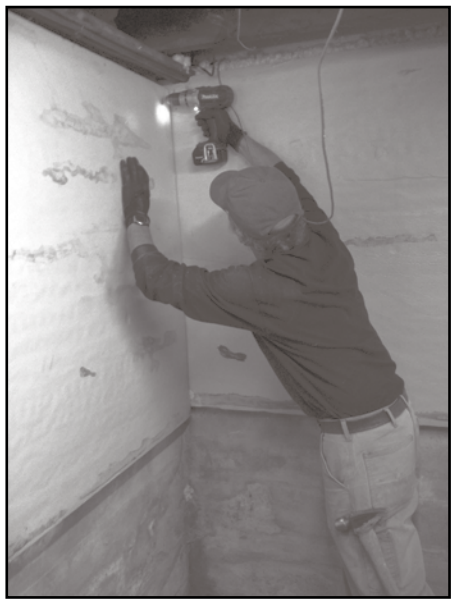
After reviewing the results and getting feedback from participants, the Thetford Energy Committee and Select Board have decided to repeat the effort going forward. In order to make the program more sustainable, we are teaming up with the Ompompanoosuc Community Trust, a Thetford non-profit, which will solicit tax-deductible charitable donations from Thetford residents and businesses to support future VAW jobs. .

We are hoping other Energy Committees throughout the state might replicate this model program to help weatherize homes of those in need. To view more photos of the project, go to http://www.thetfordvermont.us/departments/energy-committee/ For more details and information on how to replicate this effort, contact TEC chair, Bob Walker at 802-785-4126 or bwalker@SERG-info.org.

The Thetford Energy Committee would like to thank everyone who helped make this such a successful effort.

Bob Walker is chair of the Thetford Energy Committee and is the executive director of the Sustainable Energy Resource Group.

Installing foam on a foundation wall, sealing the seams and the parged foundation wall completed.



Top left: Installing window; above top: installing foundation foam; above bottom: Adding storm window in basement. All photos courtesy of Bob Walker

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RUTLAND, VT HOSTS NATIONAL SOLAR TEST CENTER

Green Mountain Power's efforts to capture energy from the sun could get a boost thanks to a state-of-the-art research station installed at the Green Mountain Power Renewable Education Center in Rutland Town.

The mobile station is designed to provide among the most accurate solar measuring systems in the world, and is one of just two like it in the United States. The other is in Alamosa, CO.

GMP was selected to host the site, in cooperation with the U.S. Department of Energy, IBM, the National Oceanic and Atmospheric Administration and others, due to its commitment to solar energy and industry-leading solar programs, willingness to collaborate with multiple parties and strong support for solar development.

"It's a tremendous honor to host this project and continue to expand our understanding of the role solar energy can play in Vermont and around the world," GMP President and CEO Mary Powell said. "This project will help the entire industry by helping improve solar forecasting and reducing already-falling solar costs. This initiative is part of our mission to deliver the clean, cost-effective, and reliable power customers tell us they want."

The solar measurement system, owned by NOAA, was installed at no cost to GMP customers as part of a DOE SunShot project focused on solar forecasting. Other partners include ISO-New England, which operates the regional transmission grid and energy market; ISO-California; the National Renewable Energy Laboratory (NREL); IBM; and Tucson Electric. NREL, located in Golden, CO., is the nation's leading efficiency and renewable energy research and development lab.

"This project is a direct outgrowth of our focus at the Energy Innovation Center in Rutland and our goal to make Rutland the Solar Capital of New England," GMP Vice President Steve Costello said. "In two years, GMP has become known across the industry as one of a handful of electric companies pushing boundaries to create the most efficient and cleanest energy future possible."

The new system will send real-time data to NOAA, IBM and the World Radiation Center in Davos, Switzerland. The data collected in Rutland will be used along with data from other sites in an effort to develop a solar forecasting tool that can be used to maximize the use of solar production, remove system barriers to solar generation, and minimize costs.

Kathleen Lantz, research scientist at NOAA, said the project was part of one of the administration's key goals of helping create an informed society that anticipates and responds to climate and its impacts.

"Our mission includes research and education, and projects like this can help tie them together," Lantz said. "We are pleased to be able to work with Green Mountain Power, which has demonstrated a remarkable commitment to working with a diverse group of industry and agency partners working on DOE's SunShot initiative to help make solar cost-competitive with other forms of electricity while reducing impacts on our climate."

More information is at www.greenmountainpower.com.

From Solar Works To Real Goods Solar

Montpelier, VT

Above: Roof-mount systems installed by Real Goods Solar VT. Right: Ten Stones Array - the first of it's kind installed in Vermont.

By George Harvey

The story of Real Goods Solar (RGS) goes back to Real Goods, a store that opened in California in 1977. The business was the first ever to sell solar panels on the retail market, in 1978. Solar was very expensive in those days; the price of a nine-watt solar panel was $900. They were tiny, of course. The first hundred panels actually came from a salesman who showed up with a hundred of them in his Porsche.

Real Goods is very important in the memory of many people, as an inspiration for off-grid, sustainable living. Not content merely to sell solar panels and the hardware to install them, Real Goods published the Solar Living Source Book. This wonderful book taught and inspired us, and continues to do so today, as new editions come out. It was what taught Nancy Rae Mallery, our editor, how to live off-grid, and what gave her much of the technical knowledge she needed to go solar and, eventually, to start Green Energy Times.

In 1981, not long after Real Goods sold its first panels, another company called Solar Works opened in Vermont, selling and installing solar panels. The business was founded by Leigh Seddon. Solar Works set up the first grid-tied solar system in Vermont, twenty-eight years ago, a system, with its original panels, that is still in use. In 2008, Solar Works merged with SolarWrights to form Alteris, and in 2011, Alteris merged with RGS, bringing two of the oldest retail solar companies in the country together to become Real Goods Solar.

You might think Solar Works would have lost its identity in all the mergers, but you would be wrong. Solar Works' original office was at 64 Main Street, in Montpelier, and through the changes that time has brought about, the company has always stayed there. RGS' office is still at the original location. In fact, the original records of Solar Works, dating from 1981, are still filed in the RGS office.

Thomas Champlin, who is the senior solar energy consultant for RGS Vermont, started dreaming of solar panels at a very young age, around thirty years ago, and about the time Solar Works was starting up. Though he was raised in Massachusetts, his family has a long history in Vermont, to the point that he has always identified with it. His background includes working in the park service in Washington, gaining a lot of off-grid experience, and a first-hand understanding of the environmental destruction of extensive clear-cutting of forests. He came back east and ran a fencing business in Massachusetts. But his interest in solar power came through and Tom joined Alteris. He was with the company when it merged with RGS.

There are several sales representatives in Vermont and New Hampshire, Pete Edling, Mark Spyrzynski, and Robert Morton. Tom does about 500 site visits each year, with 115 sales this year, with an average system size of five to six kilowatts. He had seen solar systems installed in 339 homes and businesses at the time of our interview, and no doubt more since then. He says rooftop systems average about $2.75 per watt, installed, after incentives. That is a far cry from the original, uninstalled nine-watt solar panels Real Goods sold for $100 per watt.

RGS tries to use locally-sourced components wherever it is economically possible. They use local excavators, such as Stonehammer, LLC, of Woodbury, Vermont. Poles are purchased locally. Where soil conditions allow, Techno Metal Post of VT, of Monkton, supplies self-augering posts with a frost sleeve that do not require concrete, for minimum environmental impact. Gridwork (racks) comes from Unirac or DPW in New Mexico and Alberta. Fasteners are by Ecofasten of Morrisville, Vermont.

RGS uses solar modules made by Solar World in Oregon. They have not been around quite as long as RGS, but they have 35 years of experience.

RGS for Vermont: rgsenergy.com/solar-by-state/vermont.

the Solar Store of greenfield, massachusetts

By George Harvey

The Solar Store of Greenfield is definitely worth a visit. They have a range of merchandise from books to composting toilets. Most of their work is installing solar systems in Franklin, Hampshire, and Worcester Counties of Massachusetts. But talking with owners Claire Chang and John Ward, we get the impression that while they install locally, they really do think globally. They do their work because they take the idea of making the world a better place very seriously.

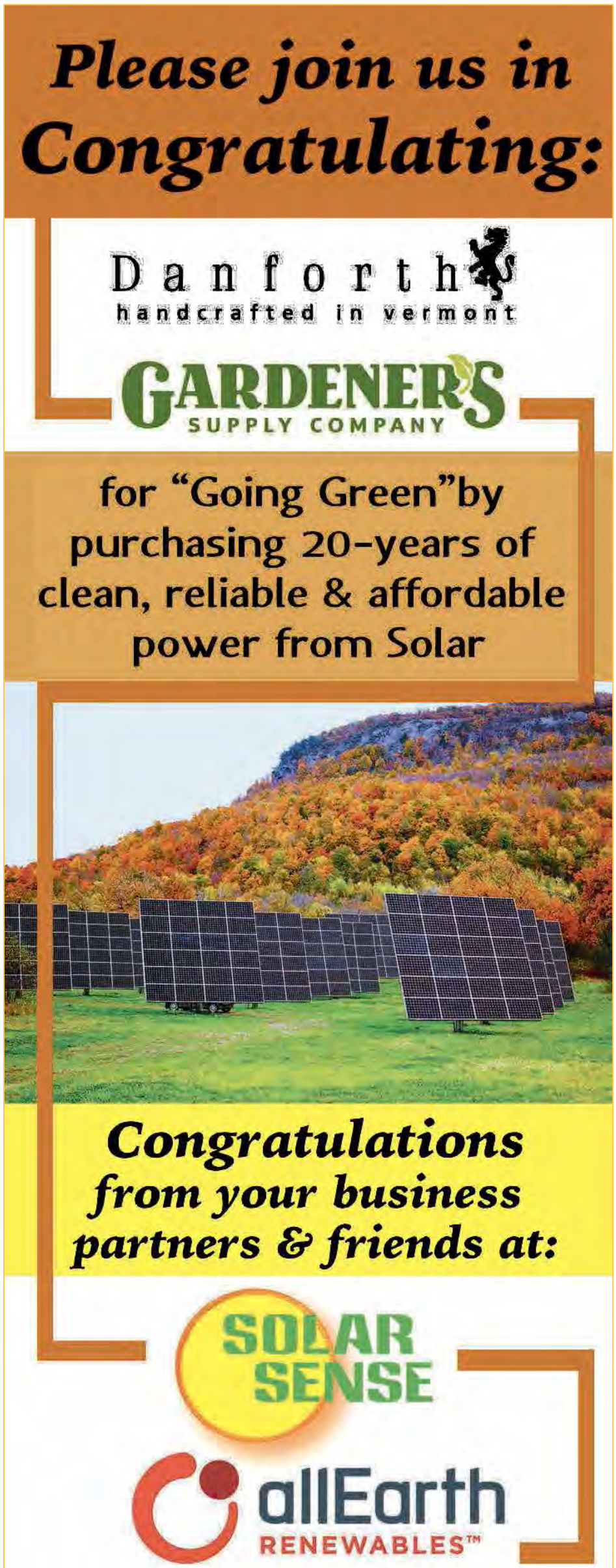
The business opened in 2005, and was the second of the independently owned stores in Dave Bonta's USA Solar Store network. The original owner, Mark Skinder, intended to provide an educational resource about solar thermal and photovoltaic power. He also wanted to help grow solar installers in the area of Massachusetts' Connecticut River Valley.

Claire Chang and John Ward joined the store in 2008, and bought it in 2011. While visitors had always found it easy to become more energy-aware, Chang and Ward wanted to make it even easier for them to move to a more sustainable and resilient lifestyle.

Chang told us, "We want to help people figure out how to move from where they are to a smaller carbon footprint with home heating, energy use, making the right decisions

cont'd on p. 12

Roof-mount system installed by the Solar Store of Greenfield



Two Local Businesses Cooperate for Solar

Staff article

Danforth Pewter and Gardener's Supply Company, a nationally known businesses based in Vermont, has partnered on a solar system for emission-free power. Danforth Pewter, a family business producing fine pewter work, is located in Middlebury Middlebury with stores in Burlington, Woodstock and Waterbury. Gardener's Supply, an employee-owned business providing environmentally friendly gardening products, has its headquarters in Burlington. They have cooperated on a new solar array on the Pulling Farm in Addison.

The 144 kilowatt (kW) system consists of SunPower 345-watt photovoltaic (PV) panels mounted on dual axis AllSun Trackers supplied by AllEarth Renewables of Williston, Vermont. The tracking mounts follow the sun, so the panels get greatest exposure as the sun moves across the sky. This means that the panels will provide optimal performance for the location where they are installed.

Because the system is optimized, it should produce 36% more energy than fixed-tilt PVs mounted on racks. A test of the tracking system got 1660 kWh of electricity per kW of PV panels, over the course of a year.

The electricity from the system is supplied through a power purchase agreement with SolarSense, LLC. The system operates through Green Mountain Power's net metering program, so Danforth Pewter and Gardener's Supply will be getting electricity at below market rates through the contract with SolarSense. SolarSense is also undertaking to support a child in the Vermont Make-A-Wish Foundation as part of their "Watts for Wishes" charity program.

Chris Fraga, founder and CEO of SolarSense, LLC, commented on the project, "This is a win through and through for Vermont and the stakeholders in the project." He stressed the fact that a number of suppliers and service partners were Vermont companies. In addition, the Vermont Economic Development Authority provided debt financing, and Green Mountain Power provided interconnects as part of their work to make Vermont a leader in Sustainable Energy. He added, "This project epitomizes our mission of socially conscious energy development, and we could not be more honored to be part of this initiative."

Bram Kleppner, CEO of Danforth Pewter, said, "AllEarth Renewables and SolarSense made it really easy for Danforth to become, as far as we know, the world's first solar-powered pewter workshop. We have been working on reducing our impact on the environment for a long time, and the creation of this solar farm allowed us to wipe out most of our electric energy carbon emissions in one fell swoop. Since the solar project is sited on land owned by one of our employees, this project really hit a sweet spot: Danforth gets reduced electricity costs, the employee who's hosting the installation reduces her power bills more or less to zero, and the atmosphere stays a little cleaner. The fact that we're partnering with our friends at Gardener's Supply as we both convert our businesses to renewable energy just makes it that much sweeter."

Gardener's Supply Company holiday photo. Photo: Gardener's Supply Company.

Jim Feinson, president of Gardener's Supply Company , said "The employee owners of Gardener's Supply could not be more pleased to partner with Danforth Pewter, AllEarth Renewables and SolarSense to develop 100% renewable solar energy to power our Williston garden center. Gardeners are truly America's backyard environmentalists, improving the world one garden at a time. They also have a very intimate relationship with the sun! Now Gardener's Supply can say we are improving our own 'backyard,' and every garden center customer can feel even better shopping with us knowing the substantial electrical energy needed for our greenhouses and store is coming from solar."

David Blittersdorf, president and CEO of AllEarth Renewables, said, "We are thrilled to partner with SolarSense to provide locally-produced solar power for two iconic Vermont companies. Both Danforth Pewter and Gardener's Supply have strong national reputations and their decision to go solar sends a strong message about the economic and environmental benefits of business-led renewable energy leadership. By utilizing our tracking technology with high efficiency SunPower modules, we can maximize production, boosting the total solar savings for Danforth Pewter and Gardener's Supply and the economic returns for each project. It's a real winning combination."

Fred and Judi Danforth, owners of Danforth Pewter. Photo courtesy of Anjanette Lemak, Designer at Danforth Pewter.

Many thanks to our Sponsor

AMERICAN-MADE SOLAR

-- with Battery Storage

By Tammy Reiss

Matthew, Tammy and Snickers Reiss, proud owners of this American made solar system. Gilbertsville, New York. Photo courtesy of Tammy Reiss.

Coming from a long line of self-reliant country flock in Upstate New York, it was a no-brainer for me to embrace renewable energy when the opportunity presented itself to become energy independent in 2014. My husband and I have always been good stewards of the land and live a sustainable lifestyle. We wanted to remain so while strategizing for our retirement, as well as being prepared for any manmade or natural disasters that may bring down the power grid.

As long as I can remember my family was happy owning energy-efficient homes while using firewood harvested from our properties to meet some of our energy needs. No thought was put into where the rest of the energy we consumed came from or how the extraction of those fossil fuels affected our planet and its inhabitants. We just took it for granted that because we live responsibly on our land, so other generations could benefit from its clean soil, air and water. We assumed others, including our government, used the land and what nature offers with the same respect. Many of us don't agree that using more fossil fuels is an acceptable answer to our growing population's energy needs. Some have further decided to lead by example, while making absolutely sure that any new source of clean energy was economically beneficial to our family and property values.

The family-owned business of Iron Edison in Colorado stood out as the company that would guide us through the purchase and installation of a 2200 watt, 24 volt American-made solar system with 300 amp-hours of battery backup storage. To make the purchase of our eight solar panels more sustainable, Iron Edison guided us to SolarWorld because they use renewable energy to manufacture the solar panels.

Iron Edison's nickel iron batteries, made in the USA by Encell Technology, work great with every major inverter and charge controller. They also have an integrated watering system and are completely freeze- resistant. They are rated for 11,000 cycles (good for an estimated 30 years) at 80% depth of charge.

Because our family is so self-reliant we applied for no state tax credits, built the solar rack and battery house, wired and installed the entire solar powered battery system and carport ourselves. Iron Edison's Brandon Williams talked us through the installation.

I can now say confidently, after taking the steps to secure my family's present and future energy needs with renewables, that there is no excuse for our country to keep building out the infrastructure for the oil and natural gas industry. On a local, state and federal level the answers to breaking America's dependence on dirty foreign and domestic energy, while cutting methane and carbon emissions and creating jobs, are right in front of us! Every one of us needs take part in being energy-efficient and take responsibility for the energy we consume daily. As American consumers we all need to ask ourselves whether the choices we make today promoting fracking, climate change or a war -- or are we helping our country secure a clean and energy-independent future?

Tammy Reiss, who has been a Green Energy TImes reader for years, is from the town of Butternuts, N.Y. Her strong advocacy against the dangers of fracking throughout New York State led, among other things, to her hometown banning hydrofracking in December of 2013.

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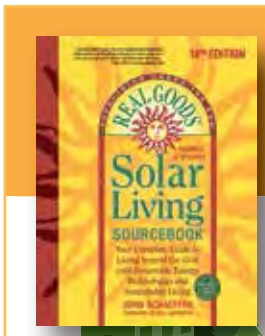

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Solar Spreads through the Upper Valley

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By Allison E. Rogers Furbish, Vital Communities

Andover Transfer Station: Solarize Kearsarge volunteers posted signs and information at one place nearly everyone visits: the town transfer station.

In a recent study, researchers at Yale and the University of Connecticut found that where and when people decide to go solar has a lot to do with whether their neighbors are going solar, too. . In fact, having other solar homes nearby matters more than almost any other factor – including income and politics.

If that's the case, then Solarize Upper Valley is priming the region for an explosion of residential solar energy installations in the coming years. With 120 homes signing Solarize contracts in five towns during the program's first 15-week campaign last spring, and 10 more towns in the midst of the program now through January 31, a lot more Upper Valley residents will be seeing solar panels in their neighborhoods.

Solarize Orford* volunteer Emily Bryant signed her contract to go solar in November with her town's competitively selected partner installer, Milhouse Enterprises (Belmont, NH). Bryant happens to be an opponent of the Northern Pass power project, and so she sees going solar as her opportunity to "do something about it instead of just running around complaining."

For others, the opportunity to take advantage of special discounted 'Solarize' pricing as well as available state and federal incentives make this a good time to reduce or nearly eliminate electric bills – particularly as electric rates rise. As of early December, 40 homeowners in the 10 current Solarize communities had signed contracts totaling 239 kilowatts; two dozen more had made verbal commitments to go solar; and nearly 700 had requested site visits with their communities' partner installers – Energy Emporium (Enfield) working with Hanover, ReVision Energy (Exeter) with Andover, New London, and Wilmot, and Milhouse with Orford, in New Hampshire; and in Vermont, Catamount Solar (Randolph) and Integrity Energy (East Bethel) working with Pomfret, Woodstock, Randolph, Brookfield, and Braintree.

Solarize Upper Valley is a program of Vital Communities, the non-profit based in White River Junction, and is aimed at making residential and small business solar photovoltaic (PV) energy more accessible across the region. The program teams up local volunteers with solar PV installers for a 15-week community outreach campaign to help residents go solar.

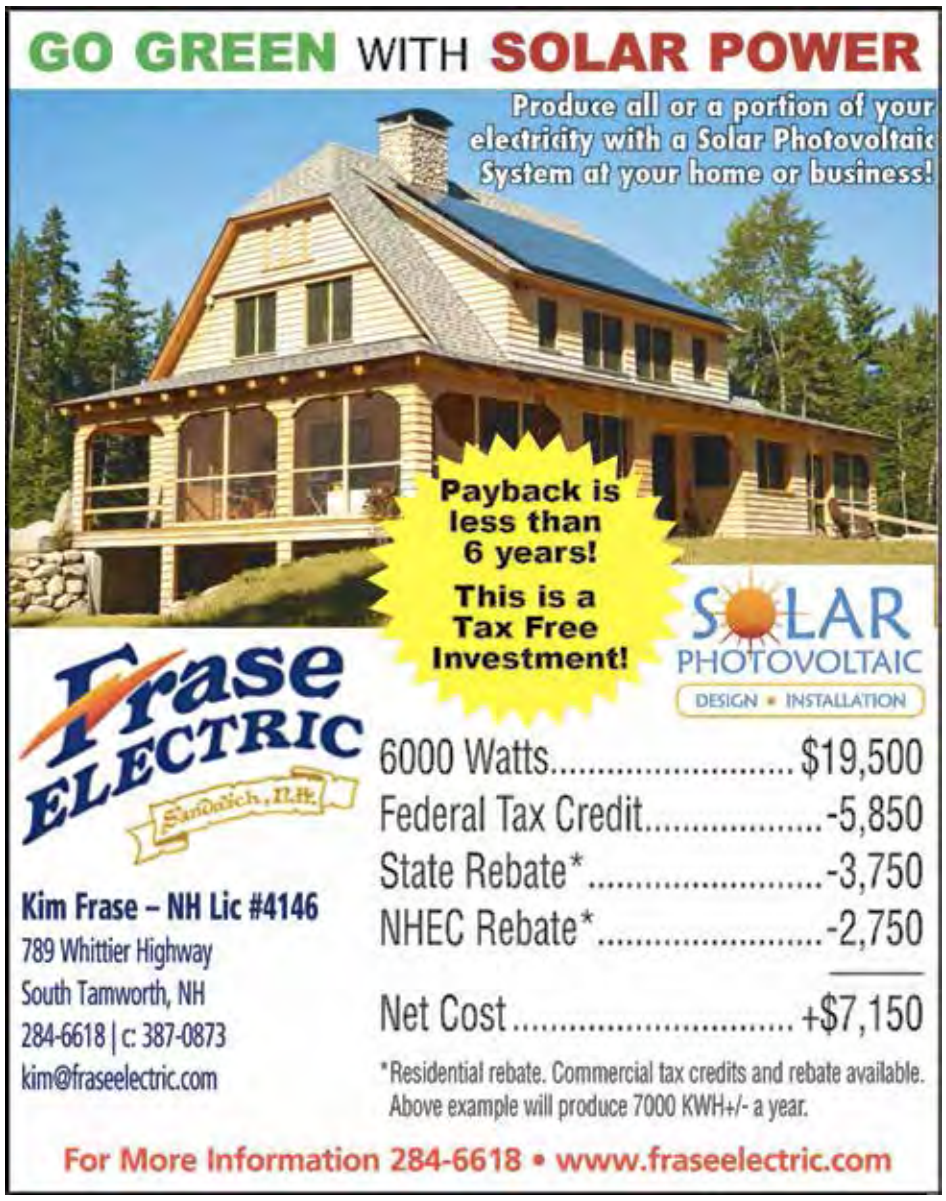
With resources and support from dedicated local volunteers and a trusted partner installer, Solarize makes it easy for homeowners to take the first step – requesting a free site visit. Through Solarize Upper Valley's tiered pricing structure, the cost goes down for everyone as more people sign contracts to go solar with the community's partner installer.

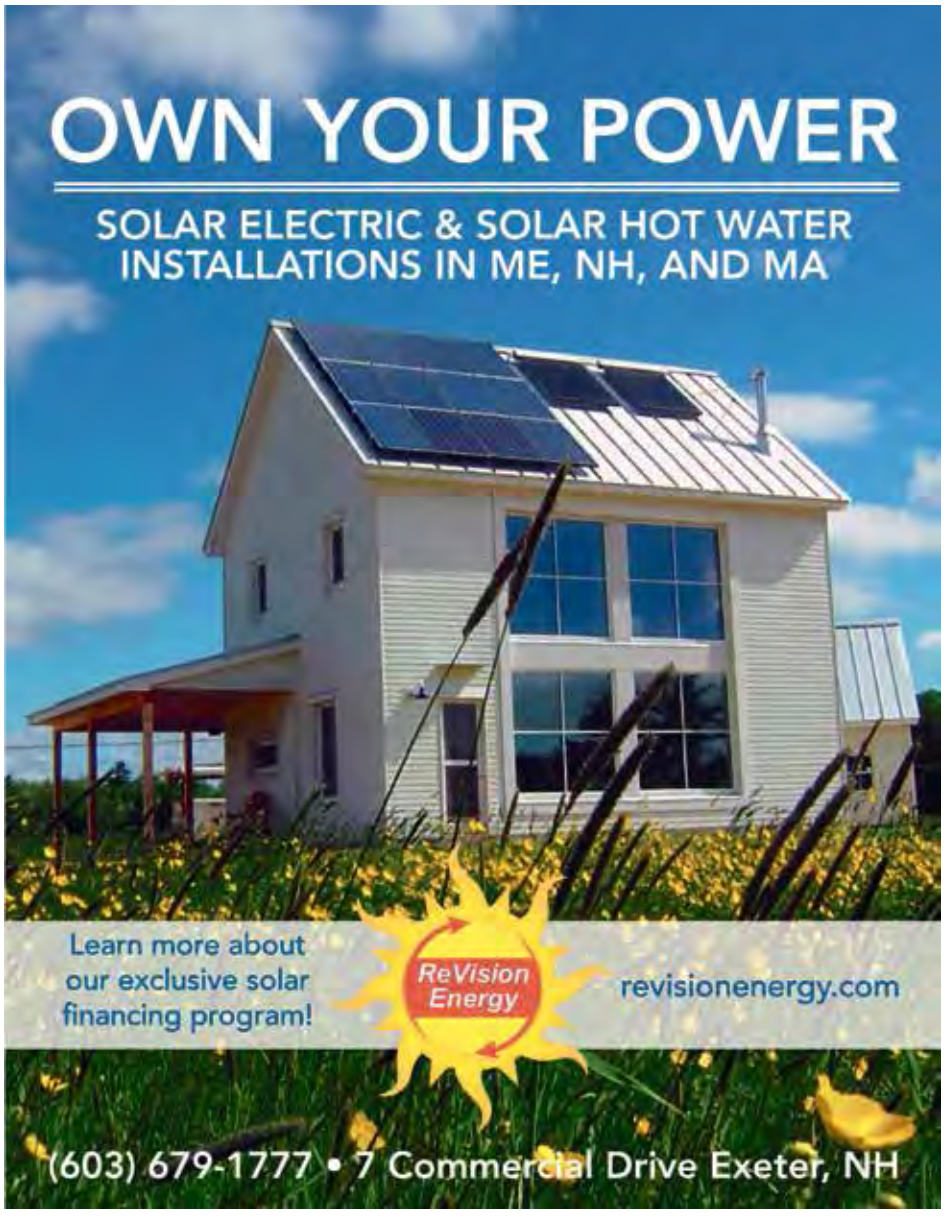
Vital Communities will coordinate a third round of the Solarize effort in mid-2015. For more information about the Solarize Upper Valley program and how to get involved, visit VitalCommunities.org/Solarize.

***As of December 1st, Orford is at Tier 4, with 10 people signed up to go solar totaling nearly 50kW. Orford is the Solarize community with the highest percentage of people asking for site visits."**

Orford Progress Meter: As of late November, the Solarize Orford campaign had signed on enough homeowners to reach Tier 2 of their discounted pricing schedule.

Solarize volunteers across the 10 current communities continue to conduct tireless outreach, including sharing information at a variety of events in the Upper Valley.





the Solar Store

cont'd from p. 8

Solar Installations by the Solor Store of Greenfield, MA.

both financially and in terms of energy. Every house and every business is unique, so a lot of what we do is educating customers. We want everyone to have the opportunity to figure out how to reduce their own carbon footprints and move away from fossil fuels."

Much of the problem facing people everywhere is keeping up with changing government regulations and incentives. Chang and Ward spend a lot of time on this as a service to potential customers. But they also try to move governments, both in Massachusetts and in Washington, to be certain the needs of the environment and generations of people yet unborn are represented as well as those who currently support candidates for government office.

Massachusetts has the good fortune to have a forward-looking piece of legislation, the Green Communities Act, passed in 2008. Since then it has been updated as the goals within it have been reached. A current goal is to have 1600 megawatts of solar PV capacity installed. Chang says that will be achieved by the end of 2017, if the state stays on its current trajectory.

The Solar Store of Greenfield is currently putting a lot of effort into making sure solar power is available to everyone. About 80% of people do not have access to a good site for solar power systems. There is virtual net metering, but some utilities are pushing to have the government do away with it. Continued action is needed to make sure people can have access to the systems they want. Chang says, "The point is not just energy independence. It is really about trying to build a community solution."

She also explains the relationship she sees between private solar system owners and utilities, "We are not in the business of putting the utilities out of business. We need them to do transmission and reliability. In Massachusetts, generation utilities are separate from the distribution utilities. We need new energy storage infrastructure projects. Currently, natural gas makes up 50% of the New England electricity profile. We need to increase renewable energy generation to replace coal, oil, nuclear and natural gas power plants." The addition of solar power to the grid means that need for both imported power and central power plants is reduced.

This year has seen customers coming in much faster. With more solar PV systems visible, people are seeing the viability and financial benefits. They understand the urgency of climate change. With banks more aware about solar financing and payback periods sometimes as short as five years, people see themselves within reach of much lower electricity costs. Even though the incentives are complicated, people feel more comfortable with the idea of PV on their roof. Chang says, "We can all be part of the energy revolution for democratic and equitable access to renewable energy."

The Solar Store of Greenfield can be contacted at 413-772-3122. The store is at 2 Fiske Ave, Greenfield, MA, and is open T-F 10-5pm and Sat 10-2pm. The website is solarstoreofgreenfield.com.

Solar Installations by the Solor Store of Greenfield, MA. All photos courtesy of Claire Chang

100kw for bennington, vt

In the Holiday Spirit of Giving

Bhima Nitta of Power Guru at the North Bennington Variety array.

By George Harvey

Trying to do better with energy, Galen Rhode, owner of the North Bennington Variety (NBV) store, improved the energy efficiency of the property by 20% with help from Efficiency Vermont, but wanted to go beyond that. He considered more efficiency measures, but found that putting money into solar photovoltaics (PVs) made better sense economically. Once he was ready, he invited a number of installers to tell him what they could do.

Bhima Nitta, of Power Guru, always advises people to make their property as efficient as possible before investing in solar equipment. "We take a holistic approach," he says. "Before we design a photovoltaic system, we help our clients use energy more efficiently." Rhode found Power Guru's holistic approach to power was quite amenable to him, and after a good deal of consideration, he decided to have Power Guru work with him on PV installation.

Rhode had a piece of property in North Bennington, Vermont between Route 67 and a railroad track. Its shape and location meant that it had marginal value for any purpose other than for solar PVs. In fact, prior to the solar array installation, the property was just a roadside lot where passers-by tossed litter. Nitta likes to design arrays that are aesthetically pleasing, and conform to the landscape. His goal is for people to say, "That's natural. That looks like it belongs there." The appearance of the NBV array was to be a source of pride.

The array consists of 400 panels of 255 watts each, organized into five sub-arrays. REC 255PE panels were used, and there are ten Fronius inverters in the system. Local contractors did much of the work; Matt Morse in Bennington did excavation, and Kenyon Concrete did footings. Mounting hardware is SnapNRack. However, Rhode did much of the contracting himself.

Nitta says that this is Power Guru's fifth group-net-metering project. "It makes sense for Vermonters who want to get together to enjoy better economics. Many people are surprised to learn that solar is now actually cheaper than the grid." There are a number of people and organizations involved in it. NBV, of course, is one of them, as is another business in the same building. Rhode also uses the system to supply his home and an apartment.

Interestingly, excess power is not being banked, but is being donated to two nonprofit organizations instead. The nearby McCullough Library is one of these, and another is Lake Paran. The amount donated is as yet unknown, because the system was only put into commission in September, and it will only be the excess that is donated.

Making power donations to nonprofits seems to be something many of us might think about. Now, in the holiday season, it would seem to be a natural. But it is a gift that can continue year-round. Whenever it arrives, a gift of electric power is something a poor nonprofit could appreciate.

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Southern Vermont Community Solar

Putney community solar field. Photo by Teal Pulsifer, Soveren Solar

By Daniel Hoviss

One of Southern Vermont's newest community solar installations is at the Vermont Agricultural Business Education Center (VABEC), just south of Brattleboro. It is the latest of the Soveren Community Solar Farms. Though these are all sold out, it is still possible to reserve a spot in the next community solar farm in Dummerston VT.

Soveren Solar, located in Bellows Falls (soverensolar.com), has installed six community solar farms in southern Vermont. They are working on lining up new locations.

There are important advantages to community solar with adjustable ground mounts. Soveren Solar's arrays, for example, are installed on locally built mounts. The adjustable racks allow them to be tilted seasonally to maximize power generation and shed snow in the winter. This feature means that owners of panels in our solar farms will get 15-20% power than from an average non-adjustable system. This is something to consider for comparing different options.

Another advantages are system warranty and maintenance. Community projects often have production warranties of 20 or 25 years, guaranteeing to produce 80% of their nameplate rating for the warrantee period. As electricity prices go up, in 25 years, the electricity that the panels generate should be worth significantly more than it is today. Soveren Community Solar projects include all scheduled maintenance and repairs at no cost for 30 years, but others will have different warrantees. It is wise to check.

While it is nearly always less expensive to commit to buying a solar system than to continue buying power, a residential customer for solar power has important choices to consider. Continuing to buy power from a utility is a never-ending proposition. By contrast, if a solar system is entirely financed, it should cost no more than buying electricity on a month-to-month basis, but the cost is an investment. In a period of five to fifteen years, the system is paid off and the solar customer gets electricity from the sun for free. Another option is to pay for the solar system upfront. It can be a great investment, not only economically, but in clean, locally-produced energy, supporting small farms and local jobs.

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Any tax-paying business in Green Mountain Power territory can purchase a solar PV system, depreciate the panels on an accelerated five-year schedule, and receive a Vermont investment tax credit of 7.2% in addition to the federal tax credit of 30%. Depending on the tax bracket; that can bring a rate of return on the investment of 20%-30%.

To get a free proposal visit http://www.putney.net/solarize/solarize-signup/, or call 802.254.1410.

Daniel Hoviss lives and works in Putney, Vermont. He is owner of e-Solutions, where he works on commission. He is active with the Putney Energy Committee, and the local Community Garden. He is very active in helping to bring about the changes necessary to move us into a sustainable future. He is also working towards building Solarize programs in So. VT.

PACE

0% TO 1.99% ENERGY FINANCING AVAILABLE

By Bob Walker

Low interest PACE (Property Assessed Clean Energy) financing is now available to help Vermonters make energy improvements in their homes. Vermonters earning up to 80% of the state's Average Median Income (AMI) can get 0% financing; 80-100% AMI can get 0.99% financing; and 100-120% AMI can get 1.99%. See the table below for qualifying income levels.

Improvements that can be financed through these low rates include energy audits; weatherization measures; cold climate heat pumps; high efficiency oil, propane and wood pellet central heating systems; heat pump water heaters; and solar hot water heaters. Renewable electric generation systems can also be financed through PACE at the usual program rate of 6.5%.

Financing these measures through PACE often results in homeowners saving more on energy costs than they pay for the improvements, so they save energy and money from day one. Your energy-efficiency utility, Efficiency Vermont, will conduct a free analysis of your project plan to let you know how cost effective your project is and assist you through the PACE process. Other PACE advantages include the fact that there is no credit score check, no closing costs and no down payment required.

PACE financing is available to all residents of Vermont towns which have passed PACE at town meeting, including: Bradford, Cavendish, Hartford, Hartland, Norwich, Randolph, Sharon, Strafford, Thetford, Vershire, Weathersfield, and Woodstock. Sustainable Energy Resource Group (SERG) is working with town energy committees in the Upper Valley and with Efficiency Vermont to inform community members about PACE at free town forums that are open to the public.

Upcoming PACE forums:

- December 9th, 2014, Montshire Museum, Norwich, VT, 6:30pm
- December 10th, 2014, Hartland Library, Hartland, VT, 6:30pm
- January 20th, 2015, Thetford Center Community Center, Thetford, VT, 6:30pm
- February 11th, 2015, Bugbee Senior Center, White River Jct., VT, 6:30pm

These forums are being cosponsored by Upper Valley Sierra Club and Vital Communities. For more information on PACE activities in the Upper Valley area, contact SERG at 802-785-4126 or your town energy committee.

PACE Interest Rates

Based on the total adjusted gross income for all household earners as shown on Line 37 of your most recent tax return:

		Number of Persons in Household							
Income	**Rate**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
< 80% AMI	**0.00%**	44,749	51,149	57,549	63,899	69,049	74,149	79,249	84,349
80% - 100% AMI	**0.99%**	44,750 – 55,938	51,150 – 64,438	57,550 – 71,938	63,900 – 79,875	69,050 – 86,313	74,150 – 92,688	79,250 – 99,063	84,350 – 105,438
100% - 120% AMI	**1.99%**	55,939 – 67,127	63,938 – 76,726	71,939 – 86,327	79,876 – 95,851	86,314 – 103,577	92,689 -111,227	99,064 – 118,877	105,439– 126,527
> 120% AMI**	**6.50%**	67,128 +	76,727+	86,328+	95,852+	103,578 +	111,228 +	118,878 +	126,528 +

* The above interest rates are for energy efficiency and thermal measures only and do not apply to renewable energy measures such as solar PV or wind power generation. The rates are limited to $10,000 of eligible project measures. Any remaining amount of project cost financed will be subject to the current PACE interest rate.

** Subject to change with each new PACE subscription period.

For more information on PACE and help through the PACE registration process, contact www.efficiencyvermont.com/PACE, PACE@efficiencyvermont.com or 888-921-5990.

Bob Walker is the executive director of SERG (Sustainable Energy Resource Group), www.SERG-info.org

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VERMONT CLIMATE ECONOMY INITIATIVE

The Vermont Council on Rural Development (VCRD) is kicking off its new Climate Change Economy Initiative with the Summit on Creating Prosperity and Opportunity Confronting Climate Change on February 18 at Vermont Technical College in Randolph. The summit will serve as a founding point for the Vermont Climate Change Economy Council (VCCEC). This group is charged with a one year mission to develop a structured plan with practical actions that will reduce carbon emissions and stimulate green economic development in Vermont.

The summit will bring together scientists, innovative business, non-profit, and community leaders, elected officials, public policy advocates, students, and interested residents. As a joint body, they will consider the impacts of climate change on Vermont and propose ways to advance the prosperity of the state while addressing them. The Summit will focus on how the emerging opportunities will allow us to build a national reputation, create jobs, and attract young people to our rural communities.

Over 400 are expected to participate in the day which features a climate science "fishbowl" looking at how climate change will affect Vermont's future, a panel asking current businesses how they are responding to climate change, and 13 working group discussions including:

- Promoting a Vision for Transportation
- Supporting Smart Growth, Reuse, Preservation, & Downtown Redevelopment
- Developing Ubiquitous Distributed Energy
- Innovating for Renewal, Recycling and Resource Limits
- Strengthening Farm & Forest Carbon Sequestration and Profitability
- Seeding a Vermont Climate Investment Strategy
- Adapting Outdoor Recreation & Tourism

Registration, summit agenda, speakers, and topics can be found through VCRD's home page at vtrural.org or call Margaret at 802 223-6091.

The ideas and priorities of conference participants will be starting points for the Vermont Climate Change Economy Council. The group, composed of leaders in business, economic development, the environmental movement and scientific community, will serve as a non-partisan center point for the development of a pro-active public policy around this central issue.

WHEN ACTIVISM MEETS BUSINESS *cont'd from p. 1*

its nuclear plants, and is starting to talk seriously about closing all its coal-burning plants. Given the facts that the German government is not willing to permit fracking, that it is uncomfortable with its dependence on Russia for natural gas, and that it is strongly against fossil fuels in general, it is hard to imagine large-scale development of any sort of fossil fuel plants in the country.

The newly spun off company will have a problem because much of its assets will be nuclear and fossil plants that will have to be closed down, without much hope of being replaced. It may be that the new company will have to adopt a business plan that foresees reduction of business with passing time rather than growth. Whatever plan it uses, it will have to attract investors, and that will not be easy.

At the same time that E.ON announced spinning off its baseload power plants, it also said it would be writing down $4.5 billion in assets for this year. Investor response to these announcements is news in itself. There was a sudden surge of interest in E.ON stock, which went up about 6%.

What the effect these events will have remains to be seen. We might expect, however, that they will make the leaders of utilities and related industries all over the world sit up and take note. Even if German energy policies are confined to Germany, the cost reductions for renewable power are worldwide.

Activism, meet business. You might like each other.

WIND

Is Wind Energy FOR THE BIRDS?

By Patrick Martin, Green Alliance Staff Writer

On Jan. 29, 2014,0 New Hampshire wind energy advocates, including Portsmouth wind energy firm Eolian Renewable Energy LLC, dodged a bullet. The N.H. House of Representatives struck down a bill that would have placed a moratorium on wind development in the state. This would have been a major blow to New Hampshire's progression towards brighter future in renewable energy.

Having temporarily dispatched of this more looming issue, it may be time to correct a misconception that has detracted so much support from the alternative energy source. Groups opposed to wind farm development often cite the droves of unlucky dead birds littering the ground beneath turbines. However, grim statistics thrown at wind energy proponents may not be entirely forthcoming.

The problem stems from the data's origin – the notorious Altamont Pass Wind Farm of the Diablo Range in Central California. The farm is said to be responsible for the deaths of 4,700 birds annually (including 1,300 majestic birds of prey). This staggering number is powerful on its own, but when examining the broader impact of wind energy across the nation, the picture differs significantly.

It is important to note two major differences between Altamont Pass and other wind farms in the country. The old turbines used in Altamont Pass at the time the bird death toll was recorded were much smaller and faster spinning than newer turbines. The larger conventional turbines spin much more slowly, which significantly decreases the likelihood of avian mortality.

The second difference setting Altamont apart from the rest is that it is an ideal habitat for a diverse cross-section of birds to thrive – particularly the federally protected Golden Eagle.

Though the American Wind Energy Association and the U.S. Fish and Wildlife Service disagree on the number of annual bird-deaths caused by U.S. wind energy, they do agree on the need to continue to seek improvements.

Steps have been taken across the country to address the problem. Newer models of turbines are not only more efficient in delivering us from fossil fuels, but they also pose a lesser threat to birds. New locations selected for wind farm development undergo rigorous environmental impact assessments.

According to Jack Kenworthy, CEO of Green Alliance Business Partner, Eolian, "Prior to siting a wind facility in a particular location, years of study go into ensuring the most productive sites are developed with the least possible impact to wildlife, including birds."

Kenworthy also said that despite a very low avian mortality for northeastern wind farms (including zero recorded eagle deaths at any commercial wind farm in the region), developers continue to cooperate closely with regulators. "Wind developers work very closely with state and federal agencies to develop avian and bat protection plans that minimize the impact to these animals during both construction and operation of wind facilities," he said.

Companies such as the LRAD Corporation are in the business of creating products that deter birds from flying too closely to wind turbines. Using sound transmissions that mimic predator calls, the technology can prevent birds from coming within 1,000 meters of a farm — saving them from what could be an untimely demise.

As a result of the success and environmental benefits of N.E. wind farms to date, many environmental organizations, including Maine Audubon, Conservation Law Foundation, and Environment New Hampshire, have stated their clear support for "well-sited wind energy projects."

With careful consideration in wind farm siting and planning, together with continued adaptive management techniques during operations, the horizon looks safer for our winged friends.

Man-made structure/ technology	Associated bird deaths per year (U.S.)
Feral and domestic cats	Hundreds of millions [source: AWEA]
Power Lines	130 million— 174 million [source: AWEA]
Windows [residential and commercial]	100 million — 1 billion [source: TreeHugger]
Pesticides	70 million — [source: AWEA]
Automobiles	60 million — 80 million [source: AWEA]
Lighted communication towers	40 million — 50 million [source: AWEA]
Wind turbines	**10,000 — 40,000** [source: ABC]

Instead of rejecting outright wind energy for its limited role in killing birds, bird enthusiasts should continue to work with the wind industry to drive additional improvements, recognizing climate change as the greatest risk to avian species and coal, oil and gas companies as a common enemy.

Learn more at Eolian Renewable Energy, LLC: www.eolian-energy.com, Green Alliance: www.greenalliance.biz.

Kingdom Community Wind Meets State Sound Levels

Summer Testing Report Analyzed 1640 Hours

The latest sound monitoring report finds Kingdom Community Wind continues to meet strict sound standards set by state regulators. The report, which analyzed 1640 hours of data, is part of an ongoing comprehensive compliance monitoring program, and the results are filed with the Vermont Public Service Board.

"We are very pleased to share this information with Vermonters," said Dorothy Schnure, GMP's spokesperson. "Kingdom Community Wind is a key part of helping to lower rates for customers by generating clean, reliable and cost-effective power. The project is part of the reason why we were able to lower rates for customers at the same time other utilities in the region have seen double-digit rate increases."

The testing follows guidelines set by the Vermont Public Service Board, and was conducted at four separate locations near the wind project. In total, 1640 hours of data were collected from August 20 to September 9, 2014. Sound levels at all four monitoring stations were below levels set by regulators for the project. Green Mountain Power has recently taken steps to increase and expand sound monitoring at the site as part of its commitment to ensure that it continues to operate within standards.

"It is great to learn that GMP continues to operate Kingdom Community Wind so responsibly and I am not surprised that the wind plant continues to meet state sound standards," said Richard Pion, chair of the Lowell selectboard. "I live near the plant and find it to be quieter than many of the other sounds near my home."

More at: www.greenmountainpower.com.

Wind Energy to Command a Larger Piece of the Renewable Energy Pie

By EarthTalk®

Hydroelectric sources of power dwarf other forms of renewable energy, but wind power has been a dominant second for years, and continues to show "hockey stick" growth moving forward. According to the Global Wind Energy Council (GWEC), global cumulative installed wind capacity—the total amount of wind power available—has grown fifty-fold in less than two decades, from just 6,100 megawatts (MW) in 1996 to 318,137 MW in 2013.

And the future looks brighter still. Analysts from Bloomberg New Energy Finance (BNEF) predict that wind will account for the largest share—30 percent—of new renewables added to the global power grid by 2030. That new renewables are expected to account for as much as 70 percent of all new power sources over the next 20 years means that wind is poised to become a major player on the global energy scene.

Here in the U.S., energy generated by domestic wind farms has nearly tripled in just the past four years, despite a brief hiccup due to a lapse in the Production Tax Credit, a renewable energy production incentive that effectively subsidizes the creation of more wind farms. But even despite this, wind represented about a third of all new power added to the U.S. grid over the past five years. The Natural Resources Defense Council (NRDC), a leading environmental non-profit and wind power advocate, forecasts that the U.S. will derive some 20 percent of its total electricity production from wind by 2030.

"The U.S. industry has many reasons for favorable long-term prospects," reports the American Wind Energy Association (AWEA), a non-profit trade group representing the wind industry. "In addition to the record activity at the end of 2013, wind energy helped keep the lights on and insulate against temporary price spikes during the recent 'polar vortex' cold weather snap, demonstrating the value of wind power in a balanced energy portfolio."

Here in the U.S., energy generated by domestic wind farms has nearly tripled in just the past four years and represents about a third of all new power added to the U.S. grid over the past five years. Photo Credit: Martin Abegglen, Courtesy Flickr

AWEA also points out recent reports showing how incorporation of wind energy lowers costs for electric consumers. "And critical to some parts of the country facing continuing drought, wind energy uses no water in its production, as well as releasing no emissions," adds the group.

The fact that wind energy in the U.S. avoids some 100 million tons of carbon dioxide emissions annually is also good news. AWEA adds that that number will grow as wind energy scales up to 20 percent of the grid and beyond "making the addition of more wind power one of the fastest,

Cont'd on p. 32

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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

As the call for increased production of homegrown, renewable forms of fuels has grown, so has the need to develop and produce them. USDA Rural Development offers opportunities to producers to development such fuels through the Biorefinery Assistance Program. The program provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries.

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

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

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

REGIONAL

NEW ENGLAND GRASSROOTS ENVIRONMENTAL FUND

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

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

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

The The Small Scale RE Incentive Program, administered by Renewable Energy Resource Center (RERC), provides funds to help defray the costs of new solar thermal, photovoltaic, and micro-hydro systems

SOLAR INCENTIVES – BASED ON RATED CAPACITY OF SYSTEM

- http://rerc-vt.org/incentives/index.htm
- http://www.dsireusa.org/incentives
- On Dec. 31, 2014, residential (including leasing)= $0.25/ Watt up to 10 kW for PV will end; $.40/kWh/year/Day up to $3000 for ShW.
- commercial/industrial = $1.50/100Btu/day up to 1100kBtu/day for ShW
- special customer* = $1.00/Watt up to 10kW. $.80/kWh/year up to $45,000 for ShW. **Group net-metered projects are only eligible for residential customers with residential meters.
- PV and ShW Efficiency Adder - adder is calculated separately and added to standard incentive subject to customer caps (eligibility requirements apply, contact RERC)
- residential = $0.15/Watt for PV; $0.50/100Btu/day for ShW. Capped at a cumulative $350, residential customers; $450, commercial/industrial/special customer = $0.15/W; $0.50/100Btu/day up to a cumulative $450 per customer

Micro-Hydro

- residential/commercial/industrial - $1.75/3'gal/minute Capped at $8750
- special = $3.50/3' gal/minute Capped at $8750.

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

Visit 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. Any unused tax credit may not be carried forward.

EFFICIENCY VERMONT

Lighting (must be ENERGY STAR)

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

Home Efficiency Improvements

- improvements: air sealing, insulation and heating system upgrades - up to $2,100 in incentives - using participating* contractors
- limited time $500 bonus for projects completed by 12/15/2014

Appliances (must be ENERGY STAR)

- Dehumidifiers - $25 mail-in rebate
- Clothes Washers - $40 rebate for CEE Tier 3 qualifying models, $75 rebate for ENERGY STAR Most Efficient
- Refrigerators - $40 rebate for CEE Tier 2 Refrigerators, $75 for CEE Tier 3 & ENERGY STAR Most Efficient
- Working second refrigerators or freezers are potentially eligible to be picked up. $50 incentive to retire old units.
- Clothes Dryer –rebate for replace electric with natural gas (contact EV*)

Heating/Cooling

- heating & hot water systems – see EV*
- energy efficient central AC and furnace fan motor - $100 mail-in rebate
- central wood pellet boilers (excluding outside wood systems) - $1,000 (See announcement on page 25)

Residential New Construction

- enroll in Residential New Construction Service – up to $1,500 in incentives and free home energy rating and expert technical assistance throughout construction and eligible for ENERGY STAR label
- Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives (contact EV*)

Other Opportunities To Save

- Advanced Power Strips – special pricing/coupons at register at participating retailers*
- Pool Pump (2-speed/variable speed) - $200 mail-in rebate
- Meter Loan – borrow "Watts Up" meter to measure the electric consumption of your appliances

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

NEW HAMPSHIRE

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH THE NH PUBLIC UTILITIES COMMISSION

Commercial Solar Rebate Program

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

- Rebates for solar electric/thermal projects 100kW (or thermal equivalent) or less
- Solar PV = $0.80/Watt D/C up to $50,000
- Solar thermal = $0.07(or$0.12 for systems of 15 collectors or fewer) per thousand- Btu per year, up to $50,000

Contact Elizabeth.Nixon@puc.nh.gov

Commercial Bulk Fuel-Fed Wood Pellet Central Heating Systems

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

Residential Solar PV Rebate Program

- $0.75/watt capped at $3,750 per system, whichever is less. Systems must be under10kW. Subject to funding availability.

Contact jon.osgood@puc.nh.gov

Residential Solar Water Heating Rebate Program

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

Contact barbara.bernstein@puc.nh.gov

Wood Pellet Boiler or Furnace

- 30% of installed system up to $6k
- Must meet thermal efficiency and particulate emissions standards

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

LOCAL INCENTIVES

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

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

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH THE NH ELECTRIC CO-OP

Commercial Solar Thermal (Hot Water)

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

Commercial Solar PV

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

Commercial Fossil Fuel Program

- 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.

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

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.

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), WMECO or a participating Municipal Light Plant community. ***Ends Dec. 2014.***

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**

There will be a new residential loan program for solar PV to be announced in November, 2014.

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.

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 Western 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.

COMMONWEALTH SOLAR PV PROGRAMS

www.masscec.com

Commonwealth Solar II provides rebates for homeowners and businesses in Massachusetts who install solar photovoltaics (PV). Rebates are granted through a noncompetitive application process for the installation of photovoltaic (PV) projects by professional, licensed contractors at residential, commercial, industrial, institutional and public facilities. For Block 20A funding, in addition to the base incentive (.25/W), further incentives ("adders") are available for installations using components manufactured in Massachusetts (.05/W), for individuals with moderate income or home values (.40/W), and for those who are rebuilding in the wake of a natural disaster (1.00/W).

For all systems, rebates are calculated by multiplying the per watt incentive (base incentive plus adders) times the nameplate capacity of the system, up to 5 kilowatts (kW); projects are eligible for rebates only if their total capacity is under 15kW. Commonwealth Solar II program will sunset at the end of 2014, but could go into 2015. Further eligibility requirements apply, and potential rebate recipients should read the full program documentation.

http://www.masscec.com/programs/commonwealth-solar-ii

DEPARTMENT 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 MASSACHUSETTS SREC POLICY

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

Under the earlier version, which expired last year, credits were given regardless of where the solar system was installed. 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.

Information can be found at http://bit.ly/Mass_SREC_II

NH REF IS IN DANGER!

WHAT'S TO BECOME OF NH'S ONLY RENEWABLE ENERGY FUND?

By Kate Epsen

New Hampshire's only dedicated fund for renewable energy is, once again, in danger. Millions of dollars ($9.4 million, to be precise) are at risk of being taken from the NH Renewable Energy Fund (REF) and put into the state's General Fund when the Governor and Legislature begin crafting their budget in 2015. The REF is not intended to fund the state's operating budget. A bipartisan legislature created this fund in 2008 as part of our Renewable Portfolio Standard, with an understanding (and binding statute) that all RPS proceeds would flow into this fund to support renewable energy initiates in the Granite State. This action to divert REF funds is ill-advised, contrary to sound fiscal policy and potentially contrary to the law. Additionally, with electric rates soaring this winter, it has never been more important to preserve this fund to help consumers invest in renewable energy (fuel-free) generation sources.

The REF is the sole source for solar electric and small wind rebates, biomass boiler and furnace rebates, solar thermal rebates, and competitive grants for hydroelectric, wind, cogeneration, and other innovative technologies that harness renewable energy resources. Not coincidentally, these are the only energy sources within our borders. These projects allow consumers to better control their energy and financial futures. The results support this goal.

These REF results are as important as its origins. This fund has thousands of stories to tell (over 2,068, to be precise). Homeowners, businesses, schools, and towns have spent countless time and resources to bring renewable energy projects to fruition. They have invested their own money along with the help of public REF dollars. The REF, on average, is leveraged five to one: private or non-state funds to those from the state. These projects also yield electricity savings, fuel oil savings, greenhouse gas emissions reductions, and retain wealth in our economy.

For example, Monadnock Paper Mills received an REF grant to rebuild a dormant hydroelectric system and displaced hundreds of thousands of fossil-fuel based kilowatt-hours otherwise purchased from the grid. Greenville Elementary School was able to install a high-efficiency wood pellet boiler, fueled by pellets produced in Jaffrey, NH. Consider the wood chip cogeneration system constructed at the Sullivan

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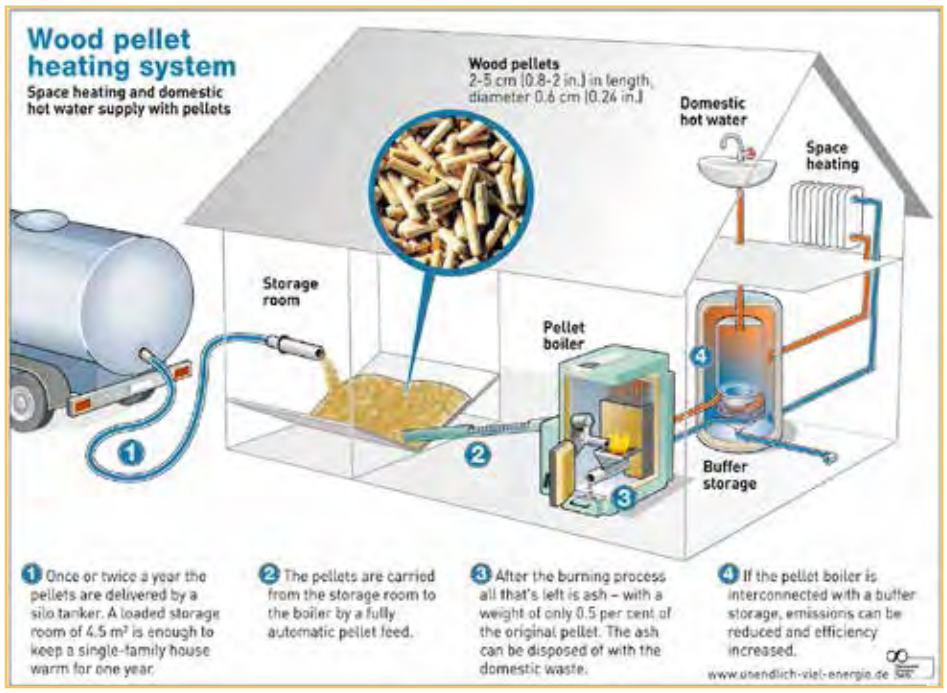
The NH REF helped fund a solar hot air system at Sanborn Regional High School in Kingston, NH. Photo courtesy NHSEA.

New Incentives *for wood pellet stoves*



Vermont Pellet Central Pellet Heater Incentives

Modern, high-efficiency wood pellet central heaters are amazing, with efficiency ratings of 85% or higher, hands-free fuel delivery from truck to storage bin to heater, and less than five gallons of wood ash to deal with for a season of heating.

Now they have gotten cheaper too, with added incentives in Vermont. . . . The Clean Energy Development Fund (CEDF) added a new $2,000 incentive for qualifying central pellet heating systems installed in a Vermont residence or business to its Small Scale Renewable Energy Incentive Program (SSREIP), effective on October 8, 2014. There is an added $500 incentive for higher efficiency units, and both of these are good on up to two heaters per home or business. . . . There is also a $350 thermal efficiency adder good toward audits or thermal efficiency improvements to the buildings in which the pellet heaters will be installed.

Qualifying pellet heaters can also receive an additional $1,000 incentive from Efficiency Vermont, bringing the total incentive for high efficiency heaters up to $3,500. There is an incentive reservation process that takes place before the installation begins and an incentive-claiming process that happens after the installation. While the incentive program began on October 8, 2014, eligible installations that began after September 8 will be able to apply for an incentive, but an incentive is not guaranteed for these installations. . . . Installations that began prior to September 8th will not be eligible. . . .

Only pellet heating systems with an efficiency rating of 80% or higher and particulate emissions of 0.2 lb/MMBtu or less per hour will be eligible for an incentive. The program has compiled a list of eligible heating systems. Eligible systems must be able to receive pellet via bulk delivery and have automatic conveyance of the pellets to the burn chamber. The pellet storage component of the system must be large enough so that the system can run at full load for no fewer than 14 days without additional pellets. Pellet boilers installed outside will not be eligible. The building in which the system is installed will have to meet a minimum level of thermal efficiency or have an energy audit completed. . . . The pellet systems must not be oversized for the heat load of the building.

For more information on the CEDF or SSREIP, contact Andrew Perchlik at: andrew.perchlk@state.vt.us

New Hampshire Central Pellet Heater Incentives

New Hampshire's Residential Bulk-Fed Wood-Pellet Central Boilers and Furnace Rebate Program offers rebates of 30% of the system and installation cost, or $6,000, whichever is less, for New Hampshire residents who invest in high-efficiency (80% or greater), bulk-fuel fed, wood-pellet central heating boilers and furnaces that become operational on or after May 1, 2012.

For complete program details, please go to http://1.usa.gov/1vjaDyw or contact Barbara.bernstein@puc.nh.gov.

HEALTHY HEATING WHEN IT'S SO COLD OUTSIDE

During winter in the northeast, many people seek to avoid high heating costs by turning to wood as a cost-saving, renewable source of energy. Unfortunately, wood heaters often are inefficient and can emit considerable amounts of pollutants into the air. EPA-certified stoves, however, are cleaner and more efficient than uncertified models. EPA maintains lists of EPA-certified stoves and EPA-qualified wood-fired hydronic heaters (also called outdoor wood boilers) on its Burn Wise website (www.epa.gov/burnwise). Older and less-efficient hydronic heaters, wood stoves, and fireplaces can produce excessive amounts of smoke that can negatively affect nearby residences.

Residential wood combustion can emit fine particles and toxic pollutants at levels that can harm your health, particularly if the appliance is operated improperly or if it is an older technology appliance such as the air-tight stoves of the 1980s. Particle pollution is especially a concern because it can cause serious health effects. Exposure to particles can aggravate lung disease, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections. For people with heart disease, particle pollution has been linked to heart attacks, irregular heartbeat, heart failure, and stroke.

Regardless of the type of in-home wood heater used, you should not smell smoke inside your home or see smoke coming out of your chimney at times other than during start up. Everyone can take measures to save money and protect their health and the health of their neighbors.

Here are wood-burning tips to follow:

- Upgrade to a cleaner burning appliance, (e.g. an EPA-certified wood stove or wood pellet appliance.
- Split wood, and season it outdoors, exposed to the air, for at least six months before burning it.
- Wood burns best when the moisture content is less than 20%. Inexpensive meters are available for testing moisture content.
- Never burn household garbage, trash, cardboard, plastics or foam.
- Never burn painted or pressure-treated wood, ocean driftwood, plywood or any wood that contains glue such as thin wood paneling, or particleboard. All emit toxic fumes when burned.
- Keep the doors of your wood stove closed unless loading or stoking the fire to avoid releasing harmful chemicals, like carbon monoxide, into your home.
- Start fires with all-natural fire starters, newspaper and dry kindling.
- Do not let a fire smolder – this increases air pollution and does not provide heat.
- Have your heating systems inspected once a year with particular attention to vents and chimneys - don't just rely on a carbon-monoxide alarm.
- Reduce your overall heating needs and heating bills by caulking around windows, doors, and pipes to seal air gaps; installing weather-stripping doors and windows, as needed; and finally, improving the insulation in your home.

EPA recommends that people replace their old wood stoves with EPA-certified stoves, professionally installed. Although many wood stoves manufactured since 1988 are EPA-certified, heaters such as most pellet stoves were exempt from this requirement. EPA is currently updating standards for residential wood heaters to strengthen emission limits for new stoves, to remove exemptions, and to add other types of wood heaters (e.g., hydronic heaters). The new standards are expected to be phased in over a five-year period beginning in February 2015 and will apply only to new wood heaters. They will not apply to existing wood heaters in use in people's homes. The proposed standards will reduce particle pollution from new stoves and heaters by 80%, providing health benefits for everyone.

More information:

- EPA's efforts to update clean air standards for wood stoves www2.epa.gov/residential-wood-heaters
- EPA info on cleaner wood burning appliances; good burning practices; wood stove change-out programs; and other actions that EPA, states, and municipalities have taken to reduce emissions from wood heaters www.epa.gov/burnwise.

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LOCAL ENERGY

Introducing a New Renewable Biomass Fuel to New England

By Jim Van Valkenburgh

New England is an ideal region for making use of biomass for heat. Trees are plentiful, the logging industry is mature, sustainable harvesting is common practice and fossil fuel heating costs are high. We have been burning wood for hundreds of years as a source of heat.

Woodstoves are quite a common sight in our region's homes, installed mainly as a way to contain heating costs but also as a way of living simpler and closer to the land. However, not all homeowners have the capability or willingness for the frequent loading and constant management that a woodstove requires. With the development of the wood pellet some 30 years ago, the invention of the automatic wood pellet stove was a natural response to homeowner demand.

What is a wood pellet? It's 100% wood that has been ground up and compressed into small, smooth, regularly shaped granules. Moisture content is about 5%.

With wood pellets being burned for heating at about half the cost of fuel oil, it was only a matter of time (and technology) before larger-scale, commercially viable pellet boiler systems were invented. That happened first in northern Europe where much higher energy costs drove the development of a new category of fully automated, high efficiency wood pellet boilers.

Here in New England, Froling Energy has over 100 municipal, school, commercial, industrial and residential clients in Vermont and New Hampshire who have invested in wood pellet boilers and are successfully using them as their main heating appliance. As a result, hundreds of thousands of gallons of oil are NOT being burned here!

In the last decade innovations have steadily decreased costs, diminished emissions, and increased biomass boiler reliability and burn efficiencies. The use of chipped wood has also taken off as a fuel for large boilers, often in large buildings or "district" heating systems. Usually the fuel for these large boilers has been "green" or fresh, wood with moisture content of about 50%.

Green chips are inexpensive and plentiful but the presence of that much water carries hidden costs. First, you need to burn many more of them just to boil off the water within them. Second, the equipment and infrastructure required to handle them requires a much bigger investment. Finally, air pollution regulations usually require scrubbers and electrostatic precipitators—increasing the initial investment. Large installations can manage these costs but there is a new alternative fuel—the Precision Dry Wood Chip (PDC)—and it presents a better financial picture than either green chips or wood pellets.

PDCs are wood chips with no bark, that are no bigger than a common match book and with a moisture content of 30% or less.

In Europe the biomass market is divided up into thirds among wood pellets, green (wet) wood chips and dry wood chips. However there are just two classes of large biomass boilers: (1) those that burn green chips and (2) those that burn wood pellets and PDCs.

During the last two years as Froling Energy has installed larger European pellet boiler systems, they included the extra equipment that enabled burning PDCs as well. However, PDCs were not available in the Northeast until September. That is when Froling Energy's chipping and drying facility came on line. They are now producing over 250 tons a month and growing—and the cost is 30% less than pellets.

So if you see the big Froling Energy box truck on the highway someday, you will know that fresh, dry, clean and locally grown PDCs are being delivered to a manufacturer or school campus near you. Heat local!

The four big Froling TX-150 boilers at Whelen Engineering in Charlestown, NH burned wood pellets last winter but now they are all burning PDCs

About Froling Energy

Froling Energy is a full service Biomass contractor serving New England. They work with owners, engineers and architects to design, install and commission efficient, economical biomass heating systems for educational, institutional, commercial and industrial clients.

For more information, the website is: www.FrolingEnergy.com. Or call them at: 603-924-1001.

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Sustainable Forestry

A Day in Vermont
Follow Your Heart

By Peter Huntoon, from A Day in Vermont collection. The beauty of Vermont through art. www.ADayin-Vermont.com.

by Cindy Humiston Weed

Sustainable Forestry Management (SFM) is the management of forests according to the principles of sustainable development. The concept can be described as the attainment of balance between society's increasing demands for forest products and benefits, and the preservation of forest health and diversity.

Nancy Patch has been the Franklin and Grand Isle, VT County Forester for the past seven years and works with sustainable forests on a daily basis.

"Sustainable management of the forest means that you will be harvesting a product from the forest in a manner that keeps the forest ecosystem intact over a pre-determined time interval," Patch said. "Harvesting the forest in such a way maintains, enhances or increases the values of those products as well as the ecological values of the forest. When practicing good forest, the quality of the forest product and the ecosystem in improved at each entry. Sustainability is defined by the time frame of the management goals."

This important balance is critical to the survival of forests, and to the prosperity of forest-dependent communities at large.

"All sustainability is related to science, using practices that are rooted in science which follow silvicultural guides," Patch noted. "Silviculture is the art and science of managing a forest."

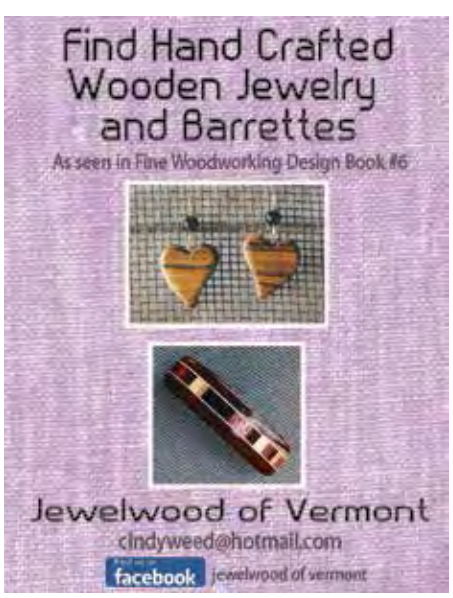
Vermont's Current Use program uses minimum sustainable forest standards. Every year, according to Patch, new parcels in the Current Use program are enrolled with a forest management plan; the plans are reviewed and approved by the county foresters. Each parcel is also inspected at least once every ten years, but generally more often in Franklin and Grand Isle counties.

"My job is to review the management plans I receive from the consultants and approve them, or ask questions to clarify or correct them," said Patch. "My other job is to do periodic inspections on all of the Current Use properties. I have approximately 900 enrolled parcels in my two counties of Franklin and Grand Isle."

Whether or not landowners are enrolled in programs like the Current Use program, Vermont law requires landowners to adhere to water quality standards that keep the soil from eroding and causing silt to enter a stream. The other relevant statute states basically that you cannot implement a heavy cut on more than 40 acres without a permit.

"The water quality and heavy cut laws are the only ones on Vermont books," Patch noted.

Other than that, there are no sustainability rules, she said. Wikipedia notes that because forests and societies are in constant flux, the desired outcome of sustainable forest management is not a fixed one. What constitutes a sustainably managed forest will change over time as values held by the public change.



Nancy Patch, the Franklin and Grand Isle, VT County Forester, works with sustainable forests every day.

SUSTAINABLE WOODWORKING SUPPORTS SUSTAINABLE FORESTRY

By Cindy Humiston Weed

I engage in sustainable woodworking, but I am not alone in this. Many local woodworkers engage in sustainable practices.

Cindy Humiston Weed

Jewelwood of Vermont

My own work is hand crafting wooden jewelry and barrettes under the banner Jewelwood of Vermont in Enosburg Falls, Vermont for over 25 years. I got into this after making softwood toys at the Montgomery Schoolhouse in the early seventies, making craft projects, and helping my husband in his wooden sash window and door business.

I was moved to my present work when I discovered the gorgeous native and exotic hardwoods like lilac, burled wood and recycled woods from woodworkers' cast-offs. Now people arrive at my shop with trunk loads of lilac branches and burls.

My earrings, barrettes, pins, necklaces are accented with semi-precious stones, sterling silver, copper, brass and gold-filled embellishments. My work sells nationwide at fine gift shops and galleries, area craft shows, and on Facebook.

In 1992, my work was featured in Fine Woodworking's Design Book #6.

www.facebook.com/pages/Jewelwood-of-Vermont

O'Meara Solar and Woodworking

The father-and-son team of Darren and Patrick O'Meara created O'Meara Solar and Woodworking in the central Vermont town of West Topsham,. The partnership grew out of needs for off-grid solar energy for their own homes and for the woodworking shop, and it and formally became a business a year ago.

Darren O'Meara is a semi-conductor test engineer at IBM in Essex Junction, Vermont, with degrees relating to electrical engineering. Speaking of his house, he explained, "We built on my grandfather's farm. Bringing power in just wasn't an option; it was just too expensive. So we did what a lot of other people do: we bought a kit and put it together ourselves." The installation is on a passive solar, timber frame home in East Orange that he and his family built, and where he now lives.

Patrick and Darren O'Meara, solar-powered woodshop.

Wood products made with solar at O'Meara's

Word spread, and Darren O'Meara starting getting phone calls from folks needing help with their solar kits. A business in solar power started to make sense, especially as IBM had been on "shaky ground" during the fifteen years he had been there. Hecompleted a solar installation and design course, and passed the NABCEP Photovoltaic EL exam, and so he handles most of the solar and electrical design work.

Darren's father, Patrick O'Meara, lives in East Orange, Vermont with his wife, Bonnie. Their home is also solar powered. Patrick O'Meara is a construction, landscape, woodworking professional with over thirty years of experience in residential and small commercial construction, including timber frame. These skills are essential for completing structurally sound solar infrastructure.

"The paths were connected," said Darren O'Meara. "We can do solar in the summer and cabinets in the winter."

With the solar business up and running, this winter the pair hopes to concentrate on more custom fine woodworking projects like desks, tables, kitchen cabinets, chairs, in their solar powered woodworking shop. Right now they are working on

Pieces of furniture made at O'Meara's Solar Workshop

native cherry cabinets for Patrick O'Meara's house, using lumber harvested and sawn by Darren's uncle. "I dried it in my greenhouse," Patrick O'Meara explained. "We dry wood and also whatever vegetables we have like beans and corn."

The shop also doubles as a solar showroom for curious visitors. People are amazed by the tools and power equipment that solar energizes

They also draw on the expertise of another local father and son team: Arnie Braman, a master electrician, and his son Frankie Braman.

O'Meara Solar and Woodworking can be contacted at (802) 522-2381 in East Orange, VT. The website is omearasolar.com.

Planet Hardwood

For others who wish to do sustainable woodworking, or just using healthy home products, a visit to Planet Hardwood in St. George, Vermont is a must.

The green building supply source offers a multitude of Forest Stewardship Certified building materials and home and health-related products. They sell flooring from sustainable sources, recycled flooring, non-toxic cork and Marmoleum floor coverings, and a host of American Formulating and Manufacturing (AFM) Safecoat products ranging from cleaners to hair and body shampoos. It is one stop shopping for eco-friendly items.

Paul Farrell, operations manager at Planet Hardwood says, "We're the one company like this in Vermont."

Photo: Planet Hardwood

Planet Hardwood supplies both finished and unfinished native and exotic wood flooring including pine, oak, maple, birch, tigerwood, cumaru, amendoim and sirari. They also offer recycled wood flooring made from longleaf pine timbers that once framed Kentucky bourbon warehouses, oak flooring from tobacco sheds in Tennessee, Canadian maple flooring rescued from abandoned woolen mills in the Carolinas, and renewable cork flooring from the Mediterranean cork-oak.

For kitchen and bath, Planet Hardwood offers Marmoleum, a floor covering with a jute backing that comes in sheets or snap together panels that is made from pressed flax seed oil, pine resin and wood flour. They also offer a new state-of-the-art countertop material called Richlite made of 10,000 layers of recycled paper compressed under 50,000 pounds of pressure. Paper stone comes in a variety of colors and is milled like wood and water proofed with a health-safe sealer.

Planet Hardwood also carries a host of AFM Safecoat product cleaners, paints and building products that are free from toxic ingredients.

Contact info: 802-482-4404, www.planethardwood.com.

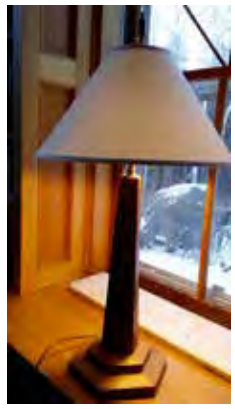
Massasecum Woodworks

Philip Byfield - Massasecum. Woodworking and Greenhouses

In Bradford, New NH, Phil and Sara Byfield run Massasecum Woodworks, building 12-sided wooden greenhouses. The small, sustainable green living company uses only safe and local materials like good lumberyard spruce 2 x 4's and Thompson's enviro-finish in their unheated greenhouses. They do not use pressure-treated woods.

"It's a small custom greenhouse business at this point," Phil Byfield, noted. "We are avid gardeners and always wanted a greenhouse. I am a design-builder, having had a career building custom houses and interiors. I am also a woodworker, and enjoy making such things as lamps and 12-sided lampshades."

Two years ago, they built their first greenhouse, modeled after Phil's lampshades. It was inspired by very expensive English greenhouses built also to be used as a sitting or reading room for several people. Sarah, a garden writer and artist, says "once the door is closed it is calming and inspirational inside."



"It's been called a therapy oasis; a space for meditation," Phil Byfield, agreed. "The experience of just sitting inside is priceless."

Next year the couple is building a larger model with hot water heat that will capture heat from the top of the greenhouse and pipe it into the soil bed.

"Keeping the soil warm is the key to these," Phil said. "But we were amazed at how many plants reappeared in early spring, including some of the micro-greens."

"This is not a greenhouse in a box kind of thing, it is a very customizable structure, built to last many years," Phil added. "The standard 14ft greenhouse can be customized with plastic or glass windows, watering systems and the works."

Massasecum Woodworks serves NH, ME, VT, and parts of MA. They can be reached at (603) 938-5988. www.massasecum-woodworks.com.

Staircase built by Phil Byfield of Massasecum Woodworks.

"Named NH's Green-Business of the Year"

By N. R. Mallery

A local printer in central New Hampshire, R.C. Brayshaw & Company, proudly dons a tagline, Named New Hampshire Green Business of the Year. We include them in our Sustainable Forestry feature because they are an FSC-certified printer with strict guidelines for certification and promoting sustainable forests.

Their green business designation includes some exemplary steps that they have taken, starting with their infrastructure. Upon purchasing their building in West Lebanon in 2010, prior to taking occupancy, it underwent a massive transformation from an energy-sucking vortex to a highly efficient facility with a new roof, along with energy efficient lighting and air-conditioning systems.

Tom Brayshaw, President and CEO stated, "We recycle between four and five tons of paper a week. All paper – left over from print runs, carton packaging, hamburger wrappers, you name it. We use vegetable-based inks with the lowest VOC (volatile organic compounds) possible, which applies to our press chemicals, as well. Our state-of-the-art Heidelberg presses minimize setup and waste during run time, lowering power and material consumption. They use materials such as MicroGREEN, which is made 100% from recyclable materials on our wide-format press, and the UV inks are safe in hospital and restaurant environments."

We want to extend our own kudos to this green business for their well-deserved designation that they proudly wear, since winning the award in 2012.

R.C. Brayshaw is located in both Warner and Lebanon, NH. Learn more about them at: www.rcbrayshaw.com.

Sustainable Forestry Links

We have prepared a set of links for those interested in sustainable forestry. Some of the links are to government forestry resources. Others are to foresters who operate sustainable. Some are for sustainably harvested products. The list can be found at the Green Energy Times website, at www.greenenergytimes.net/sustainable-forestry-links/.

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WEATHERIZATION IN NEW HAMPSHIRE
Easy and Affordable

Melissa Elander, J. Myers Builders, Inc.

At this time of year we New Englanders take stock of our winter preparations. Like the squirrel who has cached nuts for months in preparation, we check the carefully stacked rows of firewood, order pellets, and check oil and propane levels. Insulating and sealing air leaks in the home can help our home heating fuels go further.

New Hampshire homeowners may qualify for a 50% incentive, up to $4,000, to help pay for energy efficiency improvements including lighting upgrades, water conservation measures, air sealing, and insulation through the Home Performance with Energy Star program. Homeowners can find out more about the Home Performance with Energy Star program by going to www.nhsaves/save-home/, or by contacting their utility company.

J. Myers Builders, Inc., an insulating company in Lisbon, NH, has been a contractor for the Home Performance with Energy Star program since 2009. Working with the utility companies, they help reduce energy use with audits, improvements, and rebates.

One person who benefited is Debra, of Milan, NH. She enrolled her home in the Home Performance with Energy Star program through Public Service of New Hampshire. The home is heated with an oil boiler, a pellet stove, and a propane fireplace. The home is a single level ranch with a heated basement, and a family room that is built on piers. It was the coldest room in the house.

Energy Efficiency improvements will save this homeowner $754.87 annually. The costs involved were reduced by over $3,500 from rebates that are available.

The floor of the family room was insulated with fiberglass installed below two inches of rigid foam board. The rigid foam board was not sealed to provide a complete air barrier. J. Myers Builders, Inc. air-sealed at the perimeter of the floor system and all seams in the rigid foam board using spray foam. In the heated basement, the rim joists and above-ground concrete foundation were insulated with three inches of closed-cell spray foam.

The existing attic insulation was a mixture of cellulose and fiberglass, and was less than the recommended insulation value of R49. The attic was air-sealed and additional cellulose insulation was added to bring the attic to above R49. Air sealing an attic prior to adding insulation is important to stop heat loss from around lighting fixtures, wiring, fans, plumbing vents, chimneys, and any other penetrations.

Ventilation is a very important component of an energy efficient home, in order to control moisture and provide air exchange within the building. During the energy audit the existing bathroom fan was found to have a low exhaust rate. The weatherization project included the installation of a high exhaust rate bathroom fan to more effectively remove moisture from the home.

The original blower door test measured 2,507 cubic feet per minute (CFM at 50 pascals pressure) of air flow. After air sealing and insulation improvements were completed, the final blower door measured 1,463 CFM, which represents a substantial reduction in the heat loss in this home.

The total project cost was $6,831.83, reduced to $3,038.50 by the rebates available through the Home Performance with Energy Star program. The projected annual savings are anticipated to be 170 gallons of No. 2 heating oil. The improvements will reduce carbon dioxide emissions by 4,319 pounds per year and save Debra $754.87 annually.

Following the energy efficiency work, Debra noticed that the basement was less drafty and the house held heat better than before. "I am really glad this program was available, and I would recommend others to take advantage of it."

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MULTI-UNIT HOUSING ENERGY SOLUTION

New company to bring energy savings within reach for underserved markets

With $6.5 million in capital commitments, Vermont Energy Investment Corporation (VEIC) has launched Commons Energy to reduce energy costs for multi-family housing and other public-serving buildings

VEIC has announced the Commons Energy L3C, a new subsidiary to help underserved markets reduce their energy and water costs.

Commons Energy has started up with an initial capitalization of $6.5 million, including a $5 million "impact investment" from the John D. and Catherine T. MacArthur Foundation focused on multi-family housing. Additional support is being provided by the High Meadows Fund, the Kresge Foundation, the National Housing Trust, the Vermont Community Fund, and the Vermont Housing and Conservation Board.

Commons Energy takes a comprehensive approach to helping reduce energy costs for owners of small and mid-size public purpose buildings such as schools, health care facilities, affordable multifamily housing, and municipal and community structures. The approach focuses on simplicity for the building owners, including an energy savings guarantee, so they can remain focused on serving their clients.

"There are remarkable opportunities for energy savings available for hospitals, schools, and other public-serving entities," said Scott Johnstone, Executive Director of VEIC. "For the first time, Commons Energy is going to make available to these entities energy-saving tools previously only available to much larger businesses."

For the customers it works with, Commons Energy will manage and coordinate project financing, monitor and verify energy-saving measures, and help owners manage their building performance for optimal energy use in the future. Commons Energy provides access to the capital needed for making the energy improvements, which is repaid with guaranteed energy savings. For all Commons Energy projects, a deep level of energy savings on the order of 30% will be targeted.

For its inaugural project, Commons Energy is helping an affordable multi-family building in southern Vermont to reduce their energy costs. Union Square Apartments in Windsor, Vermont is replacing their oil heating system with a modern wood pellet biomass heating system, and installing new energy efficient circulator pumps. The new system will reduce their energy bills by nearly $23,000 annually, helping the building owner maintain a high level of affordability for the housing.

"Working with Commons Energy has provided a unique opportunity for us to significantly reduce our heating costs with no upfront investment," said Eric Schmitt, Director of Asset Management for Housing Vermont, which owns the building in partnership with the Windham & Windsor Housing Trust. "Every dollar we don't needlessly spend on energy is one we can use to maintain the quality and affordability of this housing."

Commons Energy is initially launching its services in Vermont and the Washington, DC region, including Maryland and Virginia. In the future, it plans expansion to Ohio and other regions.

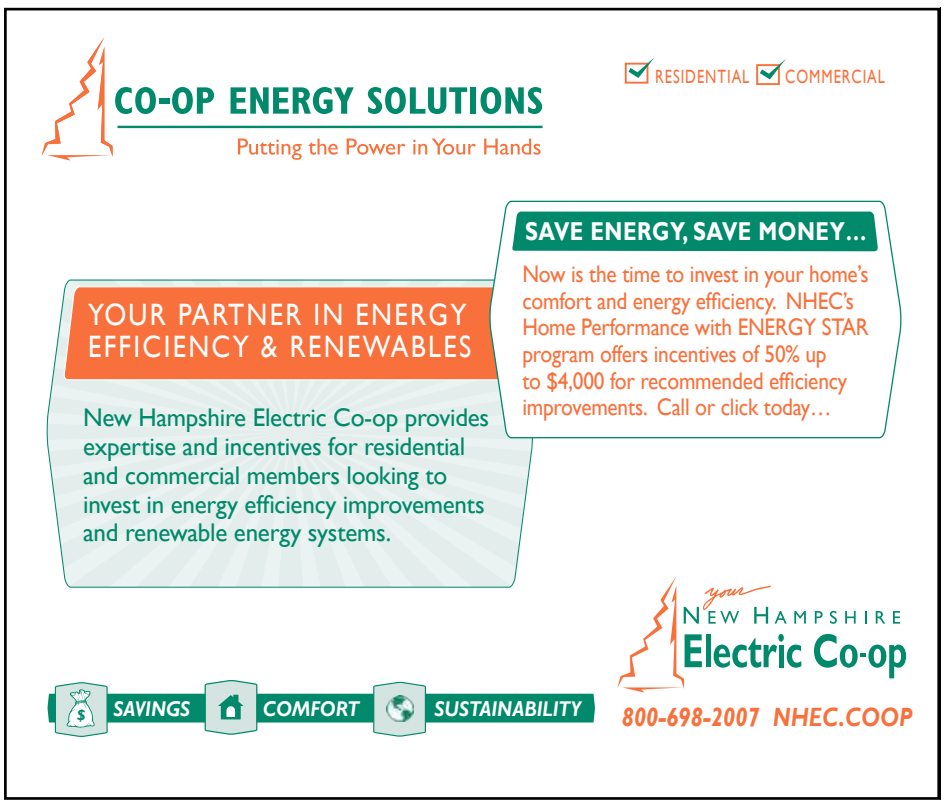
"The lack of efficient, workable financing options is a critical hurdle to meaningful energy efficiency gains throughout the U.S. multifamily sector," said Debra Schwartz, MacArthur's Director of Program-related Investments. "Fortunately, there are a growing number of creative models such as Commons Energy that can help owners upgrade multifamily buildings in ways that significantly reduce energy usage while increasing local economic activity and improving long-term affordability for hard-pressed low-income renters."

Commons Energy is not affiliated with Common Sense Energy, a Vermont-based company focused on energy efficiency through building performance optimization.

The Vermont Energy Investment Corporation (VEIC) is a mission-driven nonprofit organization founded in 1986 to reduce the economic and environmental costs of energy production and use through cost-effective energy efficiency and renewable energy technologies. For more information: www.veic.org.

Commons Energy, L3C is a comprehensive total-energy solution for owners of small to mid-size multifamily affordable housing, education, health care, and community and municipal facilities who may have difficulty accessing capital, technical skills, and implementation services.

Established as a low-profit, limited liability company (L3C), a form of LLC that balances social and financial returns, Commons Energy is a for-profit subsidiary of Vermont Energy Investment Corporation, a nonprofit organization dedicated to reducing the economic and environmental costs of energy use for all economic groups. For more information: www.commonsenergy.com.



Nine Nonprofits Awarded Solar

Nine nonprofits, including two churches, a volunteer fire department and Rutland's Paramount Theatre, will soon begin to generate some of their energy with help from the sun, thanks to grants from Green Mountain Power.

"These grants help further our mission to create a new energy system that is more environmentally and economically sustainable," President and CEO Mary Powell said. "As we continue to partner with customers and communities to create a more resilient and reliable grid, with micro-grids, renewable generation and energy storage, we will continue to help nonprofit groups embrace this exciting new world."

Charlotte Congregational Church, Fairbanks Museum and Planetarium in St. Johnsbury, the Paramount Theatre, Second Congregational Church of Bennington, Rutland County Parent-Child Center and Vermont Achievement Center will receive $20,000 each.

Rutland Community Cupboard was awarded a $7,000 grant, Mercy Ecology Farm in Benson will receive a $12,100 grant, and Guilford Volunteer Fire Department will receive a $16,400 grant. All of the projects, which will cost at least twice the grant amount covered by other funding sources, are expected to be complete by next summer.

The projects stood out and were selected based on their impact on the recipients and their communities, additional sources of funds leveraged by the grants, and educational value associated with the projects.

"With nearly two dozen applicants, we were thrilled by the creativity and commitment to sustainable energy from all kinds of nonprofit groups," said GMP Vice President Steve Costello. "We are especially excited about the educational aspects of the winning projects, which include a video display in Rutland's historic downtown theater that will be seen by thousands of people, and a solar safety training program for firefighters."

Powell highlighted the value of helping non-profits reduce their energy bills. "Every dollar the Community Cupboard cuts from its power bill is a dollar that can help feed a hungry family or senior citizen," Powell said. "These grant recipients will help continue to show how we are leading the way in Vermont to help people save money and be more comfortable, while moving to cleaner sources of energy."

More information is available on the GMP website: www.greenmountainpower.com.

Manmade Global Warming is Worsening – but there is hope

By George Harvey

Researchers from NASA and UC Irvine studying ice in an area of West Antarctica roughly the size of Texas called the Amundsen Sea Embayment report a "continuous and rapid retreat" of glaciers there. They worry that, perhaps as soon as two centuries from now, the area could melt entirely -- leading to between four and 10 feet of sea level rise around the world. Pictured: melting ice floes in Antarctica. Credit: Chris Vees

All year, we have been seeing news on climate change. Much of this comes from the United Nations' Intergovernmental Panel on Climate Change. This organization has issued a series of dire warnings over the past year, telling us that there is no scientific doubt whatever that human beings are causing serious, destructive climate change. They say that if we do nothing, the result will be a long series of disasters unlike anything human beings have seen before. They also tell us that we can do something about it.

Studies of peer-reviewed scientific literature show that 97% of all scientists publishing on the subject agree that man made climate change is real and dangerous. The other 3% did not necessarily disagree, but had not stated their position. One study found only one author out of over 9,000 was a climate change denier.

Early in the year, Senator Bernie Sanders of Vermont told us, "The scientific community across the world is sounding the alarm. Climate change is real and it will have devastating consequences around the globe unless we act boldly and decisively." He proposed a fee on carbon and methane emissions. He has also introduced a bill to end tax breaks and subsidies for oil and coal companies. Both ideas were backed by scientists and leading economists, but both were blocked in Congress.

During the last six months, we have seen climate conditions getting worse. We have seen a period of months in which worldwide heat records were set. The record cold we had last winter in New England was caused by record heat in Siberia pushing cold arctic air down on us.

In November, we got news that October was the third in a row to break temperature records world-wide. With at least two other record-setting months this year, we are almost certainly going to finish with the year being the hottest on record.

We also got something more alarming. Waters off the Canadian coasts were 4° Celsius (about 7° Fahrenheit) above normal. This was not alarming merely because of the number, but also because it was true of parts of the Pacific coast, the Atlantic coast, and even Hudson's Bay.

What is the good news? For one thing, the price of solar power has dropped so low that it is out-competing natural gas, not only in much of the world, but in much of the United States, where natural gas prices are lowest.

For another thing, the price of wind power is so low that it will out-compete anything nearly everywhere. At the same moment that we hear calls for more natural gas pipelines to supply power in eastern New England, the federal government is auctioning land off Martha's Vineyard that can supply up to 5 gigawatts of wind power, enough for half the houses in Massachusetts.

Also, batteries for backup power have started out-competing natural gas peaking plants in price. That does not even account for the fact that given a smart grid and more electric vehicles, the financing for those batteries will be largely in the form of ordinary automotive loans.

The world is changing fast. Fortunately, we can still choose what it will be.

HARD DECISIONS

cont'd from p. 1

outperforming coal in some auctions. This is nice to know, though not especially surprising. It had been predicted, and similar reports have come from other places in the last year or two, including some of solar winning auctions in the United States.

This news is particularly difficult for Australia, however. The government there has been actively attempting to reduce the growth of renewable power in favor of coal. The claim was that Australia would become the world's leading source of inexpensive fuel. Hopes for that goal have been dimming of late.

A third item in the day's news came from China, where developers are pushing hard to install as much windpower as possible before incentives are closed in 2016. The country is currently on course to add as many as 20 gigawatts (GW) in 2014, followed by about the same number in 2015. Chinese nuclear plants have capacity factors very slightly more than double those of windpower, depending on where the wind turbines are set up and how they are configured. This means that 20 GW is a little less than the equivalent of 10 GW of nuclear power, or about ten new nuclear power plants. Meanwhile, use of coal actually declined in China during the second and third quarters of this year.

Finally, an important piece of news came from Europe. The European Union has a goal of reducing greenhouse gas emissions by 20% from 1990 levels by 2020. The European Environment Agency reported that they are on track to surpass this goal by a fair margin, with a reduction of 24% by that date. While much of the greenhouse gas emission reduction is due to efficiency, the block is also expected to get at least 20% of its energy needs met by renewable power by 2020.

Solar PV modules at the Ladakh Renewable Energy Development Agency Office in the Indian district of Leh-Ladakh. Photo by Fringe2013.

Sweden outranks the U.S.

-- Greenest Country in the World

by Roddy Scheer and Doug Moss

It's true that Sweden came out on top in the recently released ranking of 60 countries in regard to sustainability by consulting firm Dual Citizen Inc. in its fourth annual Global Green Economy Index (GGEI). Norway, Costa Rica, Germany and Denmark rounded out the top five. The rankings take into account a wide range of economic indicators and datasets regarding leadership on climate change, encouragement of efficiency sectors, market facilitation and investing in green technology and sustainability, and management of ecosystems and natural capital.

Sweden's first place finish reflects the Swedes' ongoing commitment to climate change mitigation and sustainability policies and practices. The country is a leader in organic agriculture and renewable energy as well as per capita investment in green technology and sustainability research. Upwards of 75% of Swedes recycle their waste, while only four percent of the country's garbage goes to landfills. In fact, Sweden imports garbage from other nations to burn as a renewable source of energy.

On the climate front, Sweden was one of the first countries in the world—going back to 1991—to put in place a heavy tax on fossil fuels to encourage the development of greener sources of energy. Indeed, the high price of gas there has notably boosted sales and consumption of homegrown, renewable ethanol. Just a few decades ago Sweden derived 75 percent of its energy from fossil fuels, but is on track to shrink that to 18% by 2020, with many Swedes clamoring for the country to abandon fossil fuels entirely at that point. As if that were not enough, Sweden recently announced that it would pay a whopping $500 million over the next four years into the United Nations' Green Climate Fund, a pool of money sourced from richer countries to help poorer ones transition to a future less dependent on polluting fossil fuels.

Sweden topped the recently released environmental sustainability ranking of 60 countries by the Global Green Economy Index. The rankings take into account a wide range of key issues, including leadership on climate change, green technology and sustainability, and management of ecosystems and natural capital. Pictured: A display greets visitors to the Swedish Embassy in the United States. Credit: freakytrends.blogspot.com

The United States didn't fare so well in the GGEI, ranking 28th overall, just behind Rwanda and slightly ahead of Canada. Despite leadership in green technology and environmental awareness, Americans' disproportionately large carbon footprint and resistance to a national policy on climate change mitigation are hurdles to the U.S. achieving a better ranking.

The GGEI isn't the only sustainability ranking of countries. The Yale Center for Environmental Law & Policy and Columbia University's Center for International Earth Science Information Network recently released their 2014 Environmental Performance Index (EPI), a similar but more expansive ranking of 178 nations on environmental health and ecosystem vitality. Switzerland topped that list, followed by Luxembourg, Australia, Singapore and the Czech Republic. Sweden ranked ninth and the U.S. 33rd.

The fact that global rankings like the GGEI and EPI exist, shows without a doubt that sustainability concerns are a global phenomenon, and that people from Iceland to Singapore (two highly ranked countries) realize the importance of taking care of Mother Earth. Despite issuing different rankings, both indices had a lot in common, with five countries (Norway, Germany, Switzerland, Austria and Spain) making the top 10 list of each. Another common conclusion was that the U.S. has much to do if it hopes to be taken seriously among world leaders committed to protecting the planet and our common future.

Contacts: GGEI 2014, dualcitizeninc.com/GGEI-Report2014.pdf; EPI, epi.yale.edu.

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Our Changing Climate

Review by R. Lohr

This Changes Everything: *Capitalism vs. the Climate*

By Naomi Klein (Simon and Schuster 2014, 576 pages, $30.00)

Naomi Klein believes the battle on climate change boils down to two world views. One is the hierarchical-individualistic world view, which strongly supports corporate industry, opposes government assistance to the poor, and preaches that everyone gets what they deserve. Hyper-consumption and unrelenting economic growth are its cornerstones.

The other view is egalitarian-communitarian. It inclines to collective action, social justice, and suspicion of corporate power. Klein believes adopting such a view would require long term planning, tough business regulation, higher levels of taxation for the affluent, big public sector expenditure, and giving communities the power to change as they desire.

Klein says we are "looking away" to avoid confronting the climate issue. She is right - we still drive SUVs, travel by airplane, and pay taxes that support wars for oil. As I read chapter after chapter of This Changes Everything I felt deeply troubled.

I found myself asking questions. How do we move rapidly away from fossil fuels? Can we protect humanity from the twin ravages of a savagely unjust economic system and a destabilized climate? Can we reclaim democracy from corrosive corporate influence?

Can devastating climate crisis get us to adopt something better? Climate change may provoke people to improve their lives, close the gap between rich and poor, create employment, reinvigorate democracy, and disperse power into the hands of the many rather than consolidating it in the hands of the few.

Corporate interests exploit crisis to force policies that enrich the elite by lifting regulations and cutting social spending. They hedge by selling protection, expanding business opportunities in disaster response services, and selling military and security products to prepare for climate change.

There are disturbing revelations on most of the pages in This Changes Everything.

- $775 billion in annual global subsidies for fossil fuel corporations
- US oil-gas business spending $400,000 per day lobbying in 2013 and paying $73 million in Federal campaign and political donations in 2012 (that we know about)
- Involvement of supposedly green organizations, such as the Environmental Defense Fund and the Nature Conservancy, with fossil fuel corporations
- Continued investments in fossil fuels by such moneyed climate messiahs as Branson, Gates, Buffet, Bloomberg, and Pickens.

We have been indoctrinated by religion and Hollywood to expect happy endings, perhaps to hope for some amazing technology to save us at the last minute. Many parts of This Changes Everything tend to refute such an idea. Much current debate centers on where to get energy, without really addressing climate change. Emissions are surging. China, India, Brazil, and South Africa have exponential growth. We are well along a path to a dangerous climate and can only get off it by acting now.

Klein has these suggestions:

- Allow construction of only highly efficient buildings;
- Stop building pipelines and export terminals;
- Incorporate environmental and climate change issues in trade deals;
- Reign in over-consumption;
- Re-localize economies;
- Invest in clean development alternatives;
- Create development models that address poverty, cultural losses, and ecological devastation;
- Provide decentralized, renewable forms of energy;
- Revolutionize urban transportation;
- Develop an internationally administered fund to support clean energy and transition in the developing world;
- Have countries with high rates of consumption pay their ecological debt and provide reparations to those that have consumed less;
- Employ an equitable effort-sharing approach to climate stabilization, such as "greenhouse development rights";
- Clearly define and quantify the burden in a system that is effective, and not easily gamed, as carbon trading is;
- Allow foreign debt to be forgiven in exchange for climate action;
- Loosen green patents and share technological information;
- Finance costs from the fossil fuel corporations that have profited greatly.

Climate scientists are now speaking bluntly about political implications of the consumer culture. The issue that blocks the horizon is the need for a redistribution of wealth. This would require a convergence of diverse constituencies. For this, the distinction between activists and ordinary people needs to disappear.

Many of the political class are incapable of using existing renewable energy technology and implementing plans because they need to unlearn core tenets of free market ideology that governed their rises to power. This is also true of others who constantly seek to maximize advantage.

Center for Climate Preparedness

Keene, New Hampshire – The Center for Climate Preparedness and Community Resilience at Antioch University New England (AUNE) has launched its inaugural year with a major Northeast regional conference, a topical webinar series, and a funded doctoral fellowship. Its programming is focused on building the capacity of communities to identify and strengthen the connected public health, economic, environmental and social aspects that contribute to community preparedness and resilience.

"A healthy community is one that is able to withstand and bounce back from unexpected stresses and shocks," said Abigail Abrash Walton, the co-director of the program and faculty member at AUNE. "We focus on local-level solutions for climate change preparedness and resilience, because the effects of climate change are felt most directly and keenly at the local level. Municipal, county, and regional decision makers and local community members are on the front lines of building resilience."

The Center's first doctoral fellow, Christa Daniels (Koehler), AICPm manages the programs and graduate assistants who help advance that mission. Daniels, a city planner and climate adaption professional, specializes in resiliency and sustainability planning, having facilitated strategies in Pittsburg, Penn., Portland, Ore., New Hampshire's Monadnock region, New York state, New Jersey and Bridgeport, Conn. Herpast experience also includes working for the United Nations, the New Hampshire Department of Environmental Services and as a city planner for Keene, New Hampshire.

Daniels was also instrumental in coordinating the conference from which AUNE's Center for Climate Preparedness and Community Resilience was launched.

AUNE's Center for Climate Preparedness and Community Resilience was launched at the Local Solutions: Northeast Climate Preparedness Conference in partnership with the United States Environmental Protection Agency (EPA) earlier this year. The Center is again partnering with EPA to deliver a webinar series, based on the conference workshop sessions, and designed to make this capacity-building programming more widely accessible.

The next webinar, "Green Infrastructure and Flood Resiliency-Land Use Management as an Adaptation Strategy in the Built Environment," is on Thursday, January 29 at 12 pm. The webinar will focus on assessment, planning, and adaptation not only to better prepare for the next emergency, but to sustainably manage flooding, and storm water to maintain human health and a vibrant local economy. The following months' webinar topic is "Collaborating for Resilience: Reaching the Most Vulnerable Populations and Getting the Message Out." To register or learn more about these webinars please visit the Center's website: http://bit.ly/1CWUGxY.

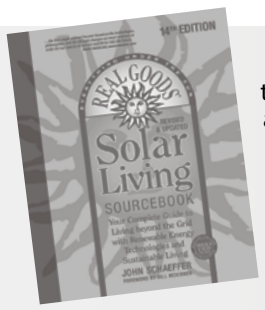
The mission of AUNE's Center for Climate Preparedness and Community Resilience is to prepare, respond and recover in the face of climate impacts and other disruptions through collaborative, innovative solutions. The center delivers applied research, consulting, and education and training. Its focus is on building capacity for preparedness locally, with a view to resilience globally and with an explicit awareness of social and climate justice.

Learn more at www.antiochne.edu.

A Book to Remember - again

Review by G. Harvey and N. R. Mallery

The Solar Living Source Book



by John Schaeffer, New Society Publishers, 463 pages, $39.95

My first big engineering project was done with a little help from my Dad, who knew how to multiply and divide. In it I showed that it was flat-out impossible for a single Santa Claus to deliver all those presents in a single night. After that I was pretty sure older children were telling the truth about Santa Claus, but I still looked forward to Christmas, eagerly awaiting the new gifts I knew I would find under a tree our living room.

Now, sixty-odd years later, I have spent much of my lifetime as an engineer, little children in my neighborhood are convinced I am Santa Claus despite my assurances that we are only distant cousins who happen to look similar, I still look forward to Christmas, and I eagerly await the next edition of Real Goods Solar Living Sourcebook.

The appearance of the Solar Living Sourcebook (SLS) is not annual, but this year we are fortunate enough to have a new edition.

When I got my new copy in the mail to review, the first thing I did was to prance around my home, chuckling. My cat, who had seen me act irrationally in the past, was unimpressed. My landlady, who understood the deep significance of the event, appeared to be more understanding.

The 14th edition of the SLS is very like the earlier editions except for two things. One of these is very important; the information, which relates to a set of rapidly changing industries, has been brought up to date. "Industries" is in the plural here, because the SLS covers a very broad range of technical information, in addition to solar. In fact, it is a great manual for modern resilient living, covering solar power, shelter, water, urban homesteading, transportation, and more. This year, there is even a chapter on natural burial.

The other thing different about this edition of the SLS is that it is no longer a catalog of merchandise for sale. I have mixed feelings about this. The goods listed for sale in past editions stimulated my imagination with images of things I could wish for as much as the old Sears Catalog did when I was a kid. What has been lost, in that respect, has been made up for by the addition of new material. Very slightly different, it is new, improved, and good as ever

Nancy Rae Mallery, the editor of Green Energy Times, has her own story about the SLS, which I really should pass along. She was influenced by its early editions to investigate renewable solar power. They gave her not only the desire and understanding to power her home with sunshine, but the strong belief that it was important to do so.

When she built her current home and began living off-grid, she saw the immediate economic benefits of her solar installation, both economically and in terms of reliability, and became an advocate of green power and energy independence. She found she had to explain the whole thing over and over as she met new people, and so she brought Green Energy Times into being.

THE LOW-HANGING FRUIT

AIR SEALING

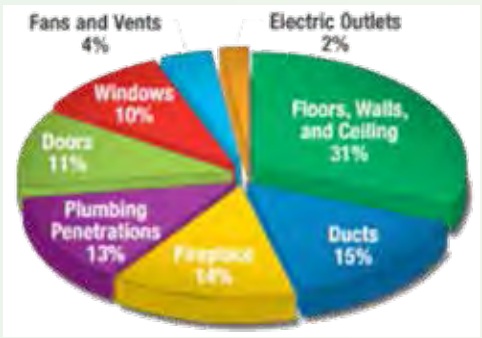
-- A Series: Part IV

By Mark Boudreau

It's happening right now. The wind is blowing. Your house is warm or at least "warmish". Outside, it's cold!

You may have noticed the drapes beginning to flutter or perhaps a draft at your feet, head, or shoulders. Many drafts come from air leakage. Air leakage is not only uncomfortable, but costly and bad for the environment. We generally find that we can lower the air leakage of an average home by between 20% and 30%. This translates into significant amounts of heating fuel saved. Having a house with air leaks is like throwing money out the window!

When we test an average 2000 square-foot home, it is common to find a total of 400 square inches of leakage. That is the equivalent of having a window twenty by twenty inches open all year long, making you hotter all summer and colder all winter. Unfortunately the fix is not as simple as closing the window. The leakage happens in a wide variety of places.



Sometimes those places are very easy to spot. If you turn off your bathroom fan and hold your hand up to it, you are likely to feel a cool draft. The same is true if you hold your hand up to the bottom of an exterior door.

A breakdown of the percentages of leakage in specific areas of a typical house is provided by the US Department of Energy. It can be found on their website at: bit.ly/DOE_air_sealing_leaks.

Here is a picture of leakage in a typical house, showing the common areas for leakage and air loss. Notice that cold air entering in the basement and then warm air exiting at the top of the building. This is a typical air loss profile.

As you can see, there is no one particular area that accounts for tremendous leakage in a house. It is generally a lot of small leaks that combine together to make a significant total air loss.

There is good news though. Some of the leaks are easy to fill.

In the right column, there are samples of the kinds of simple air sealing you can undertake in your home. If you want to deal with air leaks, it is best to get an audit from a qualified auditor first. If you want to tackle the easy work yourself make sure you sign on with an auditor who is good at explaining things and willing to coach you through some of the "low hanging fruit." We coach folks wanting to take on DIY work all the time. It is fun and rewarding.

Finally, and perhaps most important, make sure you have a qualified and certified professional check all your work. Some air sealing can cause trouble, and even some safety issues, for you and your house. You want someone who can help you navigate around those potential problems. Make sure that any air sealing is followed up with an audit and a safety check of your heating equipment. If you tighten up your house you can create a situation where your heating equipment which requires air to operate properly will be starved of air. In this case it could take its needed air from its own chimney bringing dangerous carbon monoxide back into your house. It is reasonably easy to avoid problems when you have a certified auditor or weatherization specialist in your corner.

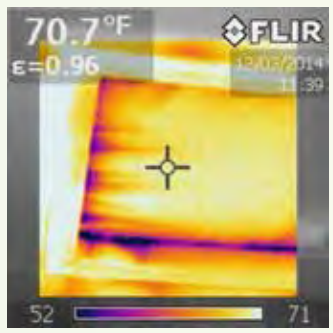
Mark Boudreau is co-owner of Lewis Creek Company, a full-service design-build company consisting of both trades-women and men located in North Ferrisburgh, VT. They take a holistic approach to new building and renovating, taking into account people, homes, the environment, beauty, economy, and performance.

CREATING A "WINDBREAKER" FOR YOUR HOME

Understanding INFRARED IMAGES

Let's look at some air leakage and infrared images. Infrared is easier than it sounds.

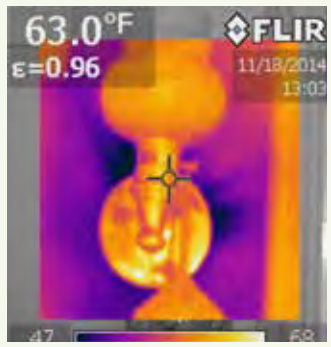
We take a picture of temperatures on a surface and assign a color to different temperatures. Blue is cold and red to white is hot.



Pic 1: Attic Hatch

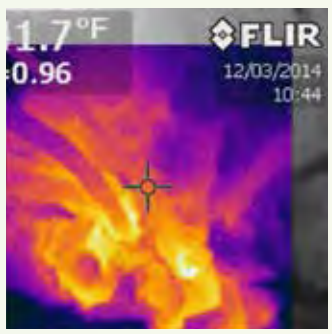
Photograph #1 is an attic hatch. You can see the blue starbursts around the orange hatch show cold air streaming across the warm surface of the hatch and cooling the hatch off. The blue outlines where the hatch itself is sitting like a door in its frame. The hatch has no rubber gasket between it and the frame, and so air is freely leaking around the frame.

This is a really easy fix with some rubber gasket material. You could even do a temporary fix with some latex caulk if you don't plan on going up into that attic any time soon. In both of images we are pulling cold air into the house for our test which is why you are seeing the cold air on the inside.



Pic 2: Light Sconce

In example #2, cold air is leaking around the base of a light sconce. You can see the same feathering similar to what was seen at the hatch. This light is mounted on the inside of the house but it is located on an outside wall. The light is also mounted on an electrical box that is in the wall. That electrical box has a number of holes in it. Warm air in the house can travel through the fixture, through the electrical box and outside, drawing cold air into the house. To fix this leakage is a bit more of a trick and requires some expertise with electrical wiring, so a professional may be needed.



Pic 3: Wires in an attic

Image #3 show four wires in the attic at the place where they descend into the building's interior walls. The blue around the perimeter of the picture is the insulation up in the cold attic. The white indicates heated air from the inside of the house that came through a wall switch on the wall below, up through the wall, and out to the attic right at this location. The electricians had to make a hole to send their wires up into the attic the hole around the wires was never caulked. So now there is a tiny chimney, at work 24 hours a day, all year, moving expensive heated air from the switch up the wire and out to the cold attic.

This is a very easy fix that most reasonably adventurous people can handle. You go up in your attic, find where the wires enter the building and seal things up with spray foam or caulk that you can get from a building supply center.

After work in the attic is done your new and tightly sealed attic can look as good as this. It is an attic which is over 30% more airtight after air sealing. It was a bit of work moving the insulation out of the way to do the air sealing, but it was well worth doing for years of heat and energy savings. It is also really great for the environment too, as it reduces the energy needed to heat the house.

This is what the wiring looks like after all the holes have been sealed. There is no leakage and the work was pretty easy.

All photos courtesy of Mark Boudreau, Lewis Creek Company

QUESTIONS TO ASK YOUR BUILDER

By George Harvey

As I chatted with a woman in a local food store, I mentioned how the energy market was changing, rapidly making energy more affordable. She asked, "How so?"

"Well, for example, an architect recently told me it has become possible for a new building to be so efficient that the fuel cost is reduced by 90%, but at the same construction cost as a conventional building."

She looked incredulous. "How can that be?" she asked.

"The furnace and chimney cost about the same as the extra insulation and air sealing."

Her face dropped. She told me sadly, "I just had a new house built." She was thinking of hundreds of dollars of completely unnecessary heating bills, every year, as long as she had the house.

If you are about to build a new home and the builder is talking about conventional building practice and heating, we recommend getting very inquisitive. Here are some of the questions you should ask:

◊ What do the designer and builder do to keep up with current building practices for efficiency? The fields are changing so rapidly, and the best in the field go to seminars and workshops to keep up to date. Those who do not do this are likely to leave clients stuck with old-fashioned equipment and practices.

◊ Are the designer and builder familiar with Passive House standards? A Passive House does not need any heat at all, beyond what comes from cooking and day to day living. While such homes are a little more expensive than conventional homes, the pay back comes in only a few years of not buying fuel. Also, many of the best Passive House technologies can be used in other buildings to reduce fuel costs without increasing construction costs.

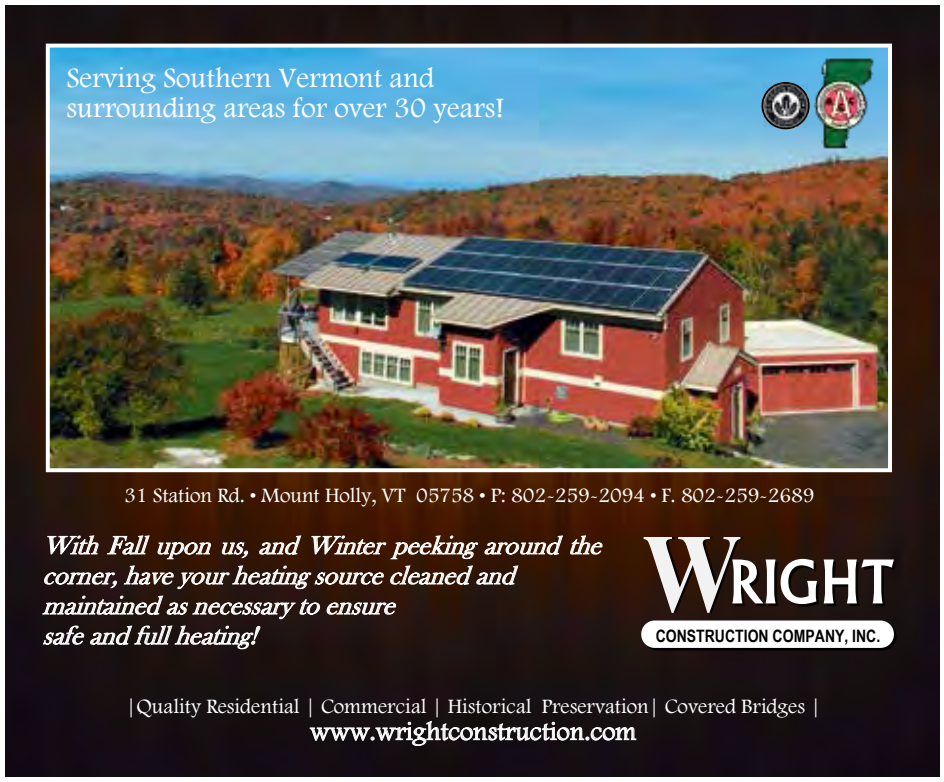
◊ Does the designer use modeling software to predict the energy costs of a house before it is built? Working on a seat-of-the pants home design is no longer acceptable practice.

◊ What testing equipment does the builder use to check that the work is done properly? At the very least, blower door tests should be made. These tell how much air infiltration happens.

◊ How does the builder document the construction? Good construction includes documentation on methods, materials, tests, and results. The builder should be willing to photograph work in progress as part of the documentation.

If a designer or builder says these practices are too time-consuming and expensive, then the house could be too inefficient and expensive to be worth building.

A blower door test to find air intrusions is important for any new structure. Photo by Ecotribu.



Prevent Outlet Drafts

Green Energy Times Staff

We have come across a nice-looking little device that can help reduce outlet drafts and improve household safety at the same time. It comes from a company called, "Mommy's Helper," located in Wichita, Kansas.

Safe-Plate™ is an automatic outlet cover. With the product installed, it looks nearly identical to a standard outlet cover, so it is not easily noticeable. When a plug is inserted, the cover slides out of the way automatically, and when the plug is removed, the cover slides back into place.

One advantage of the product is that it provides an air seal, reducing drafts and making the home more energy-efficient. Another advantage is that it helps protect children from shocks they could possibly get from uncovered outlets.

Models are available for both Standard and Decorative duplex receptacles, in white and eggshell colors. The product is approved by the Canadian Standards Association, and the manufacturer says installation is easy.

The Safe-Plate™ can be seen at mommyshelperinc.com/safeplate.htm.

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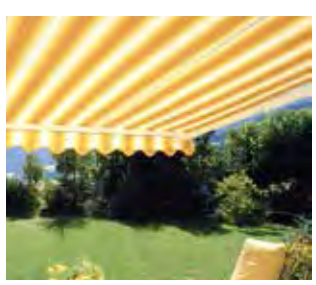

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GREEN BUILDERS
PRE-CRAFT

Left: Crew members at an Ironwood installation site. Right: Eli Gould and crew members in the PreCraft shop. Photos courtesy of Eli Gould.

By George Harvey

Eli Gould, founder of PreCraft, embarked on an unusual career path while he was a student in college. His decision to do a dual major in architecture and forestry was met with an incredulous question from the administration at Yale, who asked, "What do they have to do with each other?" Nevertheless, Gould prevailed on the issue, and got the specific educational foundation he wanted.

It is noteworthy that the combination of architecture and environmental studies has been established as a standard field since his time. In fact, Gould was invited back to Yale to address students who had followed in his footsteps.

After graduating, he returned to his hometown of Brattleboro, Vermont where he quickly started working with architectural woodworking. He started Ironwood Brand in 1994, as a sawmill and woodworking business.

"We began returning to the idea that your whole project should represent the consistent values that are most important to you," Gould says. Though Ironwood Brand has specialized in custom built residential envelopes, the underlying philosophy implies looking at a bigger picture. From land, site and forestry planning, through residential design and architectural millwork manufacturing, the operation has focused more on management services that help people to make good choices.

In time, Gould went more and more into custom prefabrication, manufacturing building components in a shop, under controlled conditions, so they could be assembled into homes in the field. This was because of the large part of the costs of a well-made building are in carpentry.

As prefabrication became more important, Gould decided to open PreCraft, as vertically integrated, focused and specialized division of Ironwood. Gould loves working with wood, partly because it is much better for the environment than other materials. Prefabrication allows improving construction standards without cutting corners while paying good wages to employees. PreCraft is focused on prefabrication of unique, custom modules, as opposed to panelized or modular.

One of the more widely known residents of the Brattleboro area is Alex Wilson, who is the founder and executive director of Building Green, publisher of Environmental Building News (EBN). Recently, he decided to renovate an old farm in Dummerston, Vermont. The project involved a "deep energy retrofit," and since the work was followed by EBN's readers, it was performed under close scrutiny of as many industry peers as cared to be involved. They commented on just about every choice made, from construction methods to the specifications of components. Since the retrofit was very extensive, they had a lot to say.

Wilson chose Ironwood and PreCraft to work on the project, and so they got a lot of national attention from people in the trades. The attention began before work started on the project; because energy use results continue to be compiled, it will doubtless continue after the project was completed.

Alex Wilson also started the Resilient Design Institute. It has brought together a number of people who contribute to continuing work in related areas of resilient living. Commenting on this and the nature of other businesses in and around southern Vermont, Gould points out the extraordinary importance of the region as a hub and model for development of new ideas. Certainly, Ironwood Brand and PreCraft have achieved a level of national acclaim as green builders.

One goal Gould wishes to keep in mind is to create local jobs. His businesses won top private ranking from Southeastern Vermont Economic Development Strategies to recover lost jobs in Vermont. The use of native lumber in engineered structures is potentially a great employment opportunity.

Thinking of increasing area employment, and also noting also that national companies need to know how their products work with those of other companies when they are used together, Gould has seen an opportunity. He is thinking about a rapid prototyping center for well coordinated systems. This has great potential to bring about its own improvements in a well engineered whole house system. He says one thing he would like to work on is tapes for air barriers in buildings. Another is testing different cold-climate heat pumps.

The Ironwood Brand website is ironwoodbrand.com. PreCraft is precraft.com.

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DEEP ENERGY RETROFIT:

Double Wall Construction

By Michael Goetinck

There are several benefits to double wall construction such as:

Increased cavity depth to achieve higher R-values.

Reduced thermal bridging so the entire wall assembly has a greater resistance to heat transfer.

If you want to know exactly how a double wall assembly is going to perform, there are a few things to consider: the depth of the cavity; the inside-to-outside distance between the studs; and how many window and door openings there are. For the purposes of this article I'm not going to discuss the impact of these openings on the wall except to say that their number, orientation, and placement affect the overall performance of the assembly.

The deeper the wall cavity, the more room there is for insulation and more insulation means more stable interior temperatures throughout the year. In our climate the exterior wall cavities of a super-insulated house are 12 inches that are filled with dense-pack cellulose deep (to achieve R-44). The walls of a house built to Passive House standards are 16 inches deep, to achieve R-60 if filled with dense-pack cellulose.

In retro-fits and new construction, the best way to achieve this is by building two 2x4 walls parallel to each other. One of the walls is the structural wall and the other is used increase the depth of the cavity. This can be done to the interior or the exterior. When the walls are this thick the studs don't have to be offset because the cellulose flows between them, reducing thermal bridging to the point where it really doesn't have much effect on the overall performance of the wall assembly.

"Fatting" walls to the interior is relatively simple. A second wall (including top and bottom plates) is framed parallel to the exterior wall. Fatting walls to the exterior requires some more thought to the exterior finish details, but the actual framing is well within a builder's skill-set. The two most common methods are building Larsen Trusses or installing engineered joists. Open chord trusses can also be used. Google "Larsen truss" and you can see plenty of pictures and other articles about their use. Using a Larsen truss necessitates removing the exterior sheathing in a retro-fit since the two stud walls are held together with ½" plywood or oriented strand board (OSB) gussets. To make installation easier, I cut all of the gussets to the size of the desired cavity depth (12 or 16 inches), nail one end so it's flush to the interior of the structural stud, and then attach the exterior stud. The top plate of the exterior wall is nailed to the soffit and the bottom plate holds the bottom of the studs in line. Engineered joists and open-chord trusses are attached to the exterior side of the structural wall studs -- or if there is existing sheathing they can be attached directly over that. The webs of the engineered joists are thin enough and the spaces between the chords on the trusses are large enough that when they are encapsulated by the cellulose during the insulation process, thermal bridging is negligible.

Interior double wall framing for a door or window opening's header in double-wall construction. Photo courtesy of Michael Goetinck, Snowdog Construction, Ltd.

Double wall construction with a Larsen Truss, showing separation of the inner and outer wood framing (note space between); openings receive windows. Photo: Michael Goetinck.

Michael Goetinck is the owner of Snowdog Construction, Ltd, in Norwich, VT. Michael has wide-ranging interests in energy conservation. In addition to his professional interest in double-wall house-shell construction, he conserves energy personally by carrying his tools to his job site in a bicycle cargo carrier.

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EATING LOCALLY WITH Winter's Harvest

By Sylvia Davatz

Photos courtesy of Sylvia Davatz

Greenhouse tomatoes for eating into early December.

"But what will I do for salad in January?" runs the perennial question when one advocates eating locally. This lament has sent me on a mission to explore the growing season's extension from every angle. In late fall, as I cruise the valley, it saddens me to see so many gardens wiped clear of any signs of growth, when we could still be harvesting such wealth.

Season-extension happens in several ways. The most obvious is keeping our gardens producing as long as possible. Many hardy greens such as kale, Swiss-chard, arugula, some lettuces, escarole, endive, radicchio, all cabbages, Brussels sprouts, celery, parsley, spinach, cilantro, and corn salad will continue to thrive even through a light frost. Some even improve in flavor from the cold. Other crops, such as beets, carrots, parsnips, leeks can be left in the garden till the ground threatens to freeze, and then moved to the root cellar. A simple hoop house will go a long way toward storing root crops for eating during most of the winter, and protecting hardy greens from snow.

Paying attention to the choice of specific varieties is another way to stretch fall harvesting. Bionda a cuore pieno, or blond full heart escarole, is one of the hardiest varieties I've found. Likewise, a parsley called "Comune."which I picked up at an Italian street market, will survive the winter outside, while the variety "Gigante di Napoli" will not. Red Russian kale is tender and extremely cold hardy. Corn salad, or mâche, will survive freezing.

If you are lucky enough to have a greenhouse where the ground does not freeze, you might harvest greens almost all winter. Move root crops there instead of into the root cellar.

Kale and chard growing in the greenhouse for winter.

Fresh fruit is one of the great challenges to local eating. There's a melon variety called Valencia Winter which remains crisp and juicy up to four months after harvest. Wild berries and pawpaw pulp can be frozen for February breakfasts.

Come early spring, look to the self-sowers. Reserve a patch of garden for the greens that have gone to seed. When the snow melts you'll have cilantro, corn salad, spinach, some lettuce volunteers, bok choy and perennial arugula—not to mention dandelion greens and other nutritious weeds!

And finally, we need to adjust our expectations for winter eating. A January salad does not need to consist of butterhead lettuce. Instead, grated carrot or shaved cabbage, with a simple lemon juice and olive oil dressing, provide freshness and crunch.

Sylvia Davatz, a 20-year seed saver, helped found the Upper Valley Seed Savers Group and the Grassroots Seed Network for the exchange of open-pollinated seeds. Reach her at sdav@valley.net.

Get 'COMPOST' Rich Quick!

LET WORMS EAT YOUR GARBAGE

By Grace Dunklee Cohen

Recycling food scraps by feeding them to composting worms. The nutrient-rich byproducts - worm castings and compost tea - fertilize indoor and outdoor plants. Photo: Karen A. Mason.

Ugh – worms eating garbage, right in your kitchen? Isn't that dirty and smelly?

Surprisingly,no. "An active, well-managed worm bin is nearly odor free and takes up very little space," according to Joan O'Connor, founder and manager of both the Tilton (NH) Winter and Summer Farmers' Markets and Northeast Organic Farming Association of New Hampshire board member. Since 1992, O'Connor (aka Joan's Famous Composting Worms) has been practicing, preaching and propagating vermicomposting – using earthworms to convert organic waste into fertilizer.

"When you follow some simple vermiculture guidelines, it's easy to turn food waste into nutrient-rich compost – the best possible form of recycling," O'Connor says. "Unlike labor-intensive traditional composting, which is often abandoned during cold winter months, worm composting is easy year round –inside your house, condo or apartment. Optionally, the bin can go outside during summer."

Traditional outdoor composting requires regular turning to aerate organic waste so micro-organisms can break it down. This solution composts high-volume yard waste well. Vermicomposting uses earthworms to aerate soil, digest organic waste and produce nutrient-rich vermicast or 'castings'– a lusciously rich worm-poop compost, higher in nutrients, but on a much smaller production scale than traditional composting.

Don't go turning over rocks to capture common night crawlers used for fishing, warns O'Connor. European nightcrawlers (Eisenia hortensis), or the smaller red worms (Eisenia foetida) or red wigglers (Lumbricus rubellus) provide the best long term vermicomposting results.

Think vegan when sorting scraps for vermiculture, says O'Connor. Avoid citrus and exclude dairy products, meat, and meat by-products (including fats) that break down slowly and cause odors. An established colony of worms can eat nearly its own weight in scraps. Worms don't have teeth and must wait for scraps to break down before they can eat. "Sometimes you can run scraps through a blender for a nice worm "smoothie" that's ready to eat," says O'Connor.

The byproduct "castings" can be used immediately or stored. Mix castings directly into potting or garden soil, use as a rich top-dressing for indoor or outdoor plants. Or make "compost tea" for a rich, faster-acting elixir for all kinds of plants.

Vermicomposting appeals to a wide range of people, including teachers and students, parents and grandparents, loggers and – yes – even high-society ladies and gents.

Like people, worms are happiest (and most productive) in moderate temperatures of 60-80º. Because well-managed composting worms don't smell, they can be kept in any temperate convenient spot. Under the kitchen sink is the most popular site, but imaginative vermicomposters keep worms under beds and dining room tables, in guest rooms, behind the sofa, atop the fridge, or at the office.

Learn more about vermicomposting in the next issue (February) of Green Energy Times. Joan O'Connor will share step-by-step details on how to get started.

Joan O'Connor has been practicing, preaching and propagating vermicomposting – or using earthworms to convert kitchen food waste into fertilizer – since 1992. Photo: Grace Dunklee Cohen

EMERGING FRONTIERS IN BIOENERGY

FROM PONDS TO FUEL TANKS

THE ROLE OF ALGAE IN OUR ENERGY FUTURE

By Ellen Kahler

The Vermont Bioenergy Initiative's work to uncover potential for a Vermont bioenergy market sector began in 2003. At that time, there was no such thing as a bioenergy industry in the state and producing locally made biodiesel from locally grown oilseed crops was just starting to be thought of as something worth exploring. Now, ten years later, thanks to a partnership with UVM Extension and funding support from the US Department of Energy and the Office of Senator Patrick Leahy, the notion that fuel and heat can be produced from bioenergy sources such as oilseed crops, switchgrass, and algae is gaining more traction.

By systematically funding research and demonstration projects, the Vermont Bioenergy Initiative has been able to demonstrate:

- Vermont farmers can produce a portion of their fuel needs from locally produced sources;
- Vermont commercial boilers can be fueled with straight switchgrass or wood-switchgrass blends;
- Vermont researchers are on track developing new processes for turning algal oil into a wide range of applications, perhaps even at local waste water treatment facilities.

Ten years into helping to establish Vermont's bioenergy industry, funding has been provided to over 30 farms, researchers, and small businesses and has fostered a body of work that can serve as a strong foundation for a more robust bioenergy future. The successes, challenges, lessons learned, and bioenergy viability reports and case studies (for both Vermont and replication in other rural communities in North America) are available for free use at www.VermontBioenergy.com. The website offers educational videos, renewable energy resources, and project development ideas to be used in the field, classroom, or in advocating for sustainable business ventures and showcases the range of possibilities; from research and crop farming to feedstocks and fuel.

Ellen Kahler at the Farm Fresh Fuel Project in Grand Isle, Vermont. Photo courtesy of Vermont Sustainable Jobs Fund.

One new project is a regulatory review of the bioenergy sector (specifically oilseeds, grass and algae)

Cont'd on p.32

SOLAR ON SCHOOLS RESOURCE GUIDE FOR K-12

What is Solar Energy?

There are two main types of solar systems in use at schools: (1) Solar photovoltaic (PV) systems, which capture solar radiation and convert it directly to electricity[1] and (2) Solar thermal systems, designed to harness the sun's heat to provide for water heating or space heating or cooling. Solar energy has been used since the 1950's and is a stable, clean, and abundant domestic energy source. The US has some of the best solar energy resource potential in the world [2].

NREL sponsored the "Solar on Schools" program that was adopted by Jeffco Public Schools, the largest district in Colorado. Chatfield High School students learn about photovoltaics on the school's roof. Credit: Dennis Schroeder

Why 'Go Solar'?

Public and private K-12 schools are always looking for ways to save money. Solar energy can significantly reduce electricity costs and allow schools to allocate the saved money elsewhere. According to Greentech Media, California schools that have gone solar will save an estimated $1.5 billion in electricity costs over the next 30 years. Solar is a sophisticated and environmentally friendly renewable energy technology that can provide educational opportunities for students in the areas of science, technology, engineering, and mathematics (STEM). Solar has the potential to captivate the imagination of our youth.

Site Criteria

Two key concerns for any school interested in 'going solar' are the safety and quality of these energy installations. It is important to ensure that the buildings upon which these systems are installed are up to code and can handle the weight of solar panels. The Environmental Protection Agency (EPA) has a guide on their website that has information about pre-screening a site for solar PV development 3.

Glendale and San Ramon Valley School Districts have both gone solar and have posted FAQ's about their experiences. The City of Philadelphia has posted a Solar Guide Book that can assist schools in the process of going solar, and the Sierra Club has developed its Renewable Schools Operations Manual, designed to help schools adopt renewable energy or energy efficiency upgrades without cost to school districts or taxpayers. Each state has different regulations and incentives regarding solar installations, so it is important to research the rules, regulations, policies, and incentives that exist in your state 4.

Financing Solar

Some schools choose to own their solar energy systems outright. This guide from the National Renewable Energy Laboratory outlines the different ownership options for schools. The Solar Foundation and the U.S. Department of Energy have produced informational products covering best practices regarding the request for proposal and installation process.

In order to finance these systems, a number of schools have taken the fundraising approach, as seen in the Rochester School District and profiled in the Minnesota Student Energy Project's Renewable Energy and Schools Guidebook. Due to the comparatively high upfront cost of solar, the federal government encourages solar energy development through the use of tax credits. Unfortunately, non-taxable entities like schools have no tax liability to which they may apply these credits and are therefore unable to take direct advantage of these incentives. Given this, an increasingly common way for a school to go solar is to partner with a solar installation company that will develop, own , and maintain the system in exchange for electricity payments made under a Power Purchase Agreement (PPA). This financing model, however, is only available in states where PPAs have been authorized. Members of the community can also create a third-party entity to own the system on behalf of the school in order to take advantage of tax incentives.

Financing the installation of a solar energy system can be less expensive than anticipated. Many states offer rebates for schools, and some solar companies and utilities (e.g. SolarWorld, Chevron, SolarCity, Pacific Gas and Electric, SunPower, etc.) frequently work with school districts to help reduce or eliminate the upfront costs for solar. School administrators who worry about allowing private companies into their schools can make sure public schools stay commercial-free with this guide from the Institute for Local Self-Reliance.

Solar in the Classroom

Solar is not only a cost-effective energy solution for schools; it can be highly educational. Because solar energy can be used to teach skills that are becoming highly valued in the workplace, it is important for all students to understand the basic principles behind solar energy. Many schools that 'go solar' provide students with solar curricula to add educational value to their installations. There are teacher-training workshops as well as free solar energy courses available online 5.

Community Power Network

Resources

- ✓ Madison Gas and Electric installed solar panels in the Wisconsin area and provided the school with an educational curriculum on renewable energy and real-time performance monitoring for the PV system. Some schools going solar provide online dashboards for Live Solar Electric Generation monitoring.
- ✓ The National Energy Education Development (NEED) Project has a resource catalog put together by its Teacher Advisory Board.
- ✓ Solar School House offers a program on DVD that is classroom-ready and has been reviewed by the Interstate Renewable Energy Council (IREC).
- ✓ The Illinois Solar School Program lists teaching guides by grade level.
- ✓ DOE Solar Decathlon offers resources from class lesson plans to at-home activities.
- ✓ Solar Schools offers a number of classroom lessons and student-parent activities.

Resource Guide Prepared By:
The Solar Foundation
505 9th Street NW, Suite 800
Washington, DC 20010
www.TheSolarFoundation.org

THE SOLAR FOUNDATION
Research and Education to Advance Solar Energy

Wind Energy Commands Larger Piece of Energy Pie

Cont'd from p. 15

cheapest, and largest-scale ways for states to meet the Administration's new goals for reducing carbon pollution from power plants."

While wind continues to grow fast, solar may finally be catching up. According to BNEF, some 36.7 gigawatts (GW) of new solar photovoltaic capacity were added worldwide in 2013 compared with 35.5 GW worth of new wind power installations. BNEF adds that global demand for wind turbines may actually shrink in 2014 (by five percent), representing the first such decline since 2004. But Justin Wu, head of wind analysis for BNEF, says it's just a temporary blip: "Falling technology costs, new markets and the growth of the offshore industry will ensure wind remains a leading renewable energy technology."

Contacts: BNEF, about.bnef.com; NRDC, www.nrdc.org; AWEA, www.awea.org.

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FROM PONDS TO FUEL TANKS

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which is being conducted by the Vermont Law School. This review will provide information for farmers and entrepreneurs regarding regulations and policies to pay attention to and production activity thresholds. The final cohort of Vermont Bioenergy Initiative grantees will be completing their projects through the end of 2015 and will be updated on the website as well.

The Vermont Bioenergy Initiative will also be partnering more with the Vermont Farm to Plate Network's Energy Cross-cutting Team to further communicate local production for local use models for on-farm energy production.

Learn more at www.VermontBioenergy.com and www.VTFarmtoPlate.com

Ellen Kahler is executive director of the Vermont Sustainable Jobs Fund, a non-profit organization created by the State of Vermont to help develop Vermont's sustainable agriculture, renewable energy, and forest product market sectors. The Vermont Bioenergy Initiative is a program of the Vermont Sustainable Jobs Fund.

INNOVATIVE NET-ZERO CLASSROOM IS BUILT BY COLBY-SAWYER STUDENTS

By Jenisha Shrestha

The exterior of the Sunshack will feature a living roof, and a permaculture garden designed by students.

This fall, Colby-Sawyer College in New London, NH dedicated a free-standing sustainable classroom designed and built by students that is one of the first commercial buildings in the state to integrate a straw-bale wall system. I was involved with this one-of-a-kind experience from the beginning.

The classroom is Colby-Sawyer's latest achievement in its efforts to cultivate a culture of awareness and action regarding sustainability and the environment. It is situated behind the library and next to the college's organic permaculture garden. It was made possible by a generous grant and the efforts of faculty members in the Environmental Studies Department, most notably Professor Leon-C. Malan and Director of Sustainability Jen White '90, as well as more than 100 dedicated students and community members.

The college developed three courses to span the construction of the classroom: Shelter and Sustainability in fall 2012, The Living Building in spring 2013, and Project Completion in fall 2013. (Like many construction projects, ours finished a little behind schedule.) Those of us who successfully completed all three courses earned a Certificate in Sustainable Design and Construction.

Students enjoy the Sunshack to read during their leisure time.

The courses were taught by Bryan Felice, founding owner of Undustrial Timber Frames LLC. We first began with exploring building science and performance, the design process, natural materials, construction planning and timber frame techniques, and then we designed the building's features. Our final exam was to present our design to the Town of New London and take part in the permitting process. We passed!

The building features a timber frame structure which we constructed in the second course from the wood of native species sourced from New London and Andover. We calculated, cut and connected all the mortis and joints, and erected the frame in an old-fashioned barn raising community event. That was my first exposure to power tools [See Green Energy Times, Dec. 15, 2013, pg. 32]. The building is designed to obtain maximum solar gain through its passive solar architecture, low-E windows along the convex south wall, and concrete floor for thermal mass. With the goal of educating visitors about various natural building wall systems, this classroom features three wall systems: straw-bale, dense-packed cellulose and straw-clay. As part of an independent study, another student and I helped to construct these wall systems, applied the natural plaster and paint, and built the cob benches that add to the thermal mass and classroom seating.

The north wall consists of six inches of dense pack cellulose and 18 inches of straw-bale insulation which provides an R-value of 52.8. The east wall, with 12.5 inches dense-packed cellulose, has R-46.5, and the west wall's 15 inches dense packed cellulose has R-57. The south wall, which faces the true south, consists of 12 inches of straw-clay mixture with an R-value of 19.2. A typical wall system has an R-value ranging from 12 to19. Structural insulated panels (SIPS) that consist of an insulating foam core sandwiched between two structural facings, typically oriented strand board, were used for roofing, and that adds to the overall energy efficiency of the building. The typical R-value of ceiling assemblies is about 30, whereas the 12 inch SIPS increase ours to 78. The roof aspect is designed for a photovoltaic system and the lower face will be a 'living roof.'

The sustainable classroom is now a teacher in and of itself that will be used by the college's students and faculty, as well as the children at Windy Hill School, Colby-Sawyer's laboratory school. The space will also be available to our permaculture garden interns to use as a greenhouse for seedling production and food storage, and for hosting community and alumni events.

Future plans for the building include implementing a permaculture garden design created by Kenneth Camacho '15 and installing a photovoltaic system with sensors and digital displays inside the building so we can know how much heat the building is gaining or losing.

Eventually, a photovoltaic array will produce electricity to run the two energy-efficient mini-split heating and cooling systems, making the "living" building a NetZero building because it will produce more energy than it uses. It is even possible that the college will be able to sell energy back to the grid.

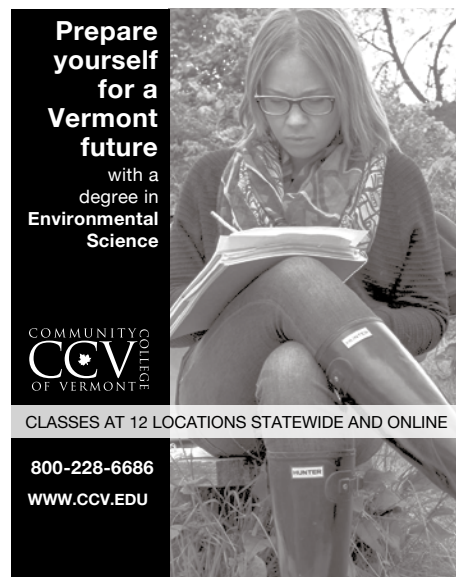
Participating in the creation of such an innovative and sustainable structure that is used by the entire campus was a great experience.

Originally from Kathmandu, Nepal, Jenisha Shrestha is a recent graduate from Colby-Sawyer College with a Bachelor's of Science degree in environmental studies. She received certification in Permaculture Design as well as a certification in Sustainable Building and Construction through Colby-Sawyer. Currently, Jenisha works as the Sustainability Fellow for the college.

The timber-frames cut by students were erected through community programs. Over 100 students and community members were involved in the construction at various stages.

Through the "truth window" on the north wall, you can see the straw-bale insulation.

Through an independent study, the interior of the Sunshack was designed to feature cob benches with natural plaster and paint.



RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: **groups.google.com/group/350-Vermont**

American Council for an Energy-Efficient Economy: Consumer guide to home energy savings - **aceee.org/consumer**

American Solar Energy Society (ASES): www.ases.org

Backwoods Solar: Specialty: solar, off-grid - **www.backwoodssolar.com**

Buildings Energy Data Book: buildingsdatabook.eren.doe.gov

Clean Power Estimator: www.consumerenergycenter.org/renewables/estimator

Consumer Guide to Home Energy Savings, Heating, Appliances, Refrigerator Guide, Building Envelope, Driving: http://aceee.org/consumer

Dept. Public Svc. (CEDF): publicservice.VT.gov/energy/ee_cleanenergyfund.html

Dsireusa.com: www.dsireusa.com Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.

Efficiency VT: This is a must go to site for immeasurable amounts of info. **www.efficiencyVT.com**

Energy Efficiency & R/E Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html

Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html

Energy Guide: Unbiased advice about today's energy choices. Find ways to save, lower your bills & help the earth's environment - **www.energyguide.com**

Energy Star Federal Tax Credits: www.energystar.gov/tax credits.

Federal Energy Regulatory Commission (FERC): www.ferc.gov

Federal Energy Regulatory Commission(FERC): www.ferc.gov

Find Solar: www.findsolar.com

Fossil Fuel Freedom: Group working to make Vermont's energy plan 100% free of fossil fuels:
To join this group go to: **groups.google.com/group/fossil-fuel-freedom-**

Greywater Info: www.oasisdesign.net/greywater

Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - **hes.lbl.gov**

Home Power Magazine: www.homepower.com

IREC/ Interstate Renewable Energy Council: RE educational info. **www.irecusa.org**

NABCEP/ North American Board of Certified Energy Practitioners: This organization that tests & certifies PV system installers. Individuals are Certified, companies are not. **www.nabcep.org**

NESEA/ Northeast Sustainable Energy Assoc.: www.nesea.org

National Association of Energy Service Co. (NAESCO): www.naesco.org

National Renewable Energy Laboratory (NREL): www.nrel.gov

National Solar Institute: www.nationalsolarinstitute.com

NeighborWorks® Alliance of Vermont: Low-cost energy loans - **www.vthomeownership.org**

New Hampshire Sustainable Energy Assoc. NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. **www.nhsea.org**

New York Solar Energy Industries Association/NYSEIA www.nyseia.org

NFRC independent rating & labeling system for the windows, doors, skylights **www.nfrc.org**/

NH Office of Energy and Planning: www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm

Renewable Energy World: www.renewableenergyworld.com

Renewable Energy VT: 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 Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. **SolarStoreofGreenfield.com**

Tax Incentives Assistance Project (TIAP): www.energytaxincentives.org

The Energy Grid: www.pvwatts.org

The Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - **www.eere.energy.gov**

Track the Stimulus Money: www.recovery.gov/Pages/home.aspx

Vermont Energy and Climate Action Network (VECAN): works to start and support town energy committees as a powerful, people-powered response to realizing a clean energy future. www.vecan.net.

Vermont Tar Sands Action: Group working to stop the XL Pipeline and any other developments stemming from the Alberta Tar Sands. To join this group go to: **groups.google.com/group/vt-tar-sands-action**

VPIRG: understand the clean energy resources available to VT - **www.vpirg.org/cleanenergyguide**

VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - **www.veic.org**

Weatherization, Energy Star & Refrigerator Guide: www.waptac.org

www.susdesign.com/tools.php Online info for solar benefit with house design. i.e. window overhangs, sun angle & path…

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ACORN MUFFINS FOR THE HOLIDAYS

New business in Norwich, VT: Oaklore. Acorn flour muffin mixes, made with flour from acorns gathered locally in the Upper Valley, King Arthur flours (gluten and gluten-free versions available), and a choice of cranberries or chocolate chips. Acorns were a staple crop for cultures around the world until recent history, and it's been my vision to breathe life back into this food source that was once a major form of nourishment. Nicely packaged in a reusable quart mason jar, -- just add wet ingredients and bake. $20 each. www.oakloreproducts.com or 207-751-1160 to learn more.

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Massachusetts: COAL-FREE by 2017

2014 activism has won over coal in New England when Massachusetts' last two operational coal-fired power plants are scheduled to be retired by 2017. Several years ago, the state had four coal plants, but due to the hard work and dedication of community leaders and the support of Toxics Action Center, soon Massachusetts will be completely coal-free.

This past year's work in Holyoke, Mass., made all the difference. Action for a Healthy Holyoke resulted in a responsible retirement of the Mt. Tom coal plant.

Community member Carlos Rodriguez advocated for a just transition to the task force. "We all know in Holyoke there is a high rate of unemployment," said Rodriguez, who argued that deconstruction jobs for the plant should be offered first to former plant employees and then to local citizens. Rodriguez also called for the plant's owner to provide generous severance packages, job training, and a donation to the community.

With the Mt. Tom plant scheduled to close this fall, the action for a Healthy Holyoke is continuing to support the union, advocate for full clean-up of the site and push for the redevelopment of that property. We hope to see support for similar work in Somerset, Mass., where the Brayton Point coal plant will close in 2017.

Read more at www.toxicsaction.org

GUIDE TO ADVERTISERS:

Parabens in Skin and Beauty Products

by Roddy Scheer and Doug Moss

Essential oils are more popular than ever for medicinal and therapeutic purposes as well as in fragrances and flavorings for food and drinks. Typically produced by harvesting and distilling large amounts of various types of plant matter, essential oils are in many cases all-natural and can take the place of synthetic chemicals in many consumer applications. But some wonder whether our fascination with essential oils is so good for the planet, now that their popularity has turned them into big business.

"It often takes hundreds of pounds of plant material to make one pound of essential oil," reported aromatherapist and author Mindy Green of GreenScentsations.com. She adds that it takes 50 to 60 pounds of eucalyptus to produce one pound of eucalyptus oil, 200 to 250 pounds of lavender for one pound of lavender oil, 2,000 pounds of cypress for a pound of cypress oil and as many as 10,000 pounds of rose blossoms for one pound of rose oil. Production of these source crops takes place all over the world and is often organized by large multinational corporations with little regard for local economies or ecosystems.

"Growing the substantial quantities of plant material needed to produce essential oils results in a monoculture style of farming, with large swaths of land dedicated to a single species," said Green. "These systems are most efficiently managed by intense mechanization, and irrigation is frequently used for optimal oil production of the plants."

"As global citizens we have not learned how to equitably distribute vital resources like food, and water resources are trending toward a crisis of the future," added Green, "so there are deep ethical concerns about devoting croplands to essential oils destined for use in candles, bath oils, perfumes, or lavish massage and spa purposes." Green also warned that many essential oils are not produced from sustainable sources. "Some species are at risk, particularly those occupying marginal habitats such as dwindling tropical forests," she reported, adding that the poverty-stricken in developing countries will harvest and sell whatever they can, in order to put food on their own tables.

Parabens are added to toothpastes and other hygiene products we use daily. Photo: Rice and Danielle, courtesy Flickr

Synthetic compounds called parabens are added to toothpastes, deodorants, shampoos and other products to stop the growth of fungus, bacteria and other potentially damaging microbes. Individual products contain limited amounts within safe limits, but cumulative exposure could be overloading our bodies and contributing to a wide range of health problems, including breast cancer and reproductive toxicity.

Cropwatch, a non-profit that keeps tabs on the natural aromatics industry, maintains a list of wild species threatened by the fast-growing essential oil trade. Of particular concern are essential oils derived from rosewood, sandalwood, amyris, thyme, cedarwood, jatamansi, gentian, wormwood and cinnamon, among others, as they may well be derived from threatened and illegally harvested wild plant stocks.

Also, some essential oils must be treated as hazardous if spilled and should be kept out of sewers and local waterways. Mountain Rose Herbs, a leading retailer of essential oils, reports that if its tea tree oil spills, it should be absorbed with inert material and sealed in a container before disposal at a hazardous waste collection site. Such information is included on the company's material safety data sheet for every essential oil and includes information about flammability and chemical composition. Consumers would be well served to check the MSDS for any essential oils they might like—Mountain Rose will supply them to customers by request—to make sure they are using (and disposing of) them correctly.

Contacts: Green Scentsations, www.greenscentsations.com, Cropwatch, www.cropwatch.org, Mountain Rose Herbs, www.mountainroseherbs.com.

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Ingredient of the Month

By Larry Plesant

COOL BEAUTY

HAS THE TIME FINALLY COME FOR REFRIGERATED COSMETICS?

My kids grew up with a jar of "green stuff" in the door of the fridge. Whenever they got a scrape, bite or "owie" they would tearfully reach in the fridge for a soothing jar of homemade salve. Our garden mixture of natural oils, garden herbs and beeswax brought nearly miraculous and instant relief to whatever ailed them.

We kept our green stuff (variously known as a balm, salve, ointment or unguent) refrigerated to extend its shelf life just as refrigeration does for fruits and veggies. A well-made, otherwise unpreserved batch of salve could last up to four years with refrigeration.

There was a big PR blitz about refrigerated cosmetics twenty years ago. The predicted boom never materialized and some nice people went belly-up. Everyone went back to making and using heavily preserved products. Fast forward to present day…

Awareness (and paranoia) about preservatives has never been higher. Neither has the cancer rate. It might make sense to pay attention. Preservatives inhibit and kill life trying to eat your food or your cosmetic product. But you and I are life too! It is foolish to imagine that a lifetime of low level exposure to preservatives has no impact on human health. It is also hard to quantify the damage, if any, that their use may cause to humans.

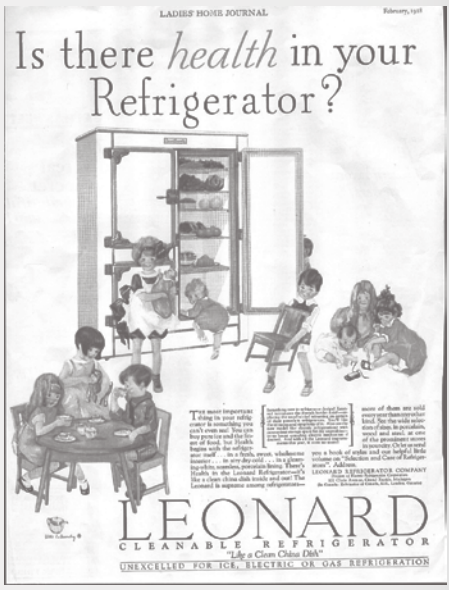
Our ancestors knew a lot about keeping food (and food for your skin) lasting into the lean season. Natural materials are preserved by (among other methods) desiccation, pickling in vinegar, or by using a 20% sugar or salt medium surrounding the item you want to keep. Keeping natural stuff fresh by storing it at reduced temperatures is a sensible way to preserve both water and oil-based natural cosmetics. As most people reading this will likely be refrigerator owners already, the rest is just habit!

Vermont Soap makes two products that really should live in the fridge. The first is our own green salve which we call Green Gold. Green Gold is an anti-aging herbal moisturizer containing strongly anti-inflammatory botanicals. It is certified food-grade organic and terribly under preserved as a result. Few cosmetic preservatives qualify for organic certification, and this is slowing down to the conversion from yucky products to yummy ones. Let your refrigerator become your preservative system, and whole worlds of potential formulations open up.

VT Soap's other fridge-friendly product is our new line of organic herbal deodorants. These organic stick deodorants keep longer, last longer and stain less when cold. So keep cool and calm with a cold underarm stick!

Expand your horizons! The next time you need an herbal moisturizer or underarm deodorant…just reach into the fridge!

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



Circa: 1928, Ladies Home Journal. Vintage Ad Leonard Refrigerator Children with doll and Tea Table.

Cont'd from p. 17

NH REF IS IN DANGER!

County Complex that now saves the county $290,000 per year: The REF contributed $300,000 to this $3.18 million dollar project. Sanborn Regional High School in Kingston, NH installed a solar hot air system and now purchases the heat output through a first-ever solar thermal power purchase agreement at a discount from what it would pay for heating oil. These projects, and thousands more, would not have been possible without the REF.

Unfortunately, common sense and good fiscal governance seems to be faltering. In the last budget year, Governor Hassan and the Legislature passed a bipartisan budget that quietly swept over $16 million from the REF into the General Fund. This special fund is established by law (NH RSA 362-F:10), restricted in its use for these efforts, and does not provide authority for the repurposing of these funds in any circumstance. Hundreds, if not thousands of opportunities were lost. Tens of millions of dollars of private investment flowed elsewhere. Luckily, the fund remains solvent—for now.

In past years, the solar electric rebate program from homeowners has run out of funding. Municipalities and businesses have requested millions in funds that were not available. This need not happen. Over 1,400 homeowners have invested in wood pellet or solar electric generation systems – this is merely a fraction of the technical and economic potential we know exists. Likewise for the commercial and industrial sectors. New Hampshire must stopping raiding this fund if it truly intends to continue to pursue an innovative economy, transparent fiscal policy, and trustworthy government.

Kate Epsen is the Executive Director of the NH Sustainable Energy Association. www.nhsea.org.

BRATTLEBORO, VERMONT
SUPER FRESH CAFÉ

By George Harvey

In Brattleboro, Vermont, Superfresh! Organic Café is rapidly coming to its first anniversary, having opened for business in its current location on January 18, 2014. During that year, the café has earned quite a reputation.

Superfresh! Organic Café specializes in a very specific sort of vegetarian food. It is vegan, gluten-free, soy-free, non-GMO, peanut-free, and wherever appropriate the food is raw. Also, whenever food can be locally sourced, it is.

For a vegan, there are two very good reasons to get food at the café. One is to eat great food. The other is to be able to prove to anyone else that vegan food can be both very satisfying and very yummy. As a non-vegan who has eaten there, I can attest to this. They say they offer "exquisite vegetarian cuisine," and I certainly agree.

The café has a large number of menu choices. There are a number of breakfast items, including breakfast sandwiches, burritos, hash browns, pancakes, and breakfast bowls. There is a kids' menu, with sandwiches, personal pizza, and various tidbits, for those of us who are still kids or remember being kids. And then there are dozens of soups, salads, sandwiches, side orders, and whole meals. There is a long list of beverages, including tea, coffee, juice, and smoothies (beer and wine soon coming). And there are a variety of tempting desserts. I think I will order a mushroom burger next time I am in, or possibly the (mostly) raw pad Thai. Or a fancy avocado sandwich.

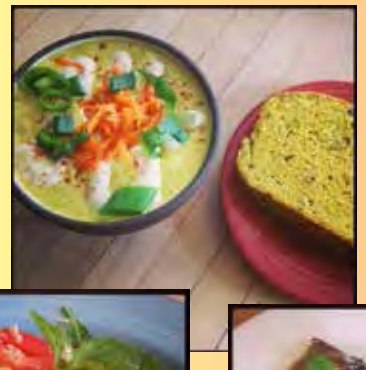
The restaurant offers two very different, very nice views from the tables. If you are seated in front, you will be able to look out across the Connecticut River at Wantastiquet Mountain, which Brattleboro folk are very fond of. In back, away from the day's traffic, you get to look over the Whetstone Brook. If you want you can get takeout.

Those who dine at the café on Friday or Saturday evenings are likely to hear live music, especially on the first Friday of each month, when Brattleboro has Gallery Walk. The café participates in this, so anyone there at that time can also see an art show.

Superfresh! Organic Café is owned by Jacob Roberts and Jessica Weston. Weston took interest in nutrition because of multiple food sensitivities. While she wanted to take care of her health, she did not want to neglect the soul-nutrition that comes with a really tasty and satisfying meal. The two wanted to share and promote fine vegan food with others.

Senja Curran, who manages the café stressed that the food is sourced locally as much as possible. Many vegetables come from Lilac Ridge Farm and much of the fruit used comes from Dwight Millar Orchards, both in the Brattleboro area. Other suppliers include Hermit Thrush Homestead, Gourmet Greens, and High Meadows Farm.

Superfresh! Organic Café is open for lunch seven days per week and for dinner on Thursday through Sunday. Their number is 802-579-1751, and their web site is superfreshcafe.com.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SUSTAINABLE TOURING CENTER OPENS
In Craftsbury, Vermont

By Roger Lohr

The Craftsbury Outdoor Center in Vermont announced the opening of a new facility to house its Touring Center, as well as a café, fitness room, waxing room, meeting space and more. This structure was built to be energy-efficient and environmentally friendly, using energy-saving designs and local materials wherever possible.

The Craftsbury facility has 3,000 square feet of photovoltaic solar panels on the roof, which will be set up for net metering (selling electric power to the energy company when possible), so that the facility will have net-zero annual electricity usage. The building structure incorporates locally sourced wood for paneling and recycled steel beams for support.

The locker rooms feature composting toilets, as well as low-flow water fixtures, timed showers, and hand-dryers to minimize paper towel waste. The heating system will incorporate waste heat from the snowmaking system along with a high-efficiency wood boiler, supplemented with solar thermal and a heat pump as needed. An electric charging station will be installed near the building in the future for electric vehicles.

The Craftsbury Outdoor Center mission includes the use and teaching of sustainable practices. In 2004, Craftsbury Outdoor Center joined the Green Hotels program and its Cedar Lodge was designated "green" by the organization. In 2010, eight tracking solar arrays were installed on site at the center yielding about 45,000 kilowatt hours of energy annually, offsetting about 35% of the center's electric use. The new building furthers Craftsbury Outdoor Center on its quest to become a steward of environmentally-friendly practices.

Roger Lohr is a freelance writer and the founder of XCSkiresorts.com. Find more about Craftsbury Outdoor Center at www.craftsbury.com and www.xcskiresorts.com/xcVTCrafts.php.

Roger Lohr is a freelance writer and the founder of XCSkiresorts.com.

NET ZERO, LOW-WASTE BUILDING ENVELOPE

Walls: Environmentally friendly Amvic ICFs insulated concrete forms == 6" of reinforced concrete sandwiched between two 2.5" layers of EPS (expanded polystyrene) foam. On the inside, there is another 5" of dense pack cellulose insulation, plus locally sourced wood siding, bringing the walls to a total of R-39.5 The ceiling structure features locally sourced hemlock purlins, 10" of a soy based spray foam insulation, and 2" of Roxul insulation. Total R value is R-63.9. We anticipate being able to heat with approximately 85,000 BTUs.

Solar PV: 32kW tracking system, 65kW array on the roof, installed by Catamount Solar out of Randolph, VT. 255W or 300W units made by ReneSola, with a Solar Edge P400 power optimizer to optimize power production and touch safe to comply with updated electrical code.

The lighting uses a combination of LED and fluorescent technology for a total of about 0.6 watts/sq ft. Yet to be installed task lighting will jump to 1.5 watts/sq ft.

The building also features many large triple glazed, argon filled windows and skylights for lots of natural light during daylight hours.

Energy saving/environmentally friendly features:

- Low flow plumbing fixtures.
- Composting toilets (very low water consumption, minimal wastewater and solid waste generation).
- Trombe walls on the southern face (passive solar heat generation during winter months).
- Large roof overhangs optimized to block sunlight from windows in summer, and let light in during the winter.
- Earth tube for makeup air (a geothermal system known as a ground coupled heat exchanger - a network of pipe underground that conditions incoming air, warming in winter and cooling in summer).
- Air sourced heat pump to generate domestic hot water during summer months in the public space.
- Passive ventilation: automated skylights that open and close depending on building temperature, humidity and CO2 levels.
- Radiant heat (allows use of low temperature water, even consistent heat and high thermal mass).
- Air curtains to minimize heat loss when doors are opened in cold weather.
- New clean burning wood stove to provide supplemental heat in the ski lodge side.
- All hot water for the building (for radiant heat and domestic hot water in winter) is provided from our centralized heat plant/heat storage facility -- a 20,000 gallon insulated water tank, two high efficiency wood gasifying boilers, and a heat recovery system to take waste heat off our biodiesel powered genset that runs our snowmaking system.
- Timers on locker room showers to minimize hot water waste.
- Air blade hand dryers in bathrooms for lower energy consumption and no waste.
- Minimally treated locally sourced and on-site wood.
- Weight room floor is a flaxseed based linoleum.

A new sustainable touring facility (below) and the original solar system (above) at the Craftbury Outdoor Center.

ALONG THE TRAIL

"The slender cross country skis sing their striding song to the towering trees, rapt in attention. Gliding through the Vermont woods on fresh snow may be pretty close to heaven. But I have to admit, so is painting. On this one I was carving out shapes like a sculptor chisels stone. And a skier carves a turn."

From A Day in Vermont collection. Celebrating the beauty of Vermont through art. Many more painting can be seen at www.ADayinVermont.com.ss

Ask the Soapman

Can I catch Ebola from shea butter?

Nope!

Our African shea nut butter is pasteurized, de-watered and super filtered before it is repackaged for sale in the West. It is actually certified as food grade in Europe.

Raw shea butter refers to the lack of refining in this product. We prefer to reprocess unrefined shea butter to keep the goodies in but get the microbes, and plant material out. When we fill tins and other consumer sizes, we remelt the shea butter and fill containers hot. This pasteurizes it a second time.

It is also important to remember that viruses and bacteria require water to exist. Shea butter has very little water in it and thus will actually exhibit mild germ killing properties. In other words, even if we did not do all of this, it is quite unlikely one can get any disease from shea butter. Even if someone with active Ebola touched the shea butter, the virus would have to stay alive for months in a hostile environment (oils). Very unlikely to actually be possible. Not that we would take the chance, but still very unlikely.

You can be comfortable knowing that you will absolutely NOT get Ebola from VT Soap's shea nut butter. It is pasteurized and packaged to food grade standards even though it is used on your skin (in the US).

All the Best,
Soapman

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Green Tips

TIS THE SEASON. GOOD TIDINGS. CONSUMPTION. NEW YEAR'S INTENSIONS

By Deborah DeMoulpied

And all at once. No wonder it feels so over whelming.

As we head to do the holiday shopping, the report on the warmest year on record may dampen the spirit and cheer of the season. How can we in good consciousness buy new "stuff"? Does the kind of "stuff" it is really matter? Well, let's hope so.

Everything has a carbon footprint. We all have a carbon footprint just by merely existing. Products have life cycles, materials can vary greatly, and production and transportation carbon costs differ immensely. By choosing gifts with less environmental impact, we all stand to be better off in the long run. The old "vote with your dollar" could not be more appropriate. You can make a difference.

It is good news that the world leaders and countries are finally coming together and finding common ground to combat climate change. We also have to do our part – Buy what matters, make commitments, get involved, and vote for people who also care about the future.

For 2015, some words of wisdom (some make great bumper stickers) may help guide you for green living awareness. Sayings? Tips? Advice? Mantras? Does it matter? How about just good food for thought:

1 – We All Live Downstream.
2 – Leave it Better than You Found It.
3 – Live Simply.
4 – When You Throw Something Away, Where Is Away?
5 – The Time to Do the Right Thing is Always Now.
6 – There Is No Planet B.
7 – Consume Less – Share More.
8 – There's No Place Like Home.

Deborah DeMoulpied is owner and founder of Bona Fide Green Goods, an earth-friendly department store in Concord, NH. Bonafidegreengoods.com won the Webby Awards Green Honoree in 2011. Deborah is also faculty of the Anticancer Lifestyle Program, teaching patients about environmental toxins and healthful solutions.

Fortuna's Sausage

Aged Naturally -- Made in New England

By George Harvey

Patti with Fortuna's Sausage products.

We first learned about Fortuna's Sausage because it was chosen as a finalist in Martha Stewart's "Made in America" contest. We are glad we did.

The story of Fortuna's Sausage started over 100 years ago when a couple the family will probably always call Nani and Poppa moved to the United States from the southern Italian region of Calabria. With them, they brought a treasure trove of heritage and traditions of their old country.

Included in their traditions were recipes for making sausages. These were used as the basis of their business, when it was started in 1982. Today, the same unaltered ingredients are used. Nothing has been added, and nothing lost. And that makes a difference.

The old methods of curing sausage did not use nitrates. What they used instead were a little culture, a lot of patience, and abiding devotion. Fortuna's sausages are cured by hanging them for weeks, until they are perfect. They do not need constant refrigeration, but that is not because of chemicals. Rather, it is because they are aged using processes nearly identical to those used to make fine cheese.

There is a story about this that is worth telling. A number of years ago, Patti and Paul wanted to bring a perfect, old-style sopresatta to market. They ran up against the problem that the US government requires a sopresatta to have nitrates. Patti and Paul drove to Washington DC to challenge the USDA on the issue, and within the course of a few hours convinced the government to allow them to sell their flagship sausage, "Soupy™," without nitrates.

I was fortunate enough to be able to sample Fortuna's Sausage products for this article. Soupy is outstanding. The pepperoni is clearly superior to any I have ever tasted before. I also tried their beef jerky that is so delightful I could call it a culinary miracle. Perhaps part of the miracle was due to the fact that Fortuna's jerky is made using their own Vermont maple syrup.

Fortuna's Sausage has standards that put quality of food above all else. This means that while they favor the idea of buying locally, enough local meats have never been available in the quality they require, so they do have to buy meat from good-quality suppliers in the Midwest. It also means their products are uncompromisingly made using the same traditional techniques that were used over a hundred years ago, when artificial colors, flavors, and preservatives were still a thing of the future.

Another plus for cured meat is that it does not require a lot of energy for cooking and refrigeration. Its reduced power load translates into a reduced need for attention to efficiency and renewable power sources. Nevertheless, the company is currently investigating sustainable energy options, including the installation of a solar array to power the business.

With Christmas before us and a short time to finish shopping, a quick trip to Fortuna's website can make choosing a local Vermont Company's products easy. This is food for the whole year, however, and we might remember that giving things that are delicious is always in good taste.

Fortuna's is available in select stores, the Rutland Farmers' Market, and at fortunasausage.com.

TAR SANDS KILLING THOUSANDS OF BIRDS

Migrating birds negatively affected by oil extraction in Canada's Boreal forest.

By EarthTalk®

Each year tens of millions of migratory birds live in or pass through the Canadian Boreal forest, a vast mostly uninhabited land stretching from Newfoundland to the Yukon. It covers 60% of Canada's area, and serves as a part-time home for more than half of America's avian population. But environmentalists are worried about the impact increasing "tar sands" oil development there might have on wildlife population.

Tar sands contain a tar-like form of petroleum called bitumen. This is extracted and eventually refined. The extraction process is especially "carbon-intensive," making it some of the dirtiest fuel around, but its abundance makes it affordable.

A recently released report by the National Wildlife Federation (NWF) and the Natural Resources Council of Maine (NRCM) concluded that almost half of the 292 different migratory bird species spend time in Canada's Boreal forest, and as many as 75 million birds are threatened by future tar sands development. Further, they say, bird losses in the hundreds of thousands have already taken place as a result of overzealous and under-regulated oil development.

"The direct and indirect impacts to birds from tar sands development are immense," states the report. "Waterfowl and shorebirds land in tailings ponds that they mistake for natural water bodies and become oiled with waste bitumen and toxic elements." The result can be birds drowning, dying from hypothermia, or being poisoned.

The Canada Warbler, one of many birds that depend upon Canada's Boreal forest. Photo: Wm. H. Maloros

U.S. State Department analysis shows that tar sands oil is 20% more carbon-pollution intensive than conventional oil on a "well-to-wheel" basis. Environmentalists would like to see U.S. lawmakers deny permits for the transport of Canadian Boreal tar sands oil through the U.S. in hopes of making future tar sands projects there too expensive to be worthwhile.

"Saying no to tar sands is a critical pillar in an effective strategy to protect wildlife from carbon pollution," says the NWF. But it remains to be seen if the Obama administration will allow construction of the controversial Keystone XL pipeline to transport the oil from Canada through the U.S. The welfare of millions of birds and our clean energy future are at stake.

Contacts: NWF, www.nwf.org; NRCM, www.nrcm.org.

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OFF-GRID HOLIDAY LIGHTING FOR ONE VT TOWN

Local business creates first commercial, self-sustaining, solar holiday light systems for the town of Randolph, VT.

By George Harvey

Last January, as the holiday decorations were being taken down in Randolph, Vermont, members of the Chamber of Commerce knew the wreaths and lights had seen their last useful year. They were just too old, worn out, and unreliable. The question was not whether to replace them, but what to replace them with.

"Randolph's holiday decorations had come to the end of their useful life, and we were striving to find something that was environmentally friendly, and did not require the use of extension cords, light bulb strings, or rely on power from town street poles," explained Emma Schuman, Director of the White River Valley Chamber of Commerce. They contacted twenty suppliers looking for the lights they wanted, but, Schuman explained, "Every company we called told us the technology was just not available yet."

Interestingly, they did not have to go all that far to find people who were actually coming up with new technology, and so were better aware and able to deal with the problems at hand. LEDdynamics, a manufacturer of LED lighting and controls, happens to be in Randolph, Vermont. So the Chamber contacted Bill McGrath, the President of LEDdynamics, and McGrath took the challenge on.

Getting electricity to LED lighting without using wires is not a difficult problem. They use very little power, and a small photovoltaic (PV) panel will do very nicely for the small number of lights in a wreath. Adding a battery is not a difficult problem; it is done all the time.

Randolph's holiday lights, however, show how complicated a simple problem can be. They had to be solar powered in the winter, through cloudy days without much sunshine in the day, but have adequate power for nighttime use. Also, the batteries had to be able to work in the cold, when batteries really do not work all that well. Adding to the problem, a simple photosensor would not do for turning the lights on at night, because the wreaths are on street lights, which fool sensors into thinking it is daytime. Yet another problem was that the system has to be able to adjust output automatically, so the lights can consume less power when a string of cloudy days comes along.

All these problems were solved by LEDdynamics engineers. Each wreath is powered by an unobtrusive solar panel and a battery which, between them, can run the lights through five nights on the power from four hours of Vermont winter sunshine. A microprocessor is in the control unit for each wreath, setting the times for startup and shutdown of the lights. The processor also is able to determine how to set the output of the lights to conserve power.

Now Randolph has fifty wreaths on town streetlights. They are reliably lighted without extension cords. The wreaths are much easier to put up and take down. Since they are so reliable, they can provide a beautiful holiday sight in Randolph. And, since they are from LEDdynamics, they are about as locally-sourced as they could be.

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