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How do 'You' G.E.T. to 350?

An Interview with Bill McKibben

April 2013 - Staff Article

What is the most important thing for everyone to understand today?

That the climate crisis is not theoretical or distant, but underway and close to home. It's a message that I think Hurricane Irene brought home to Vermonters. **So, what is global warming and what's the problem anyway?**

The science is clear: global warming is happening faster than ever and humans are responsible. Global warming is caused by releasing what are called greenhouse gases into the atmosphere. The most common greenhouse gas is carbon dioxide. Many of the activities we do every day like turn the lights on, cook food, or heat or cool our homes rely on the combustion of fossil fuels like coal and oil, which emit carbon dioxide and other heat-trapping gases when burned. This is a major problem because global warming destabilizes the delicate balance that makes life on this planet possible. Just a few degrees in temperature can completely change the world as we know it, and threaten the lives of millions of people around the world. But don't give up hope! You can help stop global warming by taking action here at 350.org.

And what does this 350 number even mean?

350 is the number that leading scientists say is the safe upper limit for carbon dioxide -- measured in "Parts Per Million"

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Founder of 350.org, Bill McKibben -- who lives in a solar-powered home.

COASTAL MAINE BOTANICAL GARDENS Wins Top Net Zero & LEED Platinum Achievement



Coastal Maine Botanical Garden's Education Center

COMING SOON TO A NEIGHBORHOOD NEAR YOU:

100% RENEWABLE ENERGY

By George Harvey

An obvious truth is that sustainable things can be sustained, but unsustainable things will end. Renewable power is sustainable. Fossil fuels are not. Use of fossil fuels will end, and if humanity survives, it will do so without them.

The question of whether we will ever reach 100% renewable power is subservient to this truth. The question is not whether we will use renewable power or fossil fuels, because we can only survive with sustainable power supplies. We will succeed in achieving 100% renewable power, or we will fail in the attempt.

I see a lot of reason for optimism about this -- provided we get serious about eliminating fossil fuels and conventional nuclear power. To start with, the resources we have can provide

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By George Harvey

When the folks at the Coastal Maine Botanical Gardens decided on a new education center, they wanted to make it Maine's first non-residential Net Zero building. They might not have understood all the complexities of LEED Platinum certification, but they clearly knew how to get good guidance. Two people who can be named as especially important are Mike Pulaski at Thornton Tomasetti and Bill Maclay of Maclay Architects.

Thornton Tomasetti, a world-wide business and structural designer of six of the ten tallest buildings in the world, has a third of its design professionals LEED accredited. Mike Pulaski helped with all manner of details that had to be done before the design could be handed off to architects, some driven by the net-zero goal, and some by the requirements of LEED certification. A team of qualified professions had to be put together. Extremely important details such as documentation had to be addressed, both to tell the designers what the requirements would be, and to provide support for LEED evaluation.

There were some unique problems for the design. LEED certification gives many points for impact on the neighborhood, but the Botanical Gardens were so far out

in the country that these were unavailable. The result was that designers had to squeeze out every point they could get, anywhere they could find it.

As much as possible of the lighting is from daylight. Heat is electric, using air-source heat pumps. Solar PV panels were an obvious choice, as was a foot of cellulose insulation. Less obvious needs



CMBG Education Center showing the data information system and above the doorway shows the air-sourced heating.

included making sure that manufacturers were conforming to specifications with which they were unfamiliar.

An interesting feature of the building is a "truth window" like those commonly seen in straw-bale construction. In this case it gives visitors a chance to see the insulation as it actually sits in the wall. The reason of this is not frivolous. It is a part of a major design issue. Education is not only what the building is all about, but also

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MANY THANKS TO OUR SPONSORS FOR THEIR SUPPORT:



David Blittersdorf's

VIEW FROM THE TOP

An Open Letter to the Vermont Energy Generation Siting Policy Commission



I applaud the commission's work focused on improving the siting of renewable energy in our state. The charge you carry from Governor Shumlin is a very important

one for Vermont. As you deliberate and prepare to issue your findings, I urge you to please look at the big picture of energy and how we obtain it in Vermont – this includes where our renewable energy resource is located, and the practical means of harnessing it at a scale that will meet our needs now and in the future.

The Vermont Comprehensive Energy Plan's key goal is for 90% of ALL energy to be supplied by renewable energy sources by 2050 – including energy used for heating and transportation. This goal requires at least three times as much electrical energy as the state currently uses. The plan outlines the majority of that electricity will need to come from wind and solar. I believe this goal is necessary and urgently required. Fossil fuels will not be around in abundance forever, and our finite planet is depending on us to do the right thing while economic conditions can support this transition.

Science and getting the facts correct matters. It is very difficult to disprove a negative statement, but in the case of determining the right path to take for the good of all, it's important to sort the signal from the noise. My concern is that many of those opposed to large scale renewable energy are not operating from a familiarity with the big-picture issues involved, or from any basis of energy expertise. I do this work in energy because I believe in its importance for society, but my convictions are rooted in science and its practical application. This is why I know that converting to an electric economy powered by renewable energy is the right path for us to take. At this crossroads in Vermont's implementation of the Comprehensive Energy Plan, please do not let renewable energy opponents create doubt in your minds just by virtue of their opposition. Weigh the facts, first judging their source and veracity.

I speak from experience. I'm very familiar with Vermont's permitting process as it stands, because I have built both a large-scale solar farm and a large-scale wind farm in Vermont within the past two years – the 2.2 MW South Burlington Solar Farm, and Georgia Mountain Community Wind, a 10 MW, four turbine farm on the Georgia-Milton town border. I have also devoted 35 years of my life to the study of renewable energy and the advancement of renewable energy systems. My background in this field includes a B.S. in mechanical engineering (UVM 1981), and subsequently founding NRG Systems in 1982 and developing it to be a worldwide leader in wind energy measurement equipment as CEO for 23 years. For seventeen years, I served on the board of the American Wind Energy Association, and I'm a founding member of Renewable

Energy Vermont. I have ongoing service commitments with several non-profit organizations that are concerned with the scientific evaluation of energy resources and systems: these include being a board member of the Association for the Study of Peak Oil – USA, and an advisory board member of the Union of Concerned Scientists. After 30 years running renewable energy businesses, I've also got a boots-on-the-ground familiarity with what will and won't work in terms of practical applications. I've been involved in every wind measurement program in Vermont; I know the state's wind resources very well. Today, my company AllEarth Renewables is advancing the technology of ground-mounted solar tracking systems. To date, we have installed over 1500 solar trackers, all manufactured at our facility in Williston, VT. We are the largest solar installer in Vermont.

Vermont has the toughest large energy project permitting of any state, and that permitting process has already been very thoroughly vetted with public input at every step of the way. If we are serious about transitioning our energy economy, it is important to remember that renewable energy projects don't only require permits; they require developers willing to make them happen. True federal leadership is lacking on this issue. Without the benefit of directly federally funded transition initiatives, any successful large-scale infrastructure change requires public-private partnerships – in this case, communities and policymakers must acknowledge that developers bring essential funds and expertise to the table, and share the common goal of retooling our energy economy to run on renewable resources. Scare off the developers, and we hobble our chances at developing a state that is energy self-reliant. Global climate change is a greater threat to human survival than any geopolitical situation past or present, but the United States fought World War II more quickly than Vermont can currently permit a single wind farm. We must explore ways to permit renewables more quickly, and with predictable timelines.

I urge the commission to recommend ways to improve permitting for all involved, not weigh projects down with additional requirements. We must simplify and standardize the process. We must switch to renewable electrical energy, away from fossil and nuclear fuels, and lead the nation in showing how this can be done. We are running out of time, and the common good of all Vermonters trumps individual self-interest. Please stand strong and do what our kids and grandkids are expecting of us: Lead us forward to a true renewable energy economy.

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

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EARTH DAY IS MORE IMPORTANT THAN EVER!

Staff article

The first Earth Day was supported by such politicians as Senator Gaylord Nelson and President Richard Nixon. In those days, carbon dioxide was considered okay, and the objects of concern were DDT and toxic waste dumps. The idea was to stop polluting, pick up the trash, and clean up the Earth. To do those things, laws had to be passed.

Today, things are different. Where they saw toxic waste as the biggest problem, today it is carbon dioxide. Where they saw cleaning up local habitats as the goal, today we see a global change. The goal is not local, and it is no longer a cleanup. Today, we can see clearly that the goal is to Save the Entire Earth. To do that, we need to motivate as many people as possible to ACT NOW.

The action is no longer to pass laws, though that may be important. The action is to reduce our consumption of fossil fuels, as quickly as possible, to zero.

There is no single person, no organization, no company, and no country that can save the planet. The UN cannot do it. We need to go in a radically new direction.

We cannot wait. We must ACT NOW, and we must do it, each one of us, as individuals. We need to get every one of us to REDUCE, REUSE, and RECYCLE, to RESTORE THE PLANET.

Start with yourself. Guide your neighbors. Call on your politicians. Move businesses to act. To save this planet, we all need to act, each one of us, as individuals.

Celebrate Earth Day with an Earth Day Resolution. ♻️

ELECTRIC SCOOTER! ELECTRIC MOTORCYCLE!

By N.R. Mallery

Interest in electric vehicles and smart transportation is increasing. One option is two wheeled -- e-bikes! It's spring - a good time to see what some regional experience has to say.

Jimmy Karlan rides his 2009 VX-1 red electric 'scooter' to and from work at Antioch University in Keene, NH. He is the director of the Science Teacher Certification Concentration and core faculty in the Department of Environmental Studies.

Karlan's daily 60 mile scooter commute has reduced his own carbon footprint by 1.56 metric tons from the 7,000 miles he has ridden since September, 2011. Jimmy rode until mid January last winter, in temperatures as low as 27°, by layering clothes, including rechargeable electric gloves, carried in the built-in storage compartments.

The VX-1 scooter gets 35 to 55 miles per charge, depending on speed (top speed 67 mph), wind resistance and hills. "The reality of the limiting miles", Karlan commented, "is that your awareness rises -- the faster you go on an electric motorcycle, as with any type of fueled vehicle, the more energy it takes and distance decreases. Riding an electric scooter "makes me keenly aware of the old adage that 'you can't get something for nothing,'" says Karlan. It costs just 75¢ to charge up completely -- a couple of pennies per mile." An upcoming upgrade to a lithium ion battery will increase this range to 55-85 miles.

Common to most electric vehicles, both riders we talked to have experienced 'range or destination anxiety'. Karlan found a sense of community from the resulting experience of NOT making it to a destination. and need to plug in.

Karlan said that he rides an electric scooter "to keep my carbon footprint low. From an educators point of view, by being used locally, it's the best way to show others the Antioch environment - by 'walking the talk' and to shout out that Antioch University is an extraordinary place -- that we take our responsibility serious!"

It is quite obvious why David Blittersdorf rides an electric motorcycle to work and to meetings -- he is the Founder/President/CEO of AllEarth Renewables in Williston, VT, AllSun Trackers and also founder of NRG Systems in Hinesburg, VT.

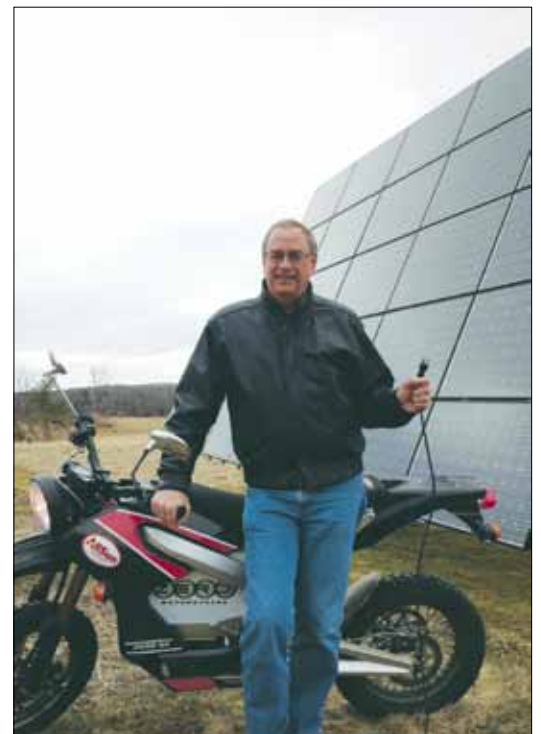
This is David's second full sized e-bike in 14 years. The older EMC, with serial #60, has a lead-acid battery - with a life of 500 cycles. It goes 12 miles at 45 mph.

He learned early not to trust the supposed 25 mile range, after making it just one mile from his destination. "My current 2011 ZeroS, with a lithium battery is supposed to go 34 miles but really gets 24-25".

Riding 11 miles to work, he re-charges his e-bike with 100% solar power from their net-metered solar farm in Hinesburg. It uses 1 kWh or 20¢ of solar power to go 10 miles -- 2¢ per mile." An Electric motorcycle, comparatively, is 4x more energy efficient based on BTU's. The Zero can go 70 mph on the highway. "It's quiet -- people look at you weird - because they




Jimmy Karlan rides his 2009 VX-1 red electric 'scooter' to and from work at Antioch University in Keene, NH. He has ridden over 7,000 miles since Sept. 2011.



David Blittersdorf with his 2011 ZeroS electric motorcycle that he re-charges with 100% solar power from their net-metered solar farm in Hinesburg, VT.

are quiet," David said.

With possible plans to upgrade to an even more efficient 2013 Zero for more power, range (85 miles at 55 mph), one hour charging and 300,000 miles or 2500 cycles on the lithium battery, choosing to incorporate an electric motorcycle in his life follows suit with Blittersdorf's well-known understanding of the need to lower our impact on the environment.

Electric scooter and motorcycles can be another step to lower our emissions. They have zero emissions! And although electric bikes have zero emissions while riding them, Karlan says, "We should never lose sight of the hidden costs associated with green products like the source of electricity that recharge our bikes or the mining and production of lithium." 

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RAIL IN VERMONT JUST GOT BETTER!

COMPLETED TRACK AND SIGNAL UPGRADES ALLOW FOR INCREASED SPEEDS AND REDUCED TRAVEL TIMES

Amtrak, in partnership with the Vermont Agency of Transportation and New England Central Railroad, announced

a revised schedule that began on March 18, for the Vermonter service between St. Albans, Vt. and Washington, D.C.



The new timetable is highlighted by a reduction in overall travel time by up to 28 minutes and is the direct result of a recently completed two-year, federally funded program which provided for the upgrade and repair of a 190-mile stretch of track, signal and other key infrastructure equipment owned and maintained by New England Central Railroad.

"The Vermonter project to upgrade the New England Central Railroad main line is a great example of a very successful public-private partnership, helping both rail passenger and freight services," said Raymond Goss, Senior, Vice President, New England Central Railroad. "This project involved the Vermont Agency of Transportation, the Federal Railroad Administration and the Railroad. We are happy to be part of this partnership."

As a result of these improvements, track speeds along the route within Vermont have been increased, from 55mph to a maximum 59mph north of White River Junction and from 59mph to a maximum 79mph south of that location to the Massachusetts border. Below the Vermont border, track speeds will remain unchanged. These efforts will reduce overall travel time and improve reliability.

"We are excited to see these service improvements resulting from our collective investment in this important rail corridor," said Vermont Transportation Secretary, Brian Searles. "The Vermonter line is

essential to our plans to expand passenger service to Montreal and these upgrades also serve to improve our freight-handling capacity. Giving passengers a smoother, faster and safer ride makes Vermont a more attractive rail destination."

The Amtrak Vermonter route experienced notable ridership growth last year, up 5.5 percent with over 82,000 passengers. Also of note is the jump in its recent on-time performance, 90.3 percent so far this year, up nearly 5% from a year ago.

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NISSAN'S LEAF BETTER AND GREENER

By George Harvey

Every once in a while, I realize what I am doing is more fun than work. This is one of those times. I was asked to see whether industry predictions on the Nissan LEAF had turned into reality. Minor problems

getting data are sometimes easier to work out when you talk to the right person, so I called the nearest dealership carrying the car, Nissan of Keene, New Hampshire.

I got put through immediately to Ben Smith, a salesman. It turns out Ben not only sells the LEAF, he also drives one. More important, he believes in it, and this shows when he talks of his own experience.

The first thing I asked about is the vehicle's range. Last year's official range was 72 miles on a charge. Clearly,

however, range is very dependent on driving habits. Ben tells me that with careful driving, using this year's new "eco mode," he is able to stretch the range to 115 miles in the summer. Older editions of the car had poorer range in winter, because the heating all comes from the battery, but newer technology has improved this markedly, and he says he gets over 80 miles consistently, even during winter.

The car's range should not have much negative effect on sales, because it is more than twice as much as most people drive each day, but it does. Ben says many people suffer from what he calls "range anxiety." My advice: if you

want to save the planet, think about how likely you are to suffer from "range anxiety" the next time we have a gas crisis.

Of course, it is not possible to talk to a car dealer without talking about comfort, handling, pickup, and so on. I really want to test a LEAF myself, but until then, I can only assure you, the LEAF's reputation is that it has all of the above, and with a special emphasis on cornering.

One of the best things about the LEAF is its low cost. Different models

range upward from \$28,800, but tax rebates, can bring that to be as low as \$21,300. Leases are also available. A cost comparison between a LEAF and other vehicles shows the cost reduction you get by paying for electricity instead of gas, engine repairs, new mufflers, and oil changes. The savings are nearly equal to the cost of the lease.

You can save money while you save the planet. Who needs fossil fuels?



Ben Smith, from Nissan of Keene, plugs in his LEAF

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(Automatic)

CIVIC

2013 Honda CR-Z Sport Hybrid

MPG*: **35 CITY 39 HWY**
(CVT)

CR-Z



2013 Honda Insight Hybrid
MPG*: **41 CITY 44 HWY**

INSIGHT

* Based on 2013 EPA mileage estimates. Use for comparison purposes only. Do not compare to models before 2008. Your actual mileage will vary depending on how you drive and maintain your vehicle.



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HARLEY DAVIDSON ENTERS THE WORLD OF EFFICIENCY

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216 MX 230 SOLAR panels will provide more than 100% of Brunswick Harley Davidson's electric usage!

By N. R. Mallery

As fuel-efficient vehicles go, how does 44 to 60 mpg sound to you? "It doesn't get much better than that," a neighbor recently commented. Well, the last time I measured the mileage on my own Harley, I was getting 60 mpg! Sounds like a good enough reason to use it more often. You would be surprised at how much you can carry, by using saddlebags and bungee cords. I have strapped on five bags of groceries to mine in the past - and even a snowboard, combining the enjoyment of riding both the motorcycle and snowboarding on one sunny spring day.

To confirm that my memory is correct, I contacted Stuart Ginsburg from Brunswick Harley Davidson, in Brunswick, NY. My recollections were not too far off.

- Road King - 50 mpg, even with two riders and gear.
- Sportster SuperLow® XL883L - 51 mpg.
- Other models - 42 to 41 mpg

Then when you go to three wheels, look what happens: the new Harley Trike only claims 38 mpg (HarleyDavidson.com). All of that doesn't compare to an electric car's mileage or have the room for four people and lots more gear. But, it is an option when you are traveling with less. It seems that fuel efficiency on two wheels is a step in the right direction. Will they be offering an electric Harley in the future? I heard that the fastest bike on record is now held by an electric motorcycle.

Recently I noticed solar panels covering the roof of a parking garage at Brunswick Harley Davidson. My quest to know more divulged some interesting data.

•216 MX 230 SOLAR panels - 18 strings of 12 modules each, with six SMA 7000 Inverters.

•The system will produce 59,616 kilowatt hours each year. The total annual usage of the dealership at the time of the system's installation was 59,603 kwh, just above their annual usage.

•In New York State, you are able to install up to 110% of any one meter's annual usage, but the incentives cap out at 50,000 kW's, making it expensive to install anything over the cap.

•The system was installed by Monolith Solar located in Rensselaer, NY. <http://monolithsolar.com>.

•This system was financed with a



Stuart Ginsburg flips the switch to turn on the solar power for Brunswick H-D

PPA (power purchase agreement). This contract allows Monolith Solar to install a system on a company's roof at no cost to them. Monolith then sells the energy produced at a 25% discounted rate to the business, as compared to their utility providers.

It was interesting that New York is also making efforts for energy efficiency in the direction of clean renewable energy. Brunswick Harley Davidson is setting a great example of their support for our future 🌱

SMART COMMUTING IN NH & VT

WHY. Transportation emissions are one of the two worst offenders that add to the rising CO2 levels in our atmosphere. As you might have read or heard from President Obama's State of the Union Address and numerous other reports, global warming is advancing MUCH faster than expected -- at alarming rates. How do we get our emissions down now? YOU CAN HELP TO MAKE THE DIFFERENCE!

OPTIONS. Commuting smartly is all about knowing your options and planning ahead. There are many options to getting around in both New Hampshire and Vermont, handi-cap -- bicycle accessible, and discounts for students and seniors. The first place to start in Vermont is GoVermont at www.connectingcommuters.org for everything you need to know to travel more efficiently. Whether getting around town, commuting or planning a day trip, leave the driving to someone else, enjoy the ride and help save our planet. Why wouldn't you want to save on average \$2,000 annually by sharing a ride or taking transit? It will certainly cost less than using your own vehicle. There are services for commuters, tourist, and shoppers. It is time to do things a better way -- a smart way, and plan on using these services for your daily routines.

And, don't forget about the train, carpooling and just sharing rides, for which there are many ways to connect for using them. Park n Ride lots are there to use. Keep 'em full!

LINKS AT-A-GLANCE:

Upper Valley Transportation Management Association (Vital Communities) The UVTMA works with area employers and communities to promote and improve commuting options. 802-291-9100 www.vitalcommunities.org/transport/index.htm

NEW HAMPSHIRE

Upper Valley Rideshare (UVRs) is the ultimate website for getting to and from the Upper Valley, providing carpool matching, benefits and support for commuters. www.uppervalleyrideshare.com.

Advance Transit (AT) will get you around the Upper Valley, weekdays, in Lebanon, Hanover, Enfield, Canaan, NH, and Norwich and Hartford, VT. Dartmouth and DHMC Shuttles.

ADA Services. 802-295-1824. www.advancetransit.com

Contoocook Valley Transportation Company (CVTC) - Monadnock Rideshare program for the southwest region & beyond. 877-428-2882. www.cvtc-nh.org

Cooperative Alliance for Regional Transportation (CART) serving the Chester, Derry, Hampstead, Londonderry, Salem and Windham, limited service to Plaistow. www.cart-rides.org

Community Alliance Transportation Services for Claremont & Newport, NH 603-863-0003.

Concord Area Transit (CAT) serves Concord, NH www.concordareatransit.org

City Express serves the City of Keene. 603-352-8494 www.hcsservices.org/services/transportation/cityExpress.php

Manchester Transit Authority (MTA) for Manchester, and connections to Nashua and Concord. 603-623-8801 www.mtabus.org/services/local-buses/

Nashua Transit System (NTS) for buses and trolleys with bike racks. 603-888-0100 www.RideBigBlue.com

Carroll County Transit provides services and connections to Belknap County. 603-752-1741 or 888-997-2020 www.tccap.org/nct.htm

Winnepesaukee Transit System (WTS) services Belmont, Franklin, Tilton, Laconia . Ride Line 603-528-2496 www.bm-cap.org/wts.htm

VERMONT

Vermont Public Transportation [Public Transit/Ferry/Rail] <http://www.aot.state.vt.us/PublicTransit/providers.htm>

AMTRAK <http://www.amtrak.com> (800) 872-7245 Long distance train service. Offers discounts for AAA membership and student advantage card

Chittenden County Transportation Authority is Burlington's bus service with links to Montpelier, Middlebury and commuter route to Milton. <http://www.cctaride.org>

Connecticut River Transit provides services in and around Bellows Falls and Springfield. <http://www.crtransit.org>

Dartmouth Coach (800) 637-0123 <http://www.dartmouthcoach.com/>

GO VERMONT is the place to go for carpoolers and commuter connections in VT! 800-685-7433 www.connectingcommuters.org

Green Mountain Railroad has day trip specials available from White River, the Champlain Valley, Bellows Falls and Rutland. <http://www.rails-vt.com/>

Green Mountain Transit Agency provides local service in Barre, Montpelier, Grand Isle, Stowe and Lamoille. <http://gmtaride.org>

Greyhound/Vermont Transit for long distance bus services. 1-800-231-2222 <http://www.greyhound.com/>

Lake Champlain Ferries providing transportation between New York and Vermont via Lake Champlain. 802-864-9804 <http://www.ferries.com/>

Marble Valley Regional Transit for Rutland, Killington, rural Manchester, Poultney and Rutland to bellows falls. Service is free on Saturday for city routes. 802-773-3244 <http://www.thebus.com/>

Rural Community Transportation, Inc. (RCT) uses buses, vans, and volunteer drivers. Routes also via The Jay-Lyn, The Highlander (Newport - Derby Line; The U S 2 Commuter (St. J. to Montpelier) and Free routes to rural areas. 802-748-8170 <http://www.riderct.org>

Stage Coach -commutes from Randolph to Dartmouth & trips within the village... 800-427-3553 <http://www.stagecoach-rides.org>

AFFORDABLE HEAT:

Why a Commitment to Heating Efficiency Can't Wait

By Johanna Miller

Vermont's building stock is old and inefficient. Vermonters are wasting precious fuel – and a ton of money – to heat the outdoors. The oil and gas that most people use is also expensive, imported, non-renewable and contributing to climate change.

Thankfully, there is a bill on the table this legislative session that would begin to confront this challenge. The bill – H.520 – aims to improve the heating efficiency of Vermont's building stock and transition people to cleaner and cheaper forms of heating fuel.

Unfortunately, the effort to address this issue in a meaningful way has fallen short, and the bill has devolved into something far less than what is needed for long-term energy savings.

H.520 passed the House and does contain some good provisions. It prioritizes weatherization for low-income heating assistance customers, outlines certification of residential building energy standards and requires some important studies, including one on the deployment of electric vehicles and the potential for a state heating efficiency charge, much like today's electric efficiency charge.

It lacks, however, the essential ingredient for success: a sufficient, consistent funding source to move heating efficiency efforts forward.

Clearly, raising money — especially in hard economic times — is tough. But let's face it: We will be forced to go down this road at some point. Budgets won't ever get easier to balance, and as the cost of fuel oil continues to rise, more people will be hard pressed to pay their heating bills.

Investing now is pivotal, and it means that the tremendous benefits accrue earlier and faster. Heating efficiency:

- Saves money. It's proven. Vermonters have saved \$775 million since 2000 by investing in electric efficiency. With heating efficiency, the average Vermont homeowner would save about \$1000 annually.
- Reduces waste. We are wasting valuable – and expensive – energy resources. Weatherizing buildings keeps the warmth in and makes homes and buildings more comfortable.
- Protects our environment. Heating efficiency is the most cost-effective way to reduce greenhouse gas emissions, minimize our contribution to climate change and protect Vermont's environment.

- Creates local jobs. Vermont currently exports over \$500 million annually out of our economy to pay for energy. A real commitment to heating efficiency and helping Vermonters switch to renewable heat will keep our dollars local, grow thousands of new jobs and build a clean energy economy in Vermont.

A serious commitment to heating efficiency is also imperative to meeting the state's own goals. In 2008, the Legislature set a target to improve the thermal efficiency of a quarter of Vermont's old, leaky homes by 2020.

To understand how best to take on their ambitious task, the state convened a Thermal Efficiency Task Force (TETF) and charged it with recommending policy, program, funding and financing strategies to retrofit 80,000 homes by 2020. The TETF outlined its well-vetted 'road map' this January for the Legislature to act upon. A few intrepid lawmakers took the results seriously, setting out to advance legislation to meet their own goals and, as the TETF found:

- Help Vermonters save \$1.4 billion on heating costs.
- Create hundreds of in-state jobs in energy efficiency and renewable heat.
- Avoid 6.68 million tons of CO2 emissions from entering the atmosphere, equivalent to removing over 1.2 million passenger cars from the roads for one year.
- Increase the benefits for low-income Vermonters by facilitating better access to weatherization programs.
- Insulate Vermonters against future shocks in the price of oil and other fossil fuels.

Unfortunately, limited dollars and overstressed political leadership, thus far, has translated into a failure to find even a fraction of the funds necessary for heating efficiency. It's possible the state will leave this opportunity on the table — and too few Vermonters will reap the significant economic benefits from weatherization investments.

It's not too late, however. There is potential opportunity for action in the Senate. And, if action this session fails, there will be need for an increasingly invigorated response next year. Make your voice heard! Learn more about this issue and find the contact information for your legislators here — <http://vnrc.org/legislature-to-consider-investing-in-heating-efficiency/>. Johanna Miller is the Energy Program Director at the Vermont Natural Resources Council — jmiller@vnrc.org, 802-223-2328, www.vnrc.org.

ALL TOWN ALERT!

By George Harvey

For the past two years, I have spent about three hours every day researching news articles on energy and climate change. I typically look through 300 headlines for articles every day. Last June, I started recording these at my blog, geoharvey.wordpress.com, where you can see them.

Last fall, I started seeing news I can only regard as alarming. This was not because of what it said so much as because of who was saying it. The warnings were no longer just coming from environmentalists.

Purely capitalist organizations have joined in, advocating protection of financial resources. Even some leaders in the fossil fuel industry began issuing statements on the millions they were spending, preparing for more frequent and much worse storms, brought on by climate change carbon emissions from products they themselves sell.

In November, the Atlantic Wire ran an article that exemplifies this. It is called The Weird Coalition Sounding the Alarm on Global Warming. One organizations issuing dire warnings is PriceWaterhouseCoopers, one of the largest accounting companies in the world. Another is the World Bank. Yet another is the CIA, whose report says climate change, driven by carbon emissions, is a top security threat for the United States for the 21st century.

At first, I failed to see a connection between all this and local community life. I did that when I understood some implications of forecasts for the next thirty-five years. An example of these can be found at the website of the New England Aquarium, in a report called Climate Change in New England. What we are being told there is that by 2050, a date within the expected lifetimes of most people currently living in New England, we will regularly be seeing floods like those brought by Hurricane Irene, possibly as often as every two

years. And of course, things have already started moving to that point. We can label Irene as a starting point, from which things gradually get worse.

At some point all too soon, FEMA will no longer have resources to bail us out, because the problem will be constant and nation-wide. At the same time, the state will not have resources to give



much more than advice. Important lost infrastructure, including many roads, will have to be abandoned. More implications arise from this.

I want to make sure everyone understands. The damage has already started. The year we had Hurricane Irene is just the worst year we have had so far. The costs are already being paid. Though it will happen fitfully, with each passing year, things will get worse, and those costs will increase. It will continue, until we get climate change under control.

Believe it or not, I have been getting emails on my blog from people who say they find my optimism refreshing. This is because the record there makes it clear that the problems we are facing can be dealt with. I believe we can, and very probably will, get through these times in a comfortable and happy state. In fact, I believe that in some ways we can be very much better off than we are now – if we act wisely.

That "if," however, is very important. We must do better than just denying that the CIA knows what it is talking about. We must do better than to depend on others, because the aid will not be there. We must be resilient, on our own, as communities and neighborhoods. If we are, we will be as able as we can be to deal with whatever issues come up.

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HARTFORD'S PUBLIC SAFETY BUILDING PV ARRAY

By Kimberly Quirk

After deciding to put a solar power system on the roof of the Public Safety Building, the Town of Hartford, Vermont put out a request for proposals last spring.

The building, located on the VA Cutoff Road in White River Junction, houses the police and fire headquarters. The project was envisioned as a demonstration solar

energy project for the town, and was originally intended to have both solar hot water and solar electric.

Since the town was using grant financing, there was a requirement that the public be able to monitor the production. Another requirement was for an educational outreach component helping people to learn more about renewable energy.

Soon after starting on the detailed design, and with some feedback from the town's energy commission, it was decided that the town could save more energy per dollar spent by providing a larger solar electric array rather than breaking the system into two parts -- solar hot water and solar electric. Even though the sun is more efficient at heating water than making electricity, the incentives and rebates provided a better return on investment for the town if they went entirely with photovoltaics (PVs).

The Public Safety Building has a flat roof. While this provided very good solar access for the collectors, flat roofs have their own special requirements. Since there is no easy way for snow and water to shed, extra care has to be taken to avoid penetrations, as they can be places where leaks form. Even walking or placing objects on the special membrane surface can cause abrasions leading to weak spots and leaking. Care has to be taken to keep the surface free from grit and particles. Solar panel racking must be protected from direct contact with the surface, and the wiring is usually laid in conduit across the roof and down the outside wall where it can safely penetrate into the building.

The low angle of tilt produces efficiency

issues of its own. One of these is that the panels do not shed snow, so it has to melt off. Another is that the electric production is somewhat reduced, especially in winter. These mean a compromise has to be struck on the angle. While it is usually optimal for PV panels in New England to have an angle of about 40-45°, our panels were mounted with a 13° tilt.

We used the PVWatts online program (<http://redc.nrel.gov/solar/calculators/pvwatts/version1/>) to determine the amount of electricity we will likely produce given the tilt angle, the due south orientation and any shading that might be encountered (none for this location). With a 13kW solar PV array, the maximum production we are likely to get for the entire year is 14,800 kWh/year. This program is great in that it breaks the numbers down for each month.

For just the months of December, January, and February, when we are likely to have the most snow and perhaps no production on these panels, the total



Public Safety Building, Town of Hartford, Vermont



The 13kW solar PV array should produce over 13,000kWh/year

production is estimated to be 2400 kWh. That's only 16% of the total yearly production. PVWatts shows that about 31% of production occurs in March to May, 33% in June to August, and 20% in September to November. So if we miss half of the production in the snowy months, we should still produce over 13,000kWh/year.

A public website of the data is available online here: <http://www.solrenview.com/SolrenView/mainFr.php?siteId=1458>. And the town is coming up with both a public display and an educational program to provide the details of this project and general information on renewable energy. For more details on this project, you can go to the Energy Emporium website: www.energyemp.com. Check it out!



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IN THE FIRST QUARTER OF 2013, 82% OF NEW U.S. ELECTRICAL CAPACITY WAS RENEWABLE

According to the Federal Energy Regulatory Commission's latest Energy Infrastructure Update report, 1536 MW of renewable energy was installed in the first quarter of 2013, including wind, solar, biomass, and hydro. This included 958 MW of wind, and 537 MW of solar. Biomass installations totaled 46 MW, and new hydro was 5.4 MW.

The new non-renewable capacity, 340 MW, was all natural gas. No new coal, nuclear, or oil generating was installed in the first three months of the year. Renewables are winning!

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SOLAR Q&A



SOLAR UNCERTAINTY with Howie Michaelson, Catamount Solar

Howie Michaelson (who has lived in a solar, off-grid home for 14 years) answers solar related questions in a simple, clear fashion. Submit your questions to G.E.T. or uncertain@catamountsolar.com for inclusion in future editions!

It seems solar is changing fast and is getting cheaper. Wouldn't it be prudent to let the dust settle and maybe buy something next year, next decade?

This is a sensible question asked frequently by people and businesses exploring whether renewable technologies and specifically solar power systems make sense to invest in right now. Since the solar market appears to be changing every month, does it make sense to invest in such a technology from a financial as well as a technological perspective? What if I buy a system this year, and next year a whole new, more efficient, cheaper technology hits the market? Isn't it better to wait?

The short answer is, no. Basically, if solar makes economic or philosophical sense to you now, waiting for something better is just that – waiting. Production technology is steadily improving, effecting incremental costs of solar, and making a system somewhat cheaper or more efficient. However, waiting for that improved technology won't provide solar power now, which can decrease or even zero out your energy bills starting now. If a solar system makes sense now, potential improvements in succeeding years will not negate its value or effectiveness. Properly designed and installed systems will provide 20 to 40 years of productive value, regardless of how the market changes.

Finally, while there may be game changing solar energy technologies on the horizon (no doubt there are), any undiscovered solar breakthroughs will likely take 5 to 10 years to make it to the commercial marketplace. As with any financial decision, it makes sense to evaluate the pros and cons in relation to existing conditions. If a solar system makes economic sense now, it will continue to do so for the life of the system.

Technology is changing. Does it make sense to look at leasing options?

Choosing whether to lease or purchase a solar system is almost always based on economics, not technology changes in the future. For people who don't have access to capital to purchase a solar system, leasing options may be a viable way of getting into solar. But the decision should be based on the current economic sense of the investment, not a worry about possibly missing out on some future improvements. Again, a system that makes financial sense now will continue to make financial sense for its lifetime if it's designed and installed properly (choose your installer well!). If purchasing a system is the right choice for you today, that won't change if there is a dramatic change in solar technology. Your investment will continue to provide a significant benefit financially and environmentally for many years to come..

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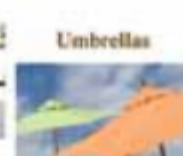
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Cont. from page 1

many times the amount of power we need. DOE calculations show we could develop up to 283,600 TWh from solar PVs, 116,100 TWh, from solar thermal, and 49,700 from wind. Solar and wind total, 449,400 TWh, and more can come from geothermal, biomass, hydro, or other renewable resources. In 2008, the U.S. used 4,369 TWh of electrical power, less than 1% of the available solar and wind resources.

Prices for power from onshore wind, solar PV, hydro, biomass, and geothermal are all less expensive than new coal or nuclear. Only natural gas is competitive with renewables, and only as long as the current natural gas bubble lasts. The prices will go up eventually, and quite possibly suddenly and soon.


Perhaps the argument against renewables that sounds most compelling is that the grid might be destabilized by intermittent renewable power sources. This idea, however, may be an improperly reasoned projection, as empirical data indicates the opposite.

Large coal and nuclear plants have to run at nearly full power each night, in low demand times, in order to be ready to supply power at high demand times. Every night, the spot wholesale price per MWh goes low, and can even become negative. In high demand times, spot

prices have gone to multiples of the retail price. Even without the presence of solar and wind, the grid is not stable.

When a 700 MW coal-burning plant in Australia went offline suddenly in February, the wholesale price of power in its area jumped in minutes from \$63 per MWh to a high of \$11,499 per MWh. Observers commented that if the power had been supplied by wind turbines instead, spread across the countryside, the variations of the individual turbines would have tended to cancel each other out, and there would never have been a complete loss of power. Empirical observations tend to support the idea that solar and wind will eventually help stabilize the grid.

A study at the University of Delaware says that a well designed grid can be supplied 99.9% by renewable power. It said we could achieve this by 2030, with lower electric bills and increased employment as a result.

As far as I can tell, there are only a few losers from a change to renewable power. Some are companies that sell fossil fuels. Others are themselves fossils – dinosaur utilities too big and too slow to change with the times. Until then, they will doubtless complain loudly, trying to keep us in the carboniferous era as long as they can. Choose and support Renewable Energy. 

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SOLAR PHOTOVOLTAICS

Solar PV Powered Driving

By Frederick Greenhalgh, Revision Energy

You know that sunshine can power your home, spin your meter backwards and get rid of your electric bill with a Solar Photovoltaics (PV) System. But did you know that an increasing number of New Englanders are using solar panels to drive around, as well? The solution is simple: buy an electric car and produce the power for it using solar panels. It's a lot easier (and less expensive) than you think.

Electric Cars: All the Range

There are several kinds of electric cars on the market, all with varying range (how many miles you can drive on an electric battery). For example, the plug-in Prius gets just 11 miles of all-electric driving, while the Nissan LEAF boasts as much as 100 miles.

The major different between a LEAF and a Prius plug-in is the size of the battery. The larger the battery, the further you can drive, but it also means you need more electricity to 'fill up.'

How it Works

Rather than plug solar panels into your electric car, the easiest and most cost-effective way to drive on sunshine is to power your home with a grid-tied solar electric system. You can size a solar



ReVision Energy has installed a solar-powered Level 2 car charger at their Portland location to power vehicles used to perform solar evaluations

solar array pumps DC power into an inverter, which then converts DC power into AC power used in your home. If your home is using electricity, those electric loads will be met with the solar power. If you are not using as much electricity, the excess is pumped out to

(some of the oldest and dirtiest in the country). By powering your electric car with solar panels, you'll not only be saving money, but contributing to cleaner air and a cooler planet.

This issue's PV Page information was enthusiastically submitted to Green Energy

Mileage	Electric Range	Cost per mile*	Cost to drive 12,000 mi
99MPGe	80	\$0.02	\$288.00
94MPGe	40	\$0.03	\$384.00
95MPGe	11	\$0.03	\$384.00
27 MPG	N/A	\$0.13	\$1,600.00
20 MPG	N/A	\$0.18	\$2,160.00
95-99MPGe	11 to 80	\$0.02	\$216.00

* Assumes \$0.16/kWh for electricity, \$3.60/gal for gas, \$0.10/kWh rate for solar electric (\$4/watt installed amortized over 20 years)



This 5kw solar array in Londonderry, NH produces all of the electricity needs in the home AND charges this Chevy Volt. Sohm drives his Chevy Volt to and from work 37 miles per day without any stops to fill up for gas. His grid-tied solar system produces 18.9kWhr/day on average. If he were to use all that energy he could drive 75 miles per day with zero fuel expenses.

the grid, and you receive a credit for the electricity you generate (the actual \$ value of that credit varies state-to-state). This is much more convenient than batteries, where your solar production is limited to the size of

Times from Revision Energy, who are playing a very important role in bringing energy independence to New England. You have probably read about many of their projects that have been installed in past issue of G.E.T. Green Energy Times supports their noteworthy efforts and want to thank Revision Energy for all they

electric array to provide anywhere from 25%-100% of your home's electricity needs, including the electric car. Being tied to the grid means you have the flexibility to generate power all day and sell it to the grid, but then plug your car in at night to charge and still use your solar credits.

When the sun is shining, a grid-tied

the battery bank.

A Cleaner Way to Drive

Most people are buying electric cars because they want a 'greener' alternative to gasoline for transportation, but the ugly truth is that electric car driving is only as clean as the electric source you use.

More than half of the electricity in New Hampshire and Vermont is created by nuclear power plants, and 15% of the power in New Hampshire comes from coal plants



A customer in Portland, Maine uses his solar panel array to charge a Tesla Model S

Factoids:

According to the US Energy Information Administration:

- You can drive 10,000 miles/year using electricity produced from 9 PV panels.
- Solar electric systems are eligible for 30% Federal tax credit, and state rebates up to \$6,500 in VT & up to \$3,750 in NH & up to \$2,000 in ME.
- Driving an electric vehicle powered by solar:
- is equivalent to paying 50¢/gallon for gasoline over the next 20 years when you factor in state and federal solar incentives.
- Eliminates thousands of lbs. of CO2 emissions.
- ME and NH have the highest per capita CO2 emissions in New England.*50% of those emissions come from transportation.
- You can charge your vehicle in just 4-8 hours with a Level II charging station.

are doing to help us move into the energy independence that will lead us into a sustainable future for our planet. You can see more of what they are up to at: www.RevisionEnergy.com

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BRATTLEBORO SCHOOLS ARE GOING SOLAR

By George Harvey

The Brattleboro School Board has signed an agreement with Southern Vermont Renewable Energy, or Soveren, for a net-metering purchase at a 500,000 kW solar array Soveren will build in Westminster. Net metering provides for off-site installation of power, making it easy for communities to take advantage of renewable energy installations.

The agreement supplies the town's four schools with electricity at a reduced cost to the town. The schools will buy electricity at a 10% discount, which will cover the costs of the renewable purchase. Since the net metering is tied to actual costs for electricity, the schools are protected from rising prices.

After seven years, the School Board may buy the solar installation at a reduced price, or, at its option, it may continue paying for the power and take possession for free after twenty years.

As a tax-exempt organization the School Board was not able to take advantage of tax credits. This fact made a net-metering purchase through Soveren a more attractive alternative. The School Board initially wanted to install the solar farm on its own property, but did not own enough land to build the array on its own property.

The project is currently in its permitting stages, but it is anticipated to be under construction soon. The hope is that it will be completed this year. ➤

SOLAR AT NO COST!

AllEarth Renewables announces zero cost residential and community-scale solar program

Vermont solar manufacturer and the largest developer of solar in the state, AllEarth Renewables, has announced a new program to finance solar at no cost to homeowners, businesses, non-profits, and public entities.

The new residential lease is unique in the state in that it offers a no cost lease for homeowners to net meter with solar at or below their electric rates with the opportunity to fully own the system at a significantly reduced cost after just 7 years.

The new community-scale solar lease features a similar no-cost program with a guaranteed electric bill savings of 10% a year for larger customers, such as businesses, schools, municipalities, and other institutions. These projects will consist of 10 trackers or more.

The lease payments under both options in this "home state" program will be at or below the customer's electricity savings, producing a zero net-cost agreement.

"As a local manufacturer, we are excited to again offer to our Vermont customers a financing option to give homeowners, businesses and communities the opportunity to net meter their energy and produce immediate savings on their electric bills," said David Blittersdorf, President of AllEarth Renewables.

The new program mirrors one that AllEarth Renewables offered in past years,

which financed more than \$18 million in solar projects around the state. The company has more than 1,800 AllSun Trackers in Vermont alone and is an Inc. 500 company for fastest growing companies nationwide.

The solar projects will feature the dual-axis AllSun Tracker, which was designed and is manufactured in Williston and produces up to 45% more energy than fixed rooftop solar by tracking the sun

each day.

AllEarth Renewables has provided solar to Vermont companies such as Concept2, Small Dog Electronics, and the Merchants Bank, Vermont institutions like Middlebury College and the University of Vermont, the municipalities of Starksboro, Hinesburg, and Rutland, and to hundreds of Vermont homeowners.

More information is available at: www.allearthrenewables.com/go-solar



(Above) AllSun Solar Trackers at Green Acres. (Inset) AllSun Solar Tracker at Perry Hill.

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COASTAL MAINE BOTANICAL GARDENS

Cont. from page 1

gains LEED points.

The design team included many members, but Vermont's Maclay Architects stand out. This company contrasts with Thornton Tomasetti in the respect that it is a small, local company with a staff of just eleven. It is perfectly aligned, however, in their expertise for sustainable building.

Bill Maclay first took interest in renewable power for buildings when he attended a lecture as a student in Pennsylvania in 1970. The topic was solar power, and the implications for architecture were made very clear to him. He focused personally on renewable power in architecture, and his thesis was on its use for co-housing in clusters. Now his firm has won numerous awards and achieved LEED certification for a number of buildings. Their own office building runs on solar power.

People at the Coastal Maine Botanical Garden like to say they have the greenest building in the state. Certainly, they now have one of only three LEED Platinum non-residential buildings in Maine. Their building was what won Maclay Architects the NESEA Zero Net Energy Building Award.

Congratulations to all on a great job! ♡

MAINE BOTANICAL GARDENS BUILDING EFFICIENCY

According to the U.S. Department of Energy, a Net-Zero building is a structure with zero net energy consumption and zero carbon emissions annually.

How Maine Botanical Gardens achieves this status includes 135 photovoltaic panels, mounted on the south-facing roof, and 102 more in an open field nearby. The 55,184 kWh systems are estimated for a payback of 10 years.

As won by Maclay Architects, NESEA awards its \$10,000 Zero 2013 Net Energy Building Award for the building considered best in the Northeast, taking efficiency, affordability, reliability, and appearance into account. Maclay is a recognized leader in sustainable design, with 10 completed Net-Zero or Net-Zero ready projects ranging from 3,000 to 75,000 s.f. They donated part of the award to the Botanical Gardens.

In addition to those mentioned in the article, many others deserve mention for work on the project. Scott Simons Architects has been recognized nationally for innovative design. H. P. Cummings of Winthrop, Maine was the construction manager. Becker Structural Engineers provided structural design services.

Bensonwood, of Walpole, New Hampshire, produced and installed the super-insulated, tightly-sealed building shell. Bensonwood fabricated assemblies at their NH facilities, and assembled them rapidly on-site, using special fabrication techniques allowing rapid work during winter while maintaining the highest standards.

Funding for the project came from the Bosarge Family Foundation, which donated \$2 million, including a fully-subscribed \$1.5 million matching challenge. The total cost for the Center and its all-native landscape is \$4.2 million.

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MASSACHUSETTS IS AHEAD OF SCHEDULE

As we are going to press, word has come in that the State of Massachusetts has already reached the renewable power goal it had set for solar capacity for 2017. That goal was 250 MW, and since it was achieved early, the state is very likely to expand the goal to a greater figure.

Reports say that the projected goals were not only reached four years early, but also that they were below anticipated costs. ♡

How do 'You' G.E.T. to 350?

Cont. from page 1

in our atmosphere. 350 PPM -- it's the number humanity needs to get back to as soon as possible to avoid runaway climate change.

If we're already past 350, are we all doomed?

No. We're like the patient that goes to the doctor and learns he's overweight, or his cholesterol is too high. He doesn't die immediately -- but until he changes his lifestyle and gets back down to the safe zone, he's at more risk for heart attack or stroke. We're in the danger zone because we've poured too much carbon into the atmosphere, and we're starting to see signs of real trouble: melting ice caps, rapidly spreading drought, increasingly severe weather, and on and on. We need to scramble back as quickly as we can to safety.

How do we actually reduce carbon emis-

sions to get to 350?

Make no mistake -- getting back to 350 means transforming our world. It means building solar arrays instead of coal plants, it means planting trees instead of clear-cutting rainforests, it means increasing efficiency and decreasing our waste. Getting to 350 means developing a thousand different solutions -- all of which will become much easier if we have a global treaty grounded in the latest science and built around the principles of equity and justice. To get this kind of treaty, we need a movement of people who care enough about our shared global future to make the needed changes themselves and to also let their voices be heard.

What can EACH of us DO -- on a personal level -- the YOU level -- not talk, but DO?

You know the things you can do around the home or the office. But the most important thing you can do by yourself is...not be by yourself. Join the burgeoning Fossil Fuel Resistance, at 350.org or elsewhere, and make a real dent in the battle for systemic change. ♡

RAE

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Most installed boiler in the Northeast

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Accumulator tank not required

Continuous running (No shutdown cleaning cycle required)

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www.maineenergysystems.com



WIND TURBINES PAY BACK THEIR ENVIRONMENTAL DEBT IN MONTHS

By Mike Barnard

One wind energy myth seems as unkillable as a bad guy in a B movie — it just keeps coming back even after it's been run over by truckloads of facts, disemboweled by

It's a bizarre myth, as the same people putting this myth forward often seem blind to the massive environmental destruction of coal generation and seem to have bought into the PR about 'natural gas', which has 50 times the full-lifecycle CO₂e emissions per MWh as wind energy.

The reality is that modern wind turbines of typical utility wind farm scale — 1.5 MW and up — pay back energy used in their full-lifecycle — materials, manufacturing, construction, use and decommissioning — in less than six months.

Wind turbine manufacturers have a vested interest in accurate full lifecycle cost assessments (LCA) and publish these. To maintain ISO certification — a necessity for any manufacturer to sell to more than backyard hobbyists — LCAs are required to be published and available. They must follow manufacturing standard ISO 14040-14043 approaches to costing. They must

be independently reviewed. What is relevant from these LCAs is that every step of manufacturing, transport, construction, operation, maintenance and disassembly is captured and quantified.

Literally everything of any significance is measured and included in the calculations.

Energy Payback Ratios for Various Generation Technologies

In this comparison, you'll see that the two generation technologies with the highest energy payback ratio are wind and wind with pumped-hydro storage. A high ratio is good in this case. ♪

	Payback time (days)	% of 20 years
Energy	146	2.0%
"Carbon"	93.9	1.3%
Carcinogens	22.53	0.3%
Resp. organics	396.56	5.4%
Resp. inorganics	386.47	5.3%
Ozone layer	393.42	5.4%
Ecotoxicity	209.62	2.9%
Acidification/Eutrophication	205.61	2.8%
Fossil Fuels	168/32	2.3%
Land use	never	
Minerals	never	

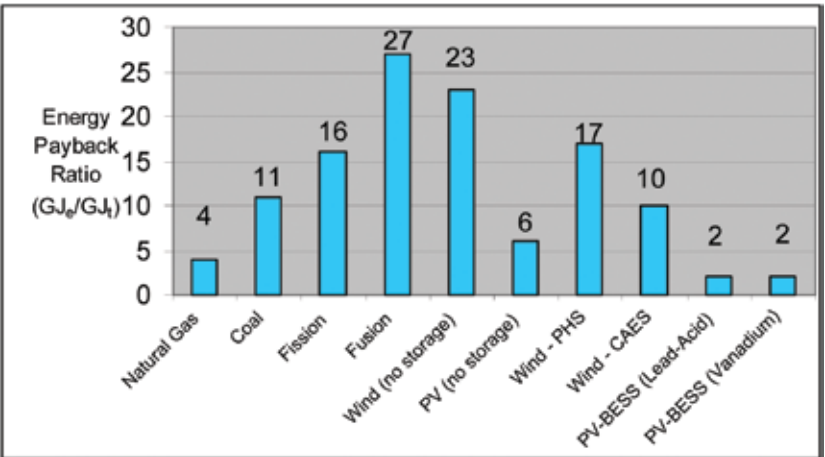
Payback times

2 MW onshore wind turbine

Payback assumptions: 2000 full-load hrs per year (~22%) Annual output estimated at 4 GWh

Carbon payback occurs within approximately 3 months. Energy payback occurs within approximately 5 months.

logic and burnt to a crisp by the light of reason. It is that wind turbines consume so much material and carbon in mining, manufacturing and construction that they never pay back the environmental debt of building them in the first place.



Source: Net energy balance and greenhouse gas emissions from renewable energy storage systems, Paul Denholm and Gerald Kulcinski, Fusion Technology Institute, University of Wisconsin-Madison, June 2003, Energy Center of Wisconsin
This article is an excerpt from <http://barnardonwind.wordpress.com/2013/03/09/wind-turbines-pay-back-total-environmental-debt-in-under-six-months/>

Terry Barber's Home in Brookfield

My home is on 13.2 acres of land in Brookfield, reached by Vt. Rte. 65 east of the Floating Bridge, and just below Allis State Park. The lot slopes gently to the southeast, and the house gets full sun from sunup until late afternoon to evening. I chose this land mostly for its exposure, but also because of many other positive attributes. It has almost equal amounts of open and

wooded area, a year round flowing stream, and over 350 feet of frontage on South Pond.

My house has a timber frame sitting atop an eighteen-inch-thick crushed stone and concrete floating slab. This is heated using Pex radiant tubing at the very bottom of slab, atop four inches of blue board insulation (R-15 edge, R-20 underneath). The exterior walls of the house have one inch of blue board as a thermal break, and blown-in cellulose insulation equaling R-30. The roof insulation is 10 inches of white bead-board between hemlock boards, providing R-40. I chose Marvin Ultimate aluminum-clad wood windows having a U-Factor of .30, and a solar heat gain coefficient of .27.



Above: Barber Whole House. Inset: Natural Rot resistant Locust entry on site found rock slab



Curved Cherry Railing & Lights

about building a new house my primary concern was about creating a safe, healthy, and comfortable home for a person with multiple chemical sensitivity (MCS), a chronic health condition. During my research I discovered a wonderful book, "Prescriptions for a Healthy House," by Paula Baker-Laporte, Erica Elliott, and John Banta. A section of this book covers heating and cooling. What I found to be most interesting was the idea of using a geothermal heat pump with hydronic distribution for heat. Because of my sensitivity to fossil fuels and wood smoke, along with molds on wood, I chose the geothermal heat pump for my house.

The ClimateMaster medium-temperature water-to-

When I first started thinking

MICRO HYDRO SYSTEMS

By Don Wemple

Today's micro-hydro Run-of-River system designs are dependable, economical, efficient, and environmentally friendly. Harnessing the power of water to generate electricity allows us to gain some sense of responsibility for meeting our own needs and for reducing our impact on the environment. Modern micro-hydro turbines have come a long way from the clunky metal turbines seen in the past. Advancements in turbine wheel (turgo or pelton) construction and generator design allow today's turbines to operate reliably in a wide variety of water conditions.

The typical Micro-Hydro system consists of diverting water from a small stream or pond downhill through a penstock or pipe (developing pressure through vertical head or height) to a turbine. The water under pressure is used to spin a turbine, and then returns to the stream. The DC electricity generated in the turbine is then typically wired to batteries through a charge controller or to an inverter where it is converted from DC to AC to power electrical loads in the home or the grid. In colder climates the water catchment system, penstock and turbine must be freeze proof (typically by burying and insulating).

The grid-tied micro-hydro system is connected through an agreement with your local power company and the energy is net-metered. In the net-metered energy system, your electric meter will spin backward whenever you are generating more power than you are using and

head" micro-hydro installations involve the placement of pipe (PVC or polyethylene) to move water stored (pond) or harvested from a high point adjacent to a stream to a lower point where the turbine is located. The minimal useful head for most micro-hydro systems is around 60 feet which corresponds to an outlet pressure of about 26 psi (2.3 ft = 1 psi). The design challenge is to size the pipe and the turbine outlet nozzle(s) appropriately for seasonally changing conditions. The minimal useful flow for most micro-hydro turbines can be as small as 25 gallons per minute (gpm) depending on the available head pressure. "Low head" micro-hydro generators can operate on as little as 10 feet of fall, but require a lot of flow to make useful power - typically 1000's of gallons per minute. At my off grid site, I feed a small pond by diverting a small amount of water from a stream, which then overflows back to the source stream. The source water for the micro-hydro turbine from the pond feeds a 3" PVC pipe, 800ft downhill to the turbine and develops a head of 185ft (80psi of pressure including friction losses) and drives the turbine. The turbine contains 3 nozzles of different sizes allowing me to adjust the flow of water to the turbine to compensate for seasonal variations in the amount of available water in the pond. Water flow rates over the course of a year vary from 25gpm in late summer to 150gpm in fall, winter and spring. Exceeding the flow rates of available water to the pond will reduce the level of the pond in a matter of days. So, how much power can I

B. Turbine: \$2000-\$3000 depending on the size of the system

C. Other Electronics: Inverter, Charge Control (for battery systems), Dump Load

once required permits are obtained. Off-grid systems require almost no permitting, but generally do not qualify for state rebates and some Federal tax credits.



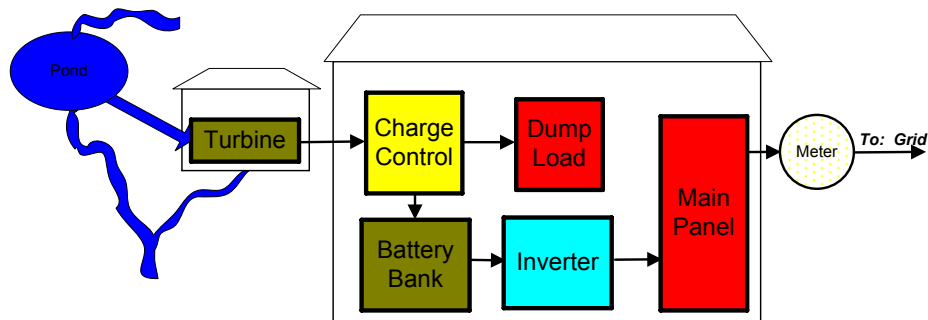
D. Grid-connections and/or Batteries, etc. \$3000-\$8000

E. Pipe, Wiring: Depends on length and size of pipe and wiring \$2000-\$4000.

E. Installation Labor, Federal and State permitting. Variable costs.

Grid tied systems require Federal (Inter-state Commerce and Water Resources) and State permits and there are small Vermont state incentives available. Paperwork for the required Federal Permits can be onerous (i.e. costly and time consuming) and very site dependant. Grid interconnection for net-metered systems is fairly simple,

About the author. Don Wemple is a Principal with Renewable Energy Systems and Technologies, LLC, providing design and installation of many types of green energy systems. He can be contacted at www.restecsolar.com. Many thanks to Green Energy Times for advancing the cause of green energy for our planet! 🌱



Simplified Micro-Hydro System

forward when you are using more power than you are generating. The result is that your electrical usage is billed at the net difference between what you make and what you use.

Battery charging applications are normally used for our customers living in remote areas with no electrical grid connection available. For both applications, the micro-hydro turbine must be continuously loaded by charging batteries, powering electrical circuits or powering the grid, or sending excess power to a "dump load".

Unloaded, the turbine would spin at very high speed, potentially damaging the generator.

Let's explore a small micro-hydro system installed on a small hillside farm in Bridgewater, Vermont used to power an off-grid barn.

How much hydro power can I make at my site?

The power that can be generated is directly related to the "head" or height of the water in feet and the "flow" of the stream in gallons per minute (gpm). Typical "high-

make at my site? The approximate power generated can easily be calculated using the following equation:

Power (watts) = Head (feet) x Flow (gal/min) x 0.09 (turbine efficiency, pipe losses, etc.). or,

Summer Power => 185ft X 25gpm X 0.09 = 416Watts

Winter Power => 185ft X 125gpm X 0.09 = 1665Watts

Max Power => 185ft X 150gpm X 0.09 = 2497Watts

And remember, your system is always working! To put things in perspective, a 1Kw system will generate 24 Kilowatt-Hours (Kw-Hr) of electricity per day; enough to power the average New England Home.

How Much Does It Cost?

Costs can be broken down into 5 main areas:

A. Site Work: Burying pipe and/or wires and housing the turbine. This is very site dependent and can vary from \$5000-\$20,000. This is the big unknown.

SUPPORT THE VERMONT MICROHYDRO BILL!

Vermont Environmental Leadership

Thanks to the vision of Rep. Margaret Cheney of Norwich, the state of Vermont can be an environmental leader with H442, the "Microhydro Bill." Passage of a progressive, forward-thinking policy encouraging adoption of responsible microhydro technology will make Vermont the first state in the nation to gain the environmental and economic benefits from microhydro.

Why Microhydro?

Today's microhydro technology produces the lowest-cost, renewable,

environmentally-sustainable kilowatt-hours available! Microhydro is accessible technology, compatible with our philosophy of distributed, small-scale renewable sources and can help Vermont meet its renewable energy goals. There are literally thousands of sites in Vermont that could be using microhydro on farms, businesses, schools, town buildings and residences... today!

In The Past... and Today
Anyone wishing to "go microhydro" must face many regulatory hurdles with State and Federal agencies and navigate regulations with expensive

Cont. on page 17

WANT ENERGY INDEPENDENCE? HAVE WATER & HILLS?

Farms/Businesses/Schools/Towns/Homeowners...



LittleGreenHydro

Get MicroHydro!

www.littlegreenhydro.com
www.facebook.com/littlegreenhydro

FEDERAL

Investment Tax Credit

The federal investment tax credit (ITC) for solar, small wind, and fuel cells is 30% of expenditures and for geothermal systems, microturbines, and combined heat and power the ITC is 10% of expenditures. Some businesses may also be able to take accelerated depreciation.

www.dsireusa.org

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

EFFICIENCY VERMONT

Lighting (must be ENERGY STAR)

- CFLs - while supplies last, select ENERGY STAR qualified spiral CFLs are just 99 cents and specialty CFLs are \$3.99 at participating retailers
- LED’s – bulbs with special pricing/ coupons at register while supplies last at participating* retailers

Home Efficiency Improvements

- improvements eg air sealing, insulation and heating system upgrades - up to \$2,000 in incentives - using participating* contractors

Appliances (must be ENERGY STAR)

- Seasonal Dehumidifiers - \$25 mail-in rebate
- Clothes Washers - \$50 mail-in rebate
- Refrigerators - \$50 mail-in rebate
- Clothes Dryer –rebate for replace electric with natural gas (contact EV*)

Heating/Cooling

- heating & hot water systems –rebate for replace electric with natural gas (contact EV*)
- energy efficient central AC and furnace fan motor - \$100 mail-in rebate
- central wood pellet boilers (excluding outside wood systems) - \$1,000

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 (seasonal)
- 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*

Clean Energy Development Fund

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

Solar Incentives – based on rated capacity of system

<http://rerc-vt.org/incentives/index.htm>
<http://www.dsireusa.org/incentives>

- residential (including leasing)= \$0.45/ Watt up to 10 kW for PV; \$1.50/100Btu/ Day up to 200kBtu for ShW.
- commercial/industrial = \$0.40/Watt up to 10kW 25kW for PV. \$1.50/100Btu/day up to 250kBtu/day for ShW
- special customer* = \$1.50/Watt up to 10kW. \$3.00/100 Btu/day up to 1500 kBtu/day for ShW.

-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; \$0.55/100Btu/day for ShW. Capped at a cumulative \$350 per customer.
- commercial/industrial/special customer = \$0.10/W; \$0.50/100Btu/day up to a cumulative \$450 per customer

Wind Incentives

- residential = \$1.20/kWh for each kWh up to 10,000 kWh/yr**
- Limit 1 turbine up to 10kW; incentive capped at 30% of total installed cost; systems >10kW are ineligible for incentives
- For turbines less than or equal to 5kW in rated capacity, 100% incentive payment is made at time of installation. Greater than 5 kW, 60% is paid after installation, 40% paid after 1 year of operation if targeted annual production is achieved.
- **Incentive capped at 30% of installed cost

Micro-Hydro

- residential/commercial/industrial - \$1.75/3’gal/minute Capped at \$8750
- special = \$3.50/3’ gal/minute Capped at \$17500 or 50% of installed cost

***special customer category limited to municipalities, non-profit housing authorities, public schools*

All incentives are subject to availability and may change.

Visit www.erc-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, 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.

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 jack.ruderman@puc.nh.gov

Residential Solar PV Rebate Program

- \$0.75/watt capped at \$3,750 per system, whichever is less. Systems must be under 5kW. 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

Funding for this ARRA program has been spent, and additional funding is unlikely.

- 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.

NH Utility Energy Efficiency Incentives Residential Programs

For more information about the many incentives offered through the NH electric utilities,

www.nhsaves.com NH Home Performance with ENERGY STAR

Sponsored by all NH electric and natural gas utilities in partnership by the U.S. Dept. of Energy. Fuel-blind eligibility using the Home Heating Index (BTUs of heating fuel / conditioned square feet / heating degree days). Must provide at least 12 months of heating fuel history. Once qualified, eligible homes get a \$450 value comprehensive energy audit for \$100 (rebated if improvements installed), and 50% instant rebate for eligible weatherization improvements up to a \$4,000. Visit www.nhsaves.com/residential/retrofit.html for more information and an online Home Heating Index calculator

NH ENERGY STAR Homes

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

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

NH ENERGY STAR Appliances & Lighting

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

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

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

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

nhsaves Lighting and Efficiency Catalog

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

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

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

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 and Greenhouse Gas Emissions Reduction Fund (RGGL).

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.

- Residential Rebate: \$25/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 rebate = \$1100, MA State Tax Credit (use only once) = \$1000, Federal Tax Credit (30% system cost) = \$3000, Net Cost = \$4900

Visit www.masscec.com/index.cfm/page/Commonwealth-Solar-Hot-Water/cdid/1176/pid/11159#shwresources

MassSave Heat Loan SHW

Through this loan program customers may also borrow at 0% interest the costs for a SHW system

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: attic-

wall-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, offered by the Massachusetts Clean Energy Center (Mass-CEC), provides rebates for the installation of grid-tied photovoltaic (PV) systems at residential, commercial, industrial, institutional and public facilities.* Commonwealth Solar II rebates are available to electricity customers served by the following Massachusetts investor-owned electric utilities: Fitchburg Gas and Electric Light (Unitil), National Grid, NSTAR Electric and Western Massachusetts Electric. In addition, customers of certain municipal lighting plant (MLP) utilities are now eligible including Ashburnham, Holden, Holyoke, Russell, and Templeton. Commercial projects are eligible for rebates for PV projects less than or equal to 15 kilowatts (kW) in capacity and the rebate will be based on the first 5 kW only. Funding is released in "blocks" every quarter. All rebate applications must be approved BEFORE the project installation begins.

Rebate amounts are based on the total PV system size per building, regardless of the number of electric meters in use and certain other characteristics of the project. The proposed Commonwealth Solar II rebate levels for residential and commercial PV systems are:

- Base incentive: \$0.40/watt
- Adder for Massachusetts company components: \$0.05/watt
- Adder for moderate home value: \$0.40/watt (applicable to resid. projects only), or
- Adder for moderate income: \$0.40/watt (applicable to residential projects only)
- Natural Disaster Relief Adder, only for projects completed in the Springfield area impacted by June 1, 2011 tornado: \$1.00/watt

The rebate is available to the system owner, which may or may not be the host customer. In the case where the system owner is a third-party owner serving a residential host customer, the project is treated as a commercial project (and eligible for the commercial rebate amounts only). 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 tracking must be utilized in order to qualify to sell SRECs. MassCEC reserves the right to conduct post-installation inspections of PV projects prior to approval for payments.

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 solar hw or pv systems.

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

BIOREFINERY ASSISTANCE PROGRAM – TECHNOLOGY

To be eligible for the program, a technology must be adopted in a viable commercial-scale operation or demonstrated to have technical and economic potential for commercial application in a biorefinery that produces an advanced biofuel.

Advanced biofuels are fuels derived from renewable biomass, other than corn kernel starch, and include:

- Biofuel derived from cellulose, hemicellulose, or lignin
- Biofuel derived from sugar and starch (other than ethanol derived from corn kernel starch)
- Biofuel derived from waste material, including crop residue, other vegetative waste material, animal waste, food waste, and yard waste
- Diesel-equivalent fuel derived from renewable biomass, including vegetable oil and animal fat
- Biogas (including landfill gas and sewage waste treatment gas) produced through the conversion of organic matter from renewable biomass
- Other fuel derived from cellulosic biomass

Eligibility

Eligibility for the Biorefinery Assistance Program is broken into three parts; projects, lenders, and borrowers. All three areas must be met to be considered eligible for the program.

The project must be located in the United States, Commonwealth of Puerto Rico, Virgin Islands of the United States, Guam, American Samoa, Commonwealth

of the Northern Mariana Islands, Republic of Palau, the Federated States of Micronesia, or Republic of the Marshall Islands. The project must meet the following criteria:

- The project must be for the development and construction of commercial-scale biorefineries using eligible technology or retrofitting of existing facilities with eligible technology.
- The project must use an eligible feedstock for the production of advanced biofuels and biobased products. Examples of eligible feedstocks include, but are not limited to, renewable biomass, biosolids, treated sewage sludge, and byproducts of the pulp and paper industry.
- The majority of the biorefinery production must be an advanced biofuel. A project that creates an advanced biofuel that is converted to another form of energy for sale will still be considered an advanced biofuel.
- The project must provide funds of not less than 20 percent of eligible project costs.
- Refinancing, under certain circumstances, may be eligible.

All projects require an independent feasibility study and technical assessment as part of the application.

A wide variety of lenders and borrowers are eligible, for specifics or other additional program information, please refer to 7 CFR 4279, Subpart C. Information can be found at www.rurdev.usda.gov/BCP_Biorefinery.html.

MICROHYDRO BILL

Cont. from page 15

consultants, lawyers and engineers. As a result, farms, businesses, towns and citizens have been prevented from installing microhydro systems.

Why?

Everyone understands that dams and river alterations are big civil projects that require oversight because the impacts to water, fish and people can be huge. Hydro regulation by state and federal agencies was developed over many years for just this reason. Fifty years ago, no one thought about renewable energy and very few people considered the idea of energy independence when a kilowatt-hour cost only a fraction of a cent. There was no economic or environmental need for microhydro in those days!

Today, renewables and the high cost of energy are real and become more urgent each day and microhydro is a modern technology that meets today's environmental and economic needs. But the very same regulation that was (and is) desirable for impactful, large-scale, conventional-technology

hydroelectric power plants of the last century prevents the adoption of advanced environmentally-sustainable microhydro today. We can do better!

There is Hope!

With passage of H442, it is possible that the regulatory impediments to microhydro will finally be lifted to allow anyone in Vermont to install a microhydro system. Of course, this applies to systems that adhere to known, achievable environmental impact guidelines developed using "best environmental practices"... such as no impoundments (dams) or stream alterations (bulldozers). Call/write your State Rep today to urge them to support H442!



PASSIONATE ABOUT STONE AND HEATING EFFICIENCY!

By Christa Davis

The best technologies endure. Northern Europeans have been heating their homes with heat-storing fireplaces for hundreds of years. Unlike the open fireplaces that adorn many American homes, the masonry heaters designed in Scandinavia are efficient, less polluting, and are a good fit with our increasing goal of using renewable energy sources which will not

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Christa Davis' Piermont, NH Masonry Heater was built by Roywood Heaters.

harm our home planet.

After spending time in Europe, Mark Twain wrote that it is shame that useful technology developed in one country was not adopted by residents of other countries. He would be glad to see that some people in this country are beginning to implement the extremely simple but efficient and safe masonry heater to bring comfort to their homes. Good reports are increasing from local residents who have had the foresight to install a masonry heater. Christa Davis of Piermont, NH has written the following about her new heater:

"The winter of 2012-2013 was a landmark in my family's 32 year history of living in Piermont, NH. It was our first year using a Masonry Heater installed by Roywood Masonry Heaters, LLC with local masons, Royce Thompson, and a true artisan, Woody Price.

"For someone who is as passionate about stone as I am, just its beauty alone in the center of our home was worth building it. Each stone was gathered by hand from surrounding areas or brought in by friends to share in the adventure. The

fact the dinners cooked in the bake oven taste wonderful and the heater warms our home safely with minimal fuss, is a wonderful bonus. We have heated with wood since 1981, using an airtight stove burning 6 plus cords of wood each year. The new heater will have gone through just over 4 cords by winter's end, keeping the temperature even with just one burn per day and requiring a second burn only on the coldest winter days. The savings in our natural resources, having no reason for concerns over chimney fires, and the even radiant heat that warms us are all positives. Nothing can beat sitting on the heated bench with a good book, dogs at my feet and a cup of cocoa as a storm howls outside.

"We aren't done yet. This summer Woody and Royce will be adding a wood cook stove to the left of the heated bench. We will enjoy the gorgeous self-contained system that



Christa Davis' Piermont, NH Masonry Heater was built by Roywood Heaters.

meets our heating and cooking needs. We look forward to years of enjoying our 'Green' project.' ♡

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A New Passive House in Moretown, Vermont

By Ward Smyth

In August of 2011 I received a call from Elga Gemst, a retired architect, about building a low-energy-use modular home on her property in Moretown, Vermont. She knew that Turtle Creek Builders (TCB)

was an Energy Star builder and associated with Preferred Building Systems (PBS), a modular builder in Claremont, New Hampshire. We met at her beautifully renovated

Energy Star home in Moretown and discussed her needs for an energy-efficient home for a special-needs family member.

Our project was delayed Tropical Storm Irene, which did considerable damage to Elga and her husband, geologist David Westerman's primary home. Finally, in late winter of 2012, we met with Chet Pasho at PBS and reviewed Elga's plans. We also met with Peter Schneider from Efficiency Vermont and toured a new Habitat for Humanity certified Passive House in Charlotte, Vermont.

Partnering with Peter and the Efficiency Vermont staff involved discussion for a design theme about the construction of an Energy Star-rated home. We decided to upgrade the standards to qualify as a certified Passive House (PH). The initial design was a two-story rectangular gable-roofed house with the first floor set down into the hillside, with walk-in entries to the upper level on the north and to the on the lower level.

By early spring we had determined this design could well meet the 4.75 kBtu/s.f./

year requirements to achieve PH certification, but it nevertheless went through a series of changes. Peter set design criteria of R-50 under slab/edge, and foundation, R-60 for the house walls, and R-90 for the upper ceiling-truss space.



Ready to insulate under slab.

Specifications were changed to reduce the use of petroleum-based foam products. Sheathing is 1/2-inch CDX plywood on the exterior filled with blown cellulose. To increase internal mass in the house, 5/8" dry-wall was used throughout.

The windows were triple-glazed high-efficiency windows.

During the upper level design, Peter, Ken Levenson from 475 High Performance Building Supply and Chet Pasho from PBS and

I explored the idea of a "vapor-open" cellulose double-framed wall system. This would replace the plywood sheathing for the exterior wall with an "intelligent fabric," allowing freedom of seasonal moisture movement out of the wall cavity. I hope our "next" house will be able to incorporate this more advanced technology.

Turtle Creek Builders and Peter, aided by thermal-bridge

modeling done by Chris West from Eco-Houses of VT, attacked the lower level, in-ground portion of the house. Turtle Creek Builders' experience with ICF foundation materials through Joel Baker from VT-ICF set the stage to work with the manufacturer, Amvic in Canada, to design a continuously insulated lower level slab-on-grade with ICF walls. To meet the PHPP requirements, it was decided

to frame a cellulose-insulated interior stud wall cavity placed 10" to the interior of the R-22 ICF forms.

The full height of all four foundation walls was formed of concrete for airtightness. This also gave us a complete, well-leveled and air-sealable plate to receive the modular upper level. Turtle Creek fabricated the 10-inch-thick EPS footing forms on-site; installing them over a bed of crushed stone, rough plumbing, radon mitigation piping, finally casting an integral dyed-concrete footing/slab.

In August the two modular boxes from Preferred Building Systems were delivered, set, and roofed. The lower-level interior walls and exterior windows, rough plumbing and electrical from the floor above were then completed down to the slab. We installed our solar HWH system and 7.9 kW grid-tied solar PV system.

A small air-to-air Mitsubishi mini-split heat pump was installed in the lower level and all of the ducting and mechanical units for our Zehender air-exchange system along with 300' of groundwater piping connected to a water to air exchanger to temper the incoming side air. One small experiment that we did in this house was to wrap the 300' of piping tightly around the septic tank to see if it's possible to pick up an additional degree or two of ground heat. We all know where the snow melts first in spring!

In the final stages, this winter, we installed an eMonitor data information system and finished balancing the air-exchange system. The house was occupied this winter, with reports that the house is actually achieving its original design loads. It is also very notable what the house does not have: no frost walls nor footings below the foundation, no furnace, no boiler, no externally vented appliances, and no fuel tanks and lines, or importantly: no deliveries!



Foundation wall

The air quality, quietness and thermal comfort of this house is remarkable. The final "nail-biter" to achieve the



Lowering 1st modular section in place

Passive House standard was to pass the final blower-door test of no more than 0.6 ACH/50 pascals of pressure. I'm very relieved to report we did.

Ward Smyth began his building career at the age of fourteen in Connecticut building playrooms for neighbors, using just a little red wagon filled with tools. Since then, he has stayed with his trade. He has served on the board of Northeast Sustainable Energy Association (NESEA) and has been deeply involved with a number of other organizations. He has received a number of awards and accreditation.

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REAL PICKLES IS GOING COOP!

By George Harvey

A solar-powered, organic, probiotic, local co-op? How do you do that?

If you want to know the answer to that question, find out from Real Pickles of Greenfield, Massachusetts.

In case you are wondering, they make real pickles. I want to make sure everybody understands this. These are real pickles, with far more nutrition, in many important ways, than the vegetables they were made from, a gift of probiotics. This is in contrast to big name pickles, in which the nutritional value is cut to practically nothing by processing for the sake of shelf life and marketing considerations. Add to that the fact that the Real Pickles products are organic, add to that the fact that they

are delicious, add to that the fact that they are local to New England, and you can see we are talking about food treasures. Nevertheless, while we could do a story on just the products -- and it would take a page to do it justice -- that is just the beginning of the story.

Following good ecological principles, Real Pickles owners started out by deciding to reuse an old building, rather than to build a new one. An important part of the financing came from the Franklin County (MA) Community Development Corporation and from Equity Trust.

To help make the building efficient, they made use of a USDA REAP grant of \$15,000. Now, it has R-40 insulation in the ceilings, and a host of improvements ranging from high efficiency lights to motion sensors and air circulation systems intended to reduce the environmental footprint.

To make this even better, they decided on going solar. The company shares its building with another socially-responsible



organization, a worker-owned cooperative specializing in solar installations called Pioneer Valley Photovoltaics. And with help from their neighbor, Real Pickles has installed a 17.6 KW photovoltaic system that produces just a bit more power than

Cont. on page 24

SOLAR INSTALLATION FOR MA MANUFACTURER LAUNCHES NEW LOCAL ENERGY PARTNERSHIP

Attleboro, MA A new solar installation at an Attleboro, MA business has helped launch a new partnership making the innovative AllSun Tracker solar electric system available to homeowners and businesses throughout southeastern Massachusetts and southern New England.

Through the dealer-partnership between Attleboro's US SolarWorks and Vermont solar tracker manufacturer AllEarth Renewables, the first AllSun Trackers installation by US SolarWorks is

fully operational at the Bruce Diamond Company, also in Attleboro.

The solar electricity produced by the 36kW installation is being used to offset electric demand used in their manufacturing processes on site. A row of six pole-mounted AllSun Tracker units, at 6kW each, were installed in this first phase of construction.

The Bruce Diamond Company is a

Cont. on page 24

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Entrepreneurial Mother Self-Starts 'Zooble'

By N. R. Mallery

Zooble Toys is a great example of a locally manufactured small business that an entrepreneurial mother of two has been able to accomplish with her own creativity and drive. Based in West Newbury, Vermont, Zooble is a family owned business operated by Jessica Dodge. Jessica is known in the area as a creator of beautiful things, murals, toys, hand bags. Formerly her hand bags were presented at the 2010 Oscar Alive "green-room".

After the birth of her second child, she began with creating toys for her own children which led to her newest thriving business.

Her creativity for non-conventional toys that are often difficult to find in stores drew attention from other mothers in the area. They began

noticing the toys Jessica had made for her children, while at the park and other social events. After many inquiries about her toys, she started producing them and opened a store-front on "Etsy". After a short amount of time, a steady stream of customers stimulated expansion into the more unique toys. Three years of growth and toys now reach places much beyond local -- such as,



Photo by Young's Photography

Japan, England and in particular, Australia.

The toys are unique, in that they all handmade. Natural and non-toxic materials are used, such as wood, wool, cotton and environmentally friendly felt. The products range from small felted wooden dolls to intricate felt castle play sets. According to owner Jessica Dodge, the price of the toys are intentionally set low, so every

child has the opportunity to play with them.

Zooble has been featured in the Huffington Post and the Disney Baby website as well as being featured on a WCAX, Made in Vermont segment.

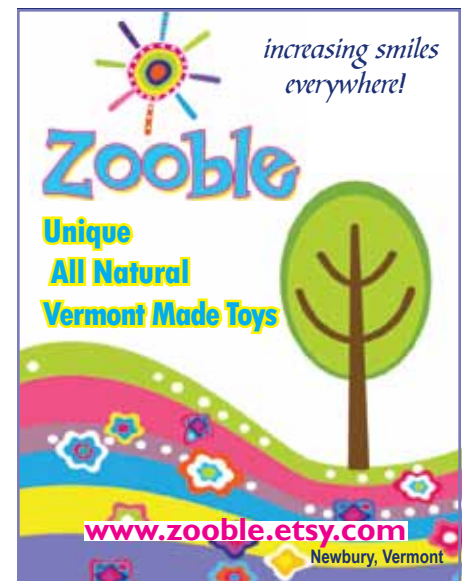
Jessica is a "featured designer" for Kunin Felt and assisted in the design and production of products for their highly anticipated 2013 trade show.

At Zooble Toys, the goal is to produce simple, handmade toys, that spark the imaginations of children. Zooble

Toys are bright, fun and unique toys for children.

As Jessica confirms, "Not only are we making toys to brighten the imagination, we are using materials that are helping

to keep our planet bright and beautiful for generations to come." You can find her creations at www.zooble.etsy.com.



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ALLSUN TRACKERS: NATIONALLY SOLD, LOCALLY MANUFACTURED

Just a couple miles from where they were manufactured, 382 pole-mounted dual-axis trackers stand at attention every sunrise at the 2.1MW South Burlington Solar Farm.

This project represents the largest distributed tracker farm in North America, but for the local manufacturer just down the road, AllEarth Renewables of Williston, the project represents much more.

"We are committed to manufacturing locally, which means we are going to source whenever possible from Vermont and from the United States when we can't find it here. That's part of producing a sustainable product and, ultimately, will help drive down costs," said David Blittersdorf, CEO and President of AllEarth Renewables.

Designed and manufactured in Williston, VT, AllSun Trackers use innovative GPS and wireless technology to follow the sun throughout the day to boost solar energy production by up to 45% over roof-top installations. The ground-mounted solar systems are designed for homes, businesses, non-profits, and commercial-scale installations.

More solar systems have been installed in Vermont using the AllSun Tracker than any other solar technology.

AllEarth Renewables sources materials for their product from local companies such as Grennon's Solderworks, NSA Industries, and Image-Tek. They have also established a dealer installer program for new solar markets locally and nationally. They manufacture the complete systems so it can be shipped next-day to solar dealers on a single pallet.

"We have a strong track record of manufacturing a high-performing innovative product and we're now aligning ourselves with smart solar installers that understand the value of solar tracking technology," said Blittersdorf, who was listed among 25 of "America's Most Promising Social Entrepreneurs of 2011" by Business Week.

The AllSun Tracker was awarded a Top-10 Green Products of the Year Award (2012) from BuildingGreen magazine.



AllSun Trackers are designed and manufactured in Williston, VT



DISCOVER LOCAL CHOCOLATE LIKE NO OTHER Liberty Chocolates!

Liberty Chocolates began two years ago in Katrina's home kitchen in Woodbury. It has grown quickly over the years and is now in over 125 locations throughout New England. Last summer, the manufacturing moved to the Vermont Fiddleheads building in Worcester, and now employs several Vermont residents, and continues to grow daily!

Katrina is dedicated to creating a progressive, and conscious business model by supporting local businesses and believes in giving back to our communities to enable us to be a part of a giving economy. For example, she has produced an Orchard Valley Waldorf Bar (strawberry flavored) to raise funds for the school's "accessible to all" program, and a Moon Time Chocolate Bar (cherry pomegranate) to raise funds for the documentary, "Things We Don't Talk About: Narratives of the Red Tent Movement," as well as a Sisterhood Bar (vanilla rose) for the non-profit organization Circle of Women International.

What makes this chocolate brand so special? Raw Local Honey... from Northwoods Apiaries out of Westfield, Vermont. Liberty Chocolate's owner, Katrina Coravos, chose to break the bounds of traditional chocolate manufacturing and developed a way to



use honey in her bars, resulting in pure decadence and a melt-in-your mouth unique chocolate eating experience loaded with goodness from the bees.

Liberty Chocolates gets their cacao beans from a small village in Peru, and even the chocolate processing is all done by hand using traditional techniques. The love, handwork, and attention of this chocolate bar from bean to the final bar is felt and tasted. Next time you come across the Liberty Chocolate brand, indulge your senses and experience the richness of cacao beans with honey.

BLOWER DOOR 101

Seal tight and ventilate right!

by Andy Duncan

Is it a new holiday decoration? An elaborate cat door? An expensive exhaust fan? No it's a blower door!

A blower door is an essential tool for residential-energy professionals. Blower doors make something that is very difficult to perceive – building air leakage – much

A blower door kit consists of several components: an adjustable frame that fits into an outside doorway, a nylon cover fitted around this frame, and a large fan that exhausts air to outside. With this all in place, the whole assembly is about as airtight as an actual exterior door. The fan speed is adjusted to create a -50 pascal pressure difference between inside and outside, or equivalent to about a 25 mph wind blowing around the house. This is enough pressure difference to find the air leaks, and to quantify the amount of air leakage. Blower door test results are reported in "CFM50" units: cubic feet of air flow per minute at a 50 pascal pressure difference.

After measuring the CFM50 air-leakage rate, energy auditors and their clients go around the inside of a building at the pressure boundary and feel for air leaks. An experienced professional will know where to look, but it is amazing how blower doors uncover air leaks in unexpected places – around bathtub enclosures, through a chimney chase, cracks in stairway steps, kitchen ceiling

"can" lights, unsealed edges of drywall, etc. Blower doors can also help answer ques-

tion such as: Can the attached garage be leaking "nasties" such as carbon monoxide into the house? Does it make sense to air-seal the crawl space walls or ceiling? And why is it nose-bleed-dry in my house in the winter?

A key component is the manometer – a highly sensitive differential pressure meter – that not only measures the CFM50 flow rate, but also the -50 pascal pressure difference between inside and outside. With the manometer's CFM50 results and the volume of a house, technicians can determine how much fresh air mechanical ventilation to install, such as bathroom



Photos: Lakes Region Community College.



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more tangible and quantifiable. If you have never checked a building's envelope (the basic "box" of the building) with a blower door running, you may have never had that A Ha moment: "So this is where air leaks are coming from!" Those air leaks may be responsible for 15 – 40% of winter heat loss in homes in this region.

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REAL PICKLES IS GOING COOP

Cont. from page 20

the company needs for business.

There has been an intentional effort to do business with local suppliers and manufacturers who are environmentally responsible. The refrigeration system they use was built by Freeaire Refrigeration, of Waitsfield, Vermont, and the decision to go with a Freeaire was because of both of these issues. Similarly, they buy their vegetables from local organic farms. They consider support for local agriculture an important part of their business.

Real Pickles' products are fermented vegetables of all kinds. Several kinds of cucumber pickles are just a start. Sauerkraut, red cabbage, beets, kimchi, the drink called kvass, and a tomatillo hot sauce round out the line. These are sold at local grocery stores, natural food stores, coops, and other stores throughout the Northeast. Their website provides a list of

retailers at <http://www.realpickles.com/stores.html>.

And now we have the news. After more than a dozen years of successful business, Real Pickles is being turned into a worker-owned Coop. There are several different reasons they have for doing this. Apart from the obvious advantage of employee ownership, this means that Real Pickles is protected in a manner that is socially responsible from being absorbed into a larger business that may have a different approach to the environment and the community.

I want to add my own review of their products. Years ago, I bought a jar of Real Pickles' dills at the Brattleboro Coop. After eating them, I did something I rarely do, which was to call the manufacturer to say I loved their product. I have been a walking advertisement for Real Pickles ever since.



SOLAR INSTALLATION FOR MA MANUFACTURER LAUNCHES NEW LOCAL ENERGY PARTNERSHIP

Cont. from page 20

manufacturer of high-quality industrial diamond tools. The local manufacturer, which has been in business since 1952, also offers custom manufacturing of machined components, assemblies, medical devices, injection molds and other industrial metalwork.

A family owned and operated business, which has manufactured over 50 million industrial diamond tools, serves industries including aerospace, automotive, bearing, semi-conductor, engraving, electronics, fiber optics – as well as research facilities and universities. A high-performing, industry-leading solar technology was the perfect fit for the cutting-edge business.

More solar power is planned for the site throughout the next couple of years.

"We believe in using solar power, and the return on investment is good. It's a long term investment for our company," said Bruce Diamond business owner Steve Puleston.

With offices and warehouses in Massachusetts, US SolarWorks is an engineering-based company, focused on designing and installing high performance solar PV and solar thermal systems. With NABCEP certified personnel and licensed engineering teams, they have served the region for nearly a decade. As factory authorized installers for some of the best names in solar, US SolarWorks has the ability to build solar arrays from a few kilowatts to multiple megawatts, and capture higher solar yields than average systems. US SolarWorks has experience in residential, commercial, and municipal solar installations.

Designed and manufactured in Williston, VT, AllSun Trackers use innovative GPS and wireless technology to follow the sun throughout the day to boost solar energy production by up to 45% over roof-top installations. The ground-mounted solar systems are designed for homes, businesses, non-profits, and commercial-scale installations.

A single 6 kW solar tracker will produce enough to power the majority energy demand of an average New England home.

"We are committed to meeting our growing customers' needs and the AllSun Tracker is an excellent addition to our



Six AllSun Trackers being installed as part of a 36kW project at the Bruce Diamond Company in Attleboro, MA by local installer, US SolarWorks

installation options. More and more people are excited about creating their own source of energy and with the AllSun Tracker they can optimize their production and get a better return on investment," said Pete Fine, president of US SolarWorks.

"We are excited to be partnering with the team at US SolarWorks and to be able to provide our product to southern New England. Designed to produce more energy from the sun, our trackers make solar practical and affordable for homeowners and businesses," said David Blittersdorf, president and CEO of AllEarth Renewables. "We are particularly pleased to have a cutting-edge, family owned business like the Bruce Diamond Company as a customer of our trackers."

AllEarth Renewables, a 2012 Inc 500 company for fastest growing businesses, has designed, manufactured, and installed over 1,400 complete grid-connected solar tracker systems. Their CEO was listed among 25 of "America's Most Promising Social Entrepreneurs of 2011" by 'Business Week'.

Terry Barber's Home in Brookfield

Cont. from page 14

water heat pump takes ground water from a single drilled well, extracts about nine degrees from this water, and uses compressed refrigerant to boost water temp to either 125 or 150° F, depending on need. My system heats to 125° and supplies preheated water to my 119-gallon domestic electric water heater, and my solar hot water tank, used to supply the hot water to both the hydronic and high efficiency, double pass, baseboard heat on the second floor.

My house is a tall-posted modified cape with approximately 1,360 square feet of living space. It has one and a half baths, two bedrooms, a mudroom entry, and an open concept including kitchen, dining, and living space. There are also three closets, and a utility room.

We kept the heating zones to a minimum. Zone 1 is the ground floor, and zone 2 is the second floor. I set the ground floor thermostat at 70°, and the second floor at 66°. During the heating season the temps rarely fluctuate more than one degree, with solar gain causing the exceptions. When the sun shines first floor temperatures rise to 74 or 75°, and upstairs may hit the 70's by late afternoon. The warmest indoor temperature recorded this past summer was 78°, and that without window shades.

Efficiency Vermont has given this house a Five Star Plus energy rating, with an HERS score of 49. The infiltration rate when blower door tested was 265 CFM50. The house uses a balanced heat recovery ventilator for a continuous supply of fresh air. The estimated annual energy cost is \$2,127. My average heating season electric use has been 831KWh per month, not bad considering all the house's appliances are electric. The permanent lighting fixtures in the house are either LED or CFL.

My overall experience having this house built has been quite positive. My builders, Timo Bradley, Josh Jackson, David Hooke, and Sean Dalton are a great team of craftsmen, who are not only creative, but also love the work that they do. This group of artisan builders, and their crew, created not only a very energy-efficient home, but also one filled with custom details. The results of all this hard work are nothing short of beautiful! I cannot say enough great things about the crew at TimberHomes LLC. From the very beginning of my project TimberHomes LLC understood my need for a safe, healthy, energy-efficient home, and that is what I have.

When I first sat down and created my house wish-list I had included solar hot water, and a five- or six- KW photo-



10inch EPS with strapping and local 1x sheathing



Cherry&Ash cabinets with cherry&walnut tops



Client with site found Ash fork

voltaic system. In order to stay within my housing budget I was forced to cut costs, consequently I chose to eliminate both the solar hot water and photovoltaic, with the intent to add them at some future date. Creating a net-zero living space is my goal, and there is no better time than the present to continue pursuing this goal.

Editor's note: The T&G (tongue and groove) system used in this house by Timberhomes LLC, is especially intended for those with MCS. Special construction techniques were also used for the same purpose. Architectural services were provided by Joan Heaton Architects of Bristol.

BECOME A PART OF A GENERATIVE SOCIETY

Book Review by Dana Rubin

OWNING OUR FUTURE

by Marjorie Kelly, 247 pages, Berrett-Koehler Publishers, Inc., \$19.95

Marjorie Kelly, a fellow at Tellus Institute, a Boston-based think tank and co-founder of Business Ethics magazine, lays out our economic clumsiness at the top of her new book, "Owning Our Future." Our current financial upheaval is a result of the industrial age and the capital market. Yes, we have heard this story before; capitalism is a tyrant but thankfully and refreshingly, Kelly puts blame where blame deserves to be placed, the structure. "We're all tangled up in our system's ownership designs. ...The economy as we once knew it will never return...nor should it..." Over the course of her book, Kelly highlights working examples of alternative economies that should be replicated.

New economic innovation is about "... creating economic architectures that are self-organized, serving the needs of life." There are two types of ownership: generative and extractive. Simply, generative production creates outcomes, which are beneficial and are in congruence with Earth's natural systems, versus extractive production, which is purely a profit-driven economy. We are currently manufacturing financial wealth with an extractive design.

Kelly argues that we can minimize our financial risks by holding our cards a



First, "...rein in corporate abuse...reform corporate governance ... [and] develop generative alternatives."

How do we do this? How do we aim for a more generative, less profit-driven economy? Kelly's first suggestion is the expansion of community banking. The 2008 housing crisis "morphed into an international banking crisis" because large, privately owned banks, were tossing out loans to five-year olds. The banks that didn't flounder were member-owned, community-oriented organizations.

Jean-Louis Bancel, president of the International Co-operative Banking Association, says cooperative banks show great resiliency. "...[The] cooperative bank aims to serve its community rather than prey upon it." Kelly's own bank, Beverly Cooperative, is a balanced feedback loop, acting as a generative lender.

Kelly blames Wall Street; the big

bit closer. And in the words of economists Herman Daly, we need to focus on the long-term welfare of humans and the planet. Kelly announces, let's start an ownership revolution!

banks are willing to "repackage loans for further sale." Wall Street has become smug, playing with invisible funds in an incredibly vulnerable market. Easy street is profit-driven and is currently skating on thin moral ice.

We have to improve our banking system, but according to Kelly, Generative Ownership Design requires a few more core elements. Companies should be just as alive as our imaginations. "How do companies come alive in a human social sense?" The mortgage crisis occurred because the system is stale, the system isn't alive, and it's simply an A-to-B process. If we have architects to design buildings with character why can't we have architects to design our businesses?

Companies improve via their members. Employers cannot look in the eyes of their employees and tell them they have only five vacation days off for the entirety of a year, and only after they've worked there for six months. We deserve more. When companies are employee-owned, the staff has a "formal voice, a right to the profits and most of all, they are happier....When people who do the work of a company are in control of their own fate, they're more likely to be treated fairly, and as a consequence, to feel alive when they go there."

Be a part of a generative society -- read "Owning Our Future." ♡

BLOWER DOOR 101

Cont. from page 22

fans or heat recovery ventilators (HRVs). Throw out the old adage "a house needs to breathe," and replace it with "seal tight and ventilate right!"

Most insulation by itself does not seal air leaks, so even a well-insulated house can have air leakage problems. Energy performance contractors should also own and use blower doors to help them find and seal air leaks. And contractors use blower doors to gauge the effectiveness of their air sealing work. An insulation contractor without a blower door is like a carpenter without a measuring tape.

All homes should get blower-door-tested -- new homes, old homes, and middle-age homes. However, some homes pose safety risks for blower door testing, such as those with exposed asbestos insulation. So blower door operators should know what they are doing. Look for BPI-certified Building Analysts or HERS-certified Energy Raters who have the expertise to use a blower door correctly. The money spent hiring a qualified blower-door-equipped energy professional yields multiple benefits from energy savings, home comfort, environmental protection, and having that Aha! moment.

Andy Duncan is the energy trainings manager at Lakes Region Community College, and the board president of New Hampshire's Residential Energy Performance Association. ♡

Vermont gluten free cookie company raises capital locally to expand business and create jobs

Vermont's alternative financing options seal the deal for economic and food industry growth for Mad River Valley's Liz Lovely Cookies

Montpelier VT - The VSJF Flexible Capital Fund L3C (The Flex Fund) recently announced specialty food producers, Liz Lovely, Inc., as the fifth investment in an expanding, mission based royalty financing portfolio committed to growing Vermont food system, forest product, and renewable energy companies by providing "equity-like" loans that are repaid through revenue sharing.

Gluten free, vegan, non-GMO Liz Lovely cookies are handcrafted in Waitsfield and distributed nationwide. Liz Lovely was at capacity in their space at Irasville Business Park in Waitsfield and an estimated \$200,000 in capital was needed to grow and expand the company.

Last fall, Liz Lovely owners, Liz and Dan Holtz, competed on national TV's Shark Tank, where entrepreneurs pitch their business to multi-million dollar investors. "Our Shark Tank appearance and related publicity inspired interest from a deluge of out-of-state investors, but it would have been the wrong fit. They were solely seeking an unreasonably high financial return. They were not interested in sustainability, in Vermont, or in creating jobs in the Mad River Valley. But the Flex Fund was on our wavelength in terms of mission." Dan remarks. "The Flex Fund does not take equity and we know exactly what our pay back is going to be. We can grow the business in the way we want, without giving up control or compromising our ethics."

Alternative financing packages unique

to Vermont are on the rise and encompass a variety of funding options. Liz Lovely's working capital to hire a sales force, cover marketing expenditures, and increase inventory came from The Flex Fund. Northfield Savings Bank was able to refinance the business and offer additional capital for equipment. The State of Vermont provided an employee training grant and the business park landlord agreed to lease the additional space.

Janice St. Onge, president of the Flex Fund explains, "Our royalty financing program preserves owner's equity and decision-making abilities, which was a good fit for Liz Lovely - whose mission is 'real food, good jobs, and environmentally sustainable business practices'. It also fit with our mission. Liz Lovely has a strong consumer following, passionate entrepreneurial owners, and a track record in growing good paying jobs. Additionally, through their continued support and mentorship of other emerging value-added agricultural businesses at the Mad River Food Hub, Liz Lovely is helping to advance the Flex Fund's food system goal of conserving and protecting agriculturally productive land in Vermont and the region." The financing package was complete February, 2012.

"Liz Lovely has been a customer of the food hub since we opened, with over-flow cold storage as needed and distribution services to Burlington and Montpelier. The Mad River Food Hub's 'very local

distribution' delivers cookies locally to Healthy Living, Hunger Mountain Coop, and other local natural food stores," reflects Robin Morris, director of the Mad River Food Hub. "Liz Lovely is the second company working with the Mad River Food Hub. The first, Farmers to You, distributes Joe's Soup, to families and customers in the greater Boston area. Joe's Vegetable and Meat Soups are produced at the Mad River Food Hub."

Farmers to You is also a recipient of financial capital through the Flex Fund as are Vermont Smoke and Cure in Hinesburg and Aegis Wind in Waitsfield.

Liz Lovely currently employs 16 full time, salaried, full-benefits employees. Growth plans include launching a new, single serve gluten free cookie line for the purpose of selling to institutions such as hospitals and ski resorts. Many of the ingredients used in Liz Lovely's bakery are not currently part of Vermont's agricultural landscape (except maple syrup, which they buy exclusively in Vermont). However, Liz Lovely is committed to working to facilitate demand and/or access to the nascent market of wheat and rice production in Vermont and the region. They are looking to source unbleached wheat flour this year from Vermont producers. Learn more at <http://lizlovely.com>.

The VSJF Flexible Capital Fund, L3C is a mission-based investment fund that provides "equity-like" financing in the form of royalty loans and subordinated debt to



targeted Vermont growth companies in value-added agriculture, forest products, renewable energy, and waste management. Flex Fund investments are combined with business assistance to ensure borrowers have the support they need to stay and grow in Vermont. As a Vermont Licensed Lender, the Flex Fund is the first business lending program in Vermont focused on providing royalty financing for growth stage businesses—and one of only two such programs of its scale in New England. With royalty financing, instead of taking a piece of ownership in the company, a lender provides debt that the company repays by sharing a piece of their gross revenue over a fixed period of time. The Flex Fund's innovative royalty/revenue-based financing allows for income and upside to investors while preserving ownership and mission with founding entrepreneurs. Learn more at www.vsjf.org/what-we-do/flexible-capital-fund. ♡

NEW ENERGY INNOVATION CENTER IN RUTLAND

SCHEDULED FOR OCTOBER, 2013 OPENING

As plans continue for Rutland, Vt to become the Solar Capital City, work on Green Mountain Power's Energy Innovation Center kicked off with an original "groundbreaking," as local and company officials and guests signed a 2x12' board that was immediately incorporated into the framing.

"Like this groundbreaking, this building will be unlike anything in Vermont, an engaging, inviting space that will serve as a working example for customers and all Vermonters of clean, renewable energy, and the birthplace of new ideas on generation, efficiency and customer choices," GMP President and CEO Mary Powell said. "We want this building to serve as a Vermont model of efficiency, sustainability and forward thinking on energy, both electrical and thermal, that will drive long-term social and economic prosperity."

The interior design includes extensive natural lighting through new windows, skylights and light tubes to reduce electrical consumption. There will be an energy-efficient revolving door, rubber flooring intended to dampen sound and mimic flowing water, and exposed mechanical and electrical systems, including bright blue "heat socks" that will frame the preserved, historic metal ceiling.

High-efficiency air-source heat pumps will provide space heating and domestic hot water. Air-source heat pumps are up to 350% efficient, meaning they can

produce 3.5 units of heat for every unit of energy consumed. A typical oil burner is only about 80 to 85% efficient.

"The building will be extremely efficient, and inexpensive to operate," Costello said. "We hope to create new thinking about efficiency, renewable energy and low-cost heating, and demonstrate how customers across Vermont can reduce their carbon footprints and save money."

The building will have a 14-kilowatt solar array on the roof, two car-charging stations, and a small furnace that will run on 100% biodiesel. The building, expected to receive Leadership in Energy and Environmental Design (LEED) certification from the U.S. Green Building Council, is scheduled to open in October.

The building will feature an open workspace, a glass-walled classroom/conference space, and an exhibit area in front.

"The design is inspirational, and GMP's presence downtown is already prompt-




ing other businesses to make their homes here," said Mayor Chris Louras, referring to Small Dog Electronics and

Same Sun Choice, which are scheduled to open this spring. "Based on our continuing collaboration, I am confident that GMP's commitment to make Rutland the Solar Capital of New England will continue to entice other businesses to come to Rutland."

The Energy Efficiency Center (EIC) will be the focal point of the solar capital effort, with a goal to create the most solar generation per capita in any city in the region. GMP employees will work with Efficiency Vermont and Neighborworks of Western Vermont to collaboratively develop new programs, outreach and opportunities for customers looking to reduce their energy bills and increase renewable generation in Vermont.

"This is a game-changer for downtown Rutland," Coppinger said. "It will draw in people, and equally important, GMP is already helping to build a new sense of pride in Rutland, and making it more vibrant than it has been in decades."

Construction on the Energy Innovation Center, located on Merchants Row in the heart of the downtown, will continue throughout the spring and summer before the October opening.

About Green Mountain Power. Green Mountain Power (www.greenmountainpower.com) generates, transmits, distributes and sells electricity in the state of Vermont. The company, which serves more than 250,000 customers, has set its vision to be the best small utility in America. 

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A SOUND STUDIO BORN OFF THE GRID

By Joel Legunn

Kristina Stykos of Pepperbox Studio has been living off the grid for 18 years -- six years in Washington County, VT, and the last 12 on Pepperbox Road in Chelsea, VT. Her current three-storey 4500 square foot house sits at the top of a hill with unobstructed views to the south of Mt. Ascutney and even Killington -- perfect for solar PV, and wind.

Off the grid when she bought it, the house got its electricity from a troublesome generator, and a broken wind turbine. Nevertheless, running a conventional power line from a mile away would be prohibitive. "I knew when I first saw this place," said Kristina, "that I would have to develop the energy systems." At that time she was not yet in the sound studio business.

So, Kristina hired the late Jim Grundy of Elemental Energy, who fixed the generator, installed two solar panels, added batteries and an inverter. A new wind turbine was added to the mix. "Unfortunately," said Kristina, "a few years later that turbine, which, ironically, is made for wind, was blown off in a storm." It took a number of years for her to replace it.

Because the house was also energy-inefficient, Kristina replaced all the insulation with spray foam, and almost all the windows with energy efficient Green Mountain windows. A propane boiler with a shoddy baseboard system -- too expensive to run, was replaced with an external wood boiler and cast iron radiators. This boiler required two circulator pumps, which are the biggest power draw in the winter. "This is a typical example of the problems you run into when you put an off-the-grid system together piecemeal, as I did," said Kristina.

Later, nine solar panels were added to the roof, and eight additional solar panels on the ground feed her husband's guitar shop. A second generator was added, also for the guitar shop. The wind turbine was eventually replaced. These energy sources feed everything -- the guitar shop and the entire house, including the sound studio.



One of our 2 solar arrays [photo by Joel Banner Baird]



A typical recording session at Pepperbox with Kristina Stykos and Patrick Ross [photo by Julie James]



One of our 2 solar arrays [photo by Michael Millard]



A typical recording session at Pepperbox with Kristina Stykos and Patrick Ross [photo by Julie James]

Kristina is an accomplished musician. The guitar is her main instrument, but since she arranges and produces music, she might be called on to play the bass, piano, mandolin and banjo, or "whatever is needed," during a recording session.

Around 2004, she began recording for herself, with some basic equipment. "In those early days," Kristina said, "it didn't take that much electricity, because I didn't have that much gear yet." But, as equipment was added, including Pro

Tools recording software, Kristina added a second, pure sine-wave inverter just for the studio to handle the additional load, eliminating the concern about damaging studio electronics, or compromising the quality of recordings.

Over the next two years, Kristina worked on a certificate in music production, through the Berklee College of Music. In 2007, she began offering her studio services in earnest. Pepperbox Studio records live, mixes, and edits everything

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from a single voice or instrument to complex band productions, often doing the arrangements.

To be off the grid is one thing; to do so and run a business that is so dependent on electricity requires constant due diligence. In winter, Kristina monitors a meter to check the battery charge and switches on the generator when it is necessary. In the spring, summer, and fall, it is barely needed. Relying mostly on alternative energy, Pepperbox Studio has rarely canceled a recording session.

When buying a home 18 years ago, Kristina's affordable choices were all off-the-grid, which was the deciding factor, perhaps more than environmental and energy conservation concerns. Necessity drove her energy conservation ethic. But after tinkering and becoming an expert after almost 20 years, she's definitely an advocate for independent, renewable energy.

For immediate success with an off-the-grid system, Kristina recommends installing everything correctly from the start, with matching, high quality components. Or, you have to install systems piecemeal, know how to tinker, be mechanical, and smart enough to troubleshoot when problems arise. And they will -- especially if you can't buy everything new, and at once. "The way I did it wasn't the easiest. It's not for the faint of heart."



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SUSTAINABLE DEVELOPMENTS AT VERMONT TECHNICAL COLLEGE

- Staff article

Vermont Technical College (VTC) has two good reasons to get our attention. One is a program to reduce energy consumption that exceeded expectations. The other is an exciting student-led project to design and build sustainable housing.

In a partnership with IBM, VTC took on a yearlong program designed to reduce electric consumption by 5.5% and save more than \$30,000. What happened in fact was that electric consumption was

reduced by 6.6%, resulting in savings of over \$40,000. The program is not over, however, and the current goal is to reduce consumption by an additional 5%.

IBM contributed 900 hours of worker time and with 550 advanced power strips for the students. Expert skills contributed to sustainable practice education and training. Equipment was changed on the basis of this expertise, with resulting savings in lighting, appliances, computers, controls, and other devices.

Meantime, students set about undertaking an impressive project to design and build housing to the standards of the Solar Decathlon. The project is called the Low Impact Design/Build Initiative (LIDI), and its goal is to develop designs for energy efficient, low impact, practical housing for families in Vermont.

Students developed floor plans over the fall, as part of the project's first step. The plans were analyzed for efficiency, practicality of materials, construction benefits, cost, and other metrics. After choosing a group of designs for further study, the LIDI team was organized to do further analysis. This team was made up of students Matthew Allen, Monica Alsup, and Heather Boyd.

One of the most important considerations in the process was the selection of



The Low Impact Design/Build Initiative (LIDI) construction begins spring 2013

an appropriated site for solar gain. The sites considered were all on the school property, and a single obvious choice was finally decided upon. The design of the building itself was influenced by the choice of site, and by the consideration that later groups of students may want to reuse the same site for new projects. This meant that the building had to be designed to be deconstructed or moved

at a later date.

Construction begins in the spring of 2013, to be completed at some point in the fall. The building will be an educational center for further work, as students go to new projects of the same type.

Clearly VTC deserves our congratulations. Well done! 🐾

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UVM'S JEFFORDS HALL THE GREEN STANDARD

By Dana Rubin

It only seems fitting that an article about the James M. Jeffords Hall be written within Jeffords Hall. Here I sit, surrounded by a metropolis of green growers, edible gardens, natural perfumes and a background track of classical music. Perhaps I should write more articles here. Those such as I passing through are able to glance into the window-fronted lab rooms, where students huddle over plant specimens and discuss in round-table style. Every stone has been turned over in terms of sustainability here at Jeffords. Composting and recycling bins line the hallways; event posters on corkboard

bulletin boards highlight upcoming seminars and green workshops. Even the toilets announce their green intentions, manufactured by TOTO; they use 63% less energy than a traditional toilet.

Jeffords is a 99,000-square-foot LEED-certified building located at "the top of the hill" on the UVM campus. Since its unveiling in 2010, UVM students have flocked to its research labs and classrooms to learn about sustainable agriculture, soil microbiology, photosynthesis, food systems and invasive species ecology.

Jeffords joins five other UVM buildings on campus that have LEED Gold certification; From blueprint to the first class assignment, it took six years to complete this project, but challenged Vermont in the best ways. The support for the \$55.7 million building came from three sectors; \$10 million in state funding; \$2 million in federal grants, thanks to Senator Patrick Leahy; and \$1 million from private dona-

tions. The laborious expedition turned into a great reward, a sustainable structure. 52.4% of the project's building materials were from local sources and Vermont sub-contractors and technicians performed more than 70% of the work. The process diverted 90% of waste away from the landfills and today, the building uses 28% less energy than a conventional building and 50% less water (UVM, facilities &

design construction, 2010)

Ellenzweig Associates and Freeman French Freeman designed Jeffords. Through sustainable design principles, the team was able to decrease the structure's



non-renewable energy sources. Jeffords has eight large curtain walls, 62 lab windows and 50 larger, storefront-style windows. This design technique has allowed for an abundance of natural lighting and ventilation. That said, Professor Gary Flomenhoft, a CDAE lecturer, has argued that green design could have gone even further. "Jeffords Hall is not facing the optimal direction to use solar heating and electricity...new buildings should be state-of-the-art with respect to their heating and electricity systems."

The next time you are looking for an alternative study space, head to Jeffords and give your own review. LEED certified yes, but can we strive for even better? If nothing else, use the conference rooms to enjoy the exquisite views of our state's mountains. Now what's greener than that? 🐾

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HOW TO PLANT AND GROW SWEET POTATOES

By Alison LaCourse

The sweet potato (*Ipomoea batatas*), a vining plant related to morning glories, is a different plant species than the familiar Irish or white potato (*Solanum*

tuberosum) form above the seed piece in a hill of soil. (True yams, *Dioscorea* spp., are native to Africa and not grown in this country.)

Sweet potato slips are small plants that sprout from the roots. These are usually ordered from a mail order company (The Maine Potato Lady offers certified organic slips grown in Maine in a greenhouse). Sweet potatoes require 90 to 150 frost-free days to mature. Nutritious and productive, they can yield up to two pounds for each row foot of plantings. Plant the slips 15 to 18 inches apart when the soil is at least 60°F. Northern growers can be successful with sweet potatoes by using black plastic to warm the soil and by applying row cover to prolong the growing season.

When Your Slips Arrive

Your slips are ready to plant immediately upon receipt. They may have lost their leaves and have very little root but unless they look rotten they will immediately set out growth from the 'nodes' on the stems. If you cannot plant immediately, put the slips in water in sunlight.

Preparing The Soil For Sweet Potatoes

Sweet potatoes like a fertile well-drained, well-aerated soil of any type with a pH of 5.5-6.5. Make a ridge 8 inches high by 12 inches wide; rows 36 inches apart. In cooler climates, use black plastic mulch to increase and maintain soil temperatures over 65°. Row Covers can help, as well, and should be on the whole season in our climate.

Planting Slips

Sweet potato slips should be planted in warm (65°) soil as soon as possible after you receive your order. Plant 12 to 15 inches apart in rows 36 inches apart. Set plants out in the evening, if the day is hot and sunny. Water these well for 7 to 10 days after planting to encourage quick root growth.

Maintenance and Cultivation
Once sweet potato plants are established they need very little attention. If needed, cultivate shallowly to prevent root damage. Once the vines spread they will keep the weeds down. Use row covers to increase and maintain the warmth.

Pests

Sweet potatoes are generally not bothered much by pests; especially in the north but here are a few pests that can be bothersome.

- Voles can eat their way through your crop underground without you knowing it.
- Deer love sweet potato foliage! And we can eat it, too! Use row cover or electric

fencing for control.

- Wireworms can be a problem in soil that was in sod as the click beetle (adult stage of the wireworm) has a two-year cycle.

Contact your extension agent on ways to control these pests as they may damage other crops you are growing.

Harvest

Harvest sweet potatoes in the third or fourth month when the vines stop growing and you have sizeable roots. You can wait until frost to get the most production but harvest before the soil chills below 55° (around the 1st frost). Be careful not to chill the roots as they will not develop their sugars and store well. Minimize skinning and bruising as this leads to decay in storage. Allow roots to cure and dry before removing excess soil. Approximate yield per ten-foot row is 6 to 15 lbs.

Curing and Storage

Sweet potatoes are cured to heal wounds and improve flavor by converting the starches to sugars. Cure for 10 days at 80 to 85° and 85 to 90% relative humidity. Or you can cure near your furnace at 75° for two to three weeks. Store in a cool (55-60°) area. Place in storage crates or boxes and cover with paper or heavy cloth to maintain humidity. Well-cured and properly stored sweet potatoes can last till April.

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Sweet potato slips



Preparing the Sweet Potato Bed,



Young Sweet Potatoes happily established

tuberosum). The part of the sweet potato most widely eaten is a swollen portion of the root, which forms in the hill of soil. Leaves and growing tips are also edible, usually stir-fried. By contrast, white or Irish potatoes, whose leaves and stems are poisonous, produce nutritious tubers on the ends of the stolons, or shoots, which



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CEDAR CIRCLE FARM

SUSTAINABILITY THROUGH CREATIVITY

By Michael Feiner

Cedar Circle Farm's Will Allen has been re-imagining the role a farm can play in feeding the community since his earliest days in the fields: Innovating, visioning, combining processes and intentions -- sustainability and resilience require thoughtful, intentional stewardship, education and action.

At Cedar Circle Farm & Education Center (CCF) in East Thetford, VT, Will, Kate, and a dedicated staff have united their passions for organic agriculture, alternative energy, local food, popular education and grassroots organizing for social and political change into one mission -- to build a real sustainable future one new farmer, new idea, and new inspiration at a time.

The 40 acre vegetable and berry farm is always looking for ways to increase productivity, reduce energy consumption and diversify the bounty they bring to the local community. In the last few years, that has included the addition of more grains and beans to the farm's rotational plantings, as well as oilseed crops like sunflowers. By extension the increase in production of local grains also reduces the dominance of commodity agriculture across the country. To accomplish this on a small to mid-size farm, CCF has had to be creative.

The farm needs to dry over two acres of beans every fall. Their multi-functioned wood-burning shop stove, where they largely burn scrap wood, dries a couple hundred pounds of beans overnight.

Luke Joanis, the farm's Operations Manager, and other resourceful folks, they accomplished this task with two 55-gallon steel barrels. One was cut in half with that half welded to the bottom of the second,



Half of the farm's 23 solar cells

whose bottom has been perforated with holes. A tiny "squirrel" fan pulls hot air from the wood heater and pumps it through a section of stovepipe into the bottom of the barrel unit. The hot air rises through the perforations into the main barrel that is filled practically to the top with threshed and cleaned beans of every variety, and escapes through an exhaust pipe at the top. Twenty-four hours later, they have dry beans ready for sale and storage.

Multi-functioning existing power sources to heat, cool or power secondary operations, is key to the way CCF approaches on-farm efficiency and sustainability. It isn't always about going



Operations Manager Luke Joanis cultivating with 'Sparky' the electric tractor

out and buying the latest green energy innovations, or high-end technologies. Some of CCF's greatest successes have come from layering processes and power sources on top of each other to get two, or three times the advantage from a single



Cedar Circle Farm Co-manager Will Allen demonstrates how to train high yield tomatoes in a farm workshop

base energy source.

The farm's 24 panel solar array offsets about 10% of the farm's electrical usage. The 1948 Allis Chalmers G has been converted to run off of 8 - 6 volt batteries, and can cultivate up to six inches deep for four hours on a full charge -- another innovation to cut the farm's reliance on fossil fuels, while cutting noise and exhaust at the same time. By retrofitting existing spaces adjacent to the farm's walk-in cooler that, as luck would have it, was mysteriously equipped with a trap door on the side, the farm has tripled their conditioned storage space without drawing on any additional energy expense.

All of these projects has been a group effort, has been 'trial and error,' and has ultimately succeeded because of a tangible shared commitment to sustainability and creativity.

"The type of farm we're going to need down the road, when it's no longer a novelty, but a necessity, is what we're trying to create here," Will insists. "We're innovating and trying new things, but we're also educating. We're training a cadre of people to take real ownership and initiative. If more people were doing that, sustainability wouldn't be an objective, it would be inevitable." ♡

Edible Landscaping Series - Part II, By Nicko Rubin

Building Soil and Growing Fruit on Challenging Sites

Soil conditions in the northeast are often less than ideal. Wet heavy soils are common. Even in those areas where the soil drains well, centuries of rain (not to mention more recent land uses) have washed away essential nutrients on all but a few sites. This article covers strategies for building soil and growing fruit on challenging sites.

Many home gardeners are turning to raised beds for annual vegetable production. Raising the soil into a mound even a few inches above the surrounding grade creates a space in the soil from which water will drain and air moves freely to both the plant roots and the soil biology that feeds them. Most fruiting trees and shrubs benefit from the same treatment and do not tolerate saturated soils. Six to twelve inches of elevation often makes a big difference. In wetter spots plant in a mound a couple of feet high to ensure that the crown of the plant has good drainage. The common planting guide image showing the tree placed in a slight depression, below the surrounding soil grade, is inappropriate for all but the most well drained soils in our very moist northeastern climate.

How do we build our mounds? Piling topsoil and compost over existing sod works, however, getting enough material

for a mound 1-2 ft high may be a challenge. A practice developed in Germany (likely in a climate comparable to our own) called hugelkultur (translated loosely to 'hill-beds') resolves this through piling coarse woody debris (large or small, fresh or rotted, hardwood or softwood). You may want to chop it up or stomp it once piled so that the material sits more tightly. Place a layer of hay, leaves, or straw over this. Cover the piled material with soil, compost, or animal manure, mulch wood chips or leaves may be laid over this. The bed is now ready for planting. The wood provides material to raise the plantings out of the wetter soil, acts as a sponge improving water retention, and supports healthy fungal soil life trees and shrubs prefer.



HUGELKULTUR

Photo: Karl Bauer <http://www.gnu.org/copyleft/fdl.html>

When planting into your hugel-bed be sure that there is adequate soil around the roots of your plant. Piles may be long for a row of berries or single mounds for individual trees. Decomposing wood will draw nitrogen from the soil so it is worth adding animal manures or an organic fertilizer for the first couple years.

Additions of organic matter such as compost and mulch go a long way to

supporting soil life and improving nutrient holding capabilities of the soil. Plants also depend on the presence of a wide range of mineral nutrients in the soil, such as calcium, magnesium, potassium, sulfur, and phosphorus just to name a few. A soil test is the best way to get a precise idea what the soil may need. Composts as well as seaweed or kelp products provide a broad spectrum of nutrients and may be applied safely without a soil test. More specific minerals may be applied in the form of various rock dusts such as lime, rock phosphate, or greensand. In my experience unless a soil has seen recent amending, it will benefit from a moderate to heavy application of lime or gypsum, providing calcium. Mineral amendments may be incorporated in the planting hole, applied on the soil surface, or both.

Once our plant's biological and mineral needs are there are a range of additional steps we can take in the context of the ecological landscape; working with companion plantings, and protecting our trees from pests such as deer and rodents.

Nicko Rubin owns and operates East Hill Tree Farm, a nursery for fruit trees, nuts, and berries in Plainfield, VT. He also offers consultation and edible ecological landscape design and planting. narubin@gmail.com. ♡

Introduction to Aquaponics

By George Harvey

Hydroponics is a system of growing vegetables without soil. The nutrients plants usually get from the soil are instead dissolved in water, and the roots are constantly wetted with it. Since there is no soil, there are very few weeds. Since there is no soil to wick water away, very little water is used. Yields are high and consistent. Harvesting is easy. Pests are easy to control. Everything is hunky-dory, aside from the fact that the nutrients for the plants are usually chemical fertilizers. Yuck!

Aquaculture is a system of growing things that grow in water. You can grow anything from algae to fish. Most people go for fish, but there is a trick to aquaculture that people have to face. Fish produce waste, just like all animals, but unlike land-dwelling animals, they live in it. So the trick to aquaculture is keeping waste under control. If you have a lot of fish in a relatively small tank, this can be a real problem. Another yuck!

Not all that long ago, someone thought of these two systems and realized the problem of each was the solution for the other. Therein lies a story of research and development that is under way all across the world, with amateurs leading the way. (Hooray for us!)

Hydroponics and aquaculture combine to make aquaponics. In this system, fish are raised in tanks. They eat food, and they produce waste in the form of urine and feces. Both of these can be broken

down by bacteria, producing ammonia. The ammonia is toxic to fish, but is food for other bacteria, which make nitrites as by-products. The nitrites are turned into nitrates by yet other bacteria. The nitrates, along with other products, are plant food. The plants filter out nearly all troublesome products, leaving the water fresh to be returned to the fish.

The result is both fish and vegetables. If the food you give the fish is organic, which it can be if you grow it yourself, the result is organic, too. It may not be certified, but it is home-grown, which is better.

This is an example of the ultimate ecological triumph. Two yucks can make a yum!

A system doing this can be created with a small tank, possibly of ten gallons. The plants could be a few heads of lettuce. The whole thing could be set up in a south-facing window.

Alternatively, the fish tanks can be quite large. They can provide water and waste for a body of plants with a larger surface area than the tank, and a greenhouse can be productive nearly year-round.

I have not seen this myself, but I have read that in a naturally lighted greenhouse, a well kept system can



Aquaponics with vibrantly colored plants

Credits: Ryan Somma, wikimediacommons.wikimedia.org

produce about one pound of food, as a combination of fish and vegetables, per

square foot, per year. If I could get that from the 14-by-14-foot greenhouse I use, I would be able to grow about 200 pounds of food per year in it.

There are tricks to this, and so we do research here. One thing we need to do is supply a growing body of fish with organically raised food, and that can take a little science. We are setting up to grow algae, duckweed, azolla, black soldier fly larvae, tiny crustaceans, small snails, and a variety of other things fish eat. The ultimate inputs are sunlight and carbon dioxide from the air, with a small amount of minerals coming mostly from local rocks, and the output is fish food. We also use waste scraps of organic food.

Another trick we are working on is how to get the system to work reliably when electricity fails. In the case of many aquaponic setups, if the electricity goes down, you have to switch to a backup generator. We want a system robust enough to keep things going during extensive blackouts.

We started the experiment with goldfish purchased from a pet store as live food for turtles and other animals. They cost 15¢ each. These little guys and gals were not in very good shape, because they were being raised for an early death. We lost most of the thirty or so we bought. Nevertheless, eight are still alive now, two years later. They are three and four inches long and quite beautiful. And, they have had babies.

Stay tuned – more is coming in upcoming issues. ♪

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PLANTING FOR A CHANGING CLIMATE PART 1: CHANGING PRECIPITATION

By Jonathan Teller-Elsberg

Gardeners and other growers don't need to be told that the weather changes, and that plantings can suffer from rapid changes or extremes in temperature, floods, or droughts. Even still, just as we are all having to learn that "climate" is not the same as "weather," strategies for resilient landscapes must adjust with the times.

In the northeastern U.S., current climate modeling points toward a couple of trends. The first, not surprisingly, is rising average temperatures. The second is increasing average annual precipitation.

Historically, the Northeast has received roughly the same amount of precipitation each month throughout the year. For example, the historical record for White River Junction shows that average monthly precipitation is 2.9 inches, plus or minus 0.5 inches or less, for every month except February (which has averaged 1.9 inches). May has the highest historical average, at 3.4 inches.

However, the increase in predicted annual precipitation won't be evenly

distributed across the year. The Northeast Climate Science Center reports that "all model simulations for the future [of the northeast U.S.] point to wetter winter and spring conditions, but much drier summers and falls" (<http://necsc.umass.edu/northeast-climate>). Mini-droughts in the later part of the growing season look to become the new normal in the Northeast.

In a garden setting, you can make your beds drought-resistant by increasing organic matter in the soil. The easiest way to do that is by adding an inch or two of compost each year. Just add it on top; there's no need to till it in. Perennials, once established, are almost always more drought resistant than annuals.

If you grow only ornamentals, the combination of good soil and perennial plants will go a long way toward resilience to variable precipitation. For edibles, it's not quite so easy. Though edible perennials, such as fruit trees and berry bushes, can survive dry spells just fine, the lack of water will harm their production—in extreme cases causing the plants to abort their fruit before it ripens.



An infiltration swale is dug on contour, with a mound to the downhill side. Plants are located on the mound. Rainwater fills the ditch and infiltrates the soil, rather than running off down slope. This reduces erosion and puts water into the root zone. The image shows mulched mounds and ditches for viewability. Ideally, add water-loving plants in the ditch and multifunction companions on the mound.

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Where supplemental water is needed, drip irrigation is vastly more efficient than sprinklers. It also has the benefit of targeting water toward the plants you like, leaving weeds to tough it out. Further, by keeping leaves and stems dry, it reduces opportunities for many fungal diseases to get a foothold.

If your land is sloping, consider terracing or digging infiltration swales. These are ditches dug exactly level (on contour) across the slope, with the soil from the ditch mounded up on the downhill side. By slowing and/or catching water that would otherwise run off down the slope, terraces and swales encourage deeper penetration of precipitation into the soil, where plants can access it. For excellent information on constructing "earthworks" like these, see Brad Lancaster's book, *Rainwater Harvesting for Drylands and Beyond*, vol. 2. (Based on Lancaster's formulas, I have created a swale sizing and spacing worksheet available at <http://goo.gl/WOUPz>.)

In a follow-up article, I'll address the issues of rising average temperatures and

increasingly erratic weather.

Jonathan Teller-Elsberg is a permaculture consultant in Norwich, Vermont, specializing in the design of edible landscapes for small properties in the Upper Valley. His website is www.TerraPermaDesign.com.

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Embodied Energy

By George Harvey

The embodied energy of an object is the energy required to make it. Anything manufactured has embodied energy associated with it.

People sometimes wonder why a wind turbine or solar panel has a carbon footprint. To a large extent, the carbon footprints of renewable power sources such as these can be explained in terms of the carbon required to produce their embodied energy.

Most solar cells are made of silicon. The silicon, however, is very highly refined, and the refining requires a lot of energy. Each square inch of a monocrystalline photo-voltaic (PV) cell represents emissions of 0.33 pounds of carbon dioxide, because manufacturing each square inch requires 0.833 kWh of electricity. Of course, if that power came from solar PVs, it would have no carbon emissions, even though it would still be embodied energy. As we use ever-greater amounts of renewable energy, carbon footprints will decline for solar cells.

Similarly, wind turbines require plastics for blades, steel for the structure, concrete for the base, along with the materials for the turbine machinery itself. All these things contribute to the carbon footprint. Just as with solar, as we get more and more of our power from renewable sources, the

carbon dioxide associated with the embodied energy will decline.

A monocrystalline solar PV cell typically takes several months in operation to produce the amount of power required to make it. Nevertheless, a PV installation will last many decades, with reasonable luck, so the payback in power is a large multiple of the power investment. Wind turbines have a much shorter lifetime, and are expected to last only 25 years or so, on average.

The greater embodied energy in the PVs has meant that they are said to have a greater carbon footprint than windpower. This is partly a matter of how things are calculated. They typical life expectancy of solar cells, for the purpose of calculating the carbon footprint, is 20 years. With a longer lifetime, the carbon footprint of solar cells is closer to that of wind turbines.

When products are manufactured, often the cost is largely made up of the embodied energy. The value of the raw materials is an important consideration, but this is also complicated because of the embodied energy they have and the rarity of the resources. Aluminum is abundant in nature, but requires a lot of energy to refine, so its price is a reflection mostly of embodied energy. Gold is rare, but is rather easy to refine, so its price is a reflection mostly of its rarity.



RIVERS SUFFER FROM GLOBAL WARMING

Climate change is negatively affecting the health of rivers and, by extension, the quality and availability of fresh water.

Global warming is no doubt going to cause many kinds of problems (and, indeed, already is), and rivers may well be some of the hardest hit geographical features, given the likelihood of increased droughts, floods and the associated spread of waterborne diseases.

For one, rivers are already starting to lose the amount of water they channel. A 2009 study at the National Center for Atmospheric Research (NCAR) found that water volume in the Columbia River in the Pacific Northwest declined by 14 percent since the 1950s. This trend is similar in major rivers all over the world.

"Many communities will see their water supplies shrink as temperatures rise and precipitation patterns shift," reports the nonprofit American Rivers, adding that a rise in severe storms will degrade water quality and increase the risk of catastrophic floods. "Changes in the timing and location of precipitation combined with rising levels of water pollution will strain ecosystems and threaten the survival of many fish and wildlife species." These shifts will have dramatic impacts, threatening public health, weakening economies and decreasing the quality of life in many places. In the U.S., the number of storms with extreme precipitation has increased 24 percent since the late 1940s—and the trend is expected to continue.

Another certain impact on rivers is more pollution as more frequent and powerful storms increase runoff from urban and

agricultural areas that contain fertilizers, pesticides, chemicals and motor oil. "In older communities where storm water and sewage are transported together in one pipe, heavy storms can overwhelm the system and send raw sewage and polluted storm water into nearby streams and rivers," says American Rivers. "These combined sewer overflows will grow more frequent as extreme storms increase."

Lower water flows and rising temperatures compound problems caused by more runoff. "More frequent droughts and shifting precipitation patterns lower water levels in rivers, lakes and streams, leaving less water to dilute pollutants," says the group. "Higher temperatures cause more frequent algal blooms and reduce dissolved oxygen levels, both of which can cause fish kills and do significant harm to ecosystems."

American Rivers reports that the health of our rivers in the face of increasing warming will depend largely on community preparedness. Municipalities that fail to address aging infrastructure "will experience greater increases in storm water runoff and sewer overflows." And communities that have damaged their wetlands, forests, streams and rivers will have fewer natural defenses to protect against the effects of climate change.

There is much we can do to protect rivers besides reduce our carbon footprints. American Rivers is promoting green infrastructure—an approach to

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Nevertheless, the actual price of an item can be regarded as a very rough reflection of the energy required to make it. When I bought my Prius, in 2001, Toyota had another car, the Echo, which cost about two-thirds as much, but it got about two-thirds as many miles per gallon of gas. Looking back, I have wondered whether the embodied energy in the Prius made it a better deal for the environment or not.

This brings up another issue, which is that extending the life of something used also extends the value of the embodied energy that it has. If I had bought a used, but very energy efficient, car, instead of the Prius, I might have been doing better for the environment than I did by buying the Prius. It is not an easy matter to calculate, because of unknowns that might exist with a used car.

Most products are simpler than cars.

The issue of embodied energy for these products is also simpler. If you buy a hand-crafted wooden chair, you are buying a product with little embodied energy. A molded plastic chair will have a far greater embodied energy. The wooden chair might last for decades, or even centuries, but the plastic chair might only last through a few seasons. The result is that the environmental impact of buying a wooden chair is really tiny by comparison to plastic.

Even our food sources have embodied energy associated with them. Perhaps I should be more accurate about this and say those food sources requiring chemical fertilizers, pesticides, or power machinery have embodied energy associated with them. A garden that is tended entirely by hand, with plants grown from saved seed, is a labor of love. Love doesn't count as embodied energy. ♪



Rivers may well be hard hit by climate change, given the likelihood of increased droughts, floods and the associated spread of waterborne diseases. Pictured: The Columbia River in the Pacific Northwest, which has lost 14 percent of its water volume since the 1950s due to higher temperatures and shifting precipitation patterns.

water management that protects, restores or mimics the natural water cycle—as the way to bolster the health of rivers. "It means planting trees and restoring wetlands rather than building a new water treatment plant. It means choosing water efficiency instead of building a new water

supply dam. It means restoring floodplains instead of building taller levees."

Contacts: NCAR, ncar.ucar.edu; American Rivers, www.americanrivers.org. Written and edited by Roddy Scheer and Doug Moss, EarthTalk® -- a registered trademark of E - The Environmental Magazine (www.emagazine.com). ♪

RESOURCES

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

SEIA/ Solar Energy Industries Association: The SEIA Tax Manual to answer your solar related tax questions. www.seia.org

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

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

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

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

Find Solar: www.findsolar.com

Energy Star Federal Tax Credits: www.energystar.gov/tax_credits.

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

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

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

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

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

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

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

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

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

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

Solar Living Source Book: www.realgoods.com

Home Power Magazine: www.homepower.com

Solar Components: www.solar-components.com

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

Solar Systems: NEsolar.com

National Solar Institute: www.nationalsolarinstitute.com

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

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

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

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

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

SmartPower: www.smartpower.org

Greywater Info: www.oasisdesign.net/greywater

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

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

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

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

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

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

Renewable Energy World: www.renewableenergyworld.com

Renewable Energy VT: www.REVermont.org

The Energy Grid: www.pvwatts.org

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

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

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-

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

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Vermonters for a Sustainable Population www.vspop.org Party.
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www.enjoyburlington.com/Parks/OakledgePark.cfm

Guest Speakers:

Jerry Karnas, Population Campaign Director, Center for Biological Diversity
www.biologicaldiversity.org
Bill Ryerson of the Population Media Center, www.populationmedia.com

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By Larry Pleasant

Ingredient of the Month

Dear Friends,
This month's Green Energy Times column is being written in a small northern village in Liberia, West Africa where I am once again working with local people to improve the quality of their soap products. We use palm and palm kernel oils crudely pressed just outside of town. I show them how to mix wood

ditch or making a garden do they really go at it. By comparison I am a human dynamo teaching and demonstrating constantly during the hot long days and working diligently at the laptop nights. I have lots of neat toys; they have lots of time. Food is seasonal and often the same for months on end. Few travel. Everyone has something to do and it usually involves basically



Larry Pleasant (on left) in a small Liberian village in west Africa.

ashes with lime or salt and lime with water to make different types of caustic, an essential ingredient in making soap. They ask me to bring nice scents and colors from America to pretty up their bar soaps. Instead I show them how to take the scent from the plants around them; lemongrass, ylang and others; and to dry and crush the bark of the cinnamon tree to make a nice dark brown color that also smells nice. For fun we swirl in the colors making

being there should something happen. It seldom does.

Two different lives; two different cultures. I work hard, have toys, but enjoy little free time. They have lots of time, few toys and a narrower world view, though this too is changing as internet and television bring the world to their door. Nigerian soap operas show wealthy, sociopathic Africans living in mansions and being mean to their wives while their



Group of Africans making soap

a novel marbled look. Everyone loves this effect. We use the neem tree to make a medicated soap and add shea butter from just north of here to make soothing, skin smoothing soap.

Life is slow and a little boring in the villages. People spend most of the day hanging around gossiping as far as I can tell. They work hard for a while each day hauling water and firewood on their heads and then rest the day away. Only when building a house, fixing a roof, digging a

grandparents in the villages live idyllic lives in clean, happy suburban style huts. Neither depiction is quite accurate. The people see wealthy NGO volunteers (as I surely appear to them), with cool kits and drivers in white SUVs carrying them around the countryside. The disease of civilization is upon them. In the words of an old and wise Amerind chief, "They have the white man's disease, usually fatal. It is called Wants Plenty Things".

Their lives have changed little in the

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past 1500 years. Ours change so fast we need a smartphone just to keep up with it all. We go through our days breathless and never quite caught up, while they sit and wait for someone to buy a small item from them so they can purchase some cloth or sandals which they have somehow forgotten how to make for themselves.

Their lives, slow and boring and filled with hang out time with friends, family and neighbors is sustainable. Our busy lives have incurably altered the face of the planet, the weather, and the course of evolution. Not content to use the 10,000 chemical combinations found in nature, we invent new ones with which the biology has no experience in breaking down and recycling the components of. Not satisfied with cross breeding food for greater yield we invent new biology (GMOs), not even knowing how they will interact with the rest of the biology that has been quietly evolving here for 2.5 billion years.

We travel through space and around the world, conquering all in our path. We allow the 3% of us that are sociopaths to hold the reins of power over the life and death of an entire planet rather than saving ourselves by euthanizing them at birth. (An MRI can now determine the exact degree of sociopathic tendencies in an individual). We rush around telling

ourselves "We gotta"; as in "We gotta do this and we gotta go here" when in fact all we gotta do is perform basic biological functions.

My students, naïve, open and vulnerable to suggestion as any stare with wide eyes at my very strange pale white skin and my cool kit ready to accept anything

our conquering culture tells them. They are almost eager to turn their back on the sustainable, natural culture that brought them to this point in time; while we Moderns use detergent shampoo with the fake scent of natural herbs and proclaim, "I'm a natural girl. I use herbal essence!"

Modern life has so much to offer, and at such a devastating price. Natural Earth Wisdom has so much to teach us; thousands of years' worth of knowledge. Who is listening? We must,

right now, in our very lives plant one foot firmly in the Modern and one foot firmly in the Traditional. This is wisdom. This is the key to our survival, to the survival of the biology that sustains us, and to our mutual sanity.

And this is the Soapman, imploring Traditionals and Moderns alike to PLEASE keep it natural. The survival of our grandchildren and countless life forms depends on it.

Will be back in beautiful Vermont soon. Be well, live long and gently prosper. ♡



Acaudron with the soap mixture in it.

Reduce, Reuse, Recycle, **RESTORE** the **PLANET!**

Most of us know the mantra, "Reduce, Reuse, Recycle!" Perhaps we should add "Restore" to those three R's, because if we follow them we can restore the Earth. We have all the technology we need to deal with carbon emissions and pollution. The only other thing we need to do as individuals, to Restore the Earth, is that enough of us Reduce, Reuse, and Recycle.

We need to reduce – for this we only need to learn to be satisfied. We can reduce the load on the planet by reusing things ranging from clothing and furniture to buildings. We need to recycle to reduce and reuse waste. By doing these things, we can restore the planet.

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Green Tips

By Deborah DeMoulpied, Bona Fide Green Goods

Spring into GREEN! Reduce, Reuse, Recycle

While springtime conjures up images of sunshine and flowers, it really is the greenest time of year - when the earth comes back to life and gives us permission to wear bright, sassy, grassy colors. It is also an opportunistic time to "talk" green.

And so we will -- talk green.

Bona Fide Green Goods has been in business nearly six years, opening at the height of the "green movement." We are still surprised when customers come in and ask: "What are green goods?" or "What's your greenest product?" or "What is green living all about?"

Each answer requires a fairly lengthy dialog since no one product represents all that is green, nor is any one lifestyle perfectly green. It's more about being green-er, that is lessening your negative environmental impact to the earth. It means your product choices are greener from start to purchase to end-of-life.

While the three Rs - Reduce, Reuse, Recycle - may sound trite to some, living greener does come down to those three words.

•Reduce goes beyond just reducing consumption; it includes reducing packaging, unnecessary

shipping, and reducing the amount or number of chemicals used in personal care products, cleaning agents, or the manufacturing process.

•Reusing conjures up images of a baggie dryer or reusable water bottle. On a bigger scale, is the manufacturer reusing the water or

capturing the heat loss for energy or additional heat?

•And where do those recycled plastic containers go anyway? Is there really a large scale market for those? Are they truly recycled or down-cycled? And what happens at the final end point? Will it eventually have to be thrown away? Can a fleece jacket made from recycled bottles be recycled again? When will recycling include, on a larger scale, the product biodegrading compost-style (recycled back to earth) such that it is even safe for food production?

The 3-Rs are listed in a particular order for a reason: to quote our own famous, locally grown, Gary Hirshberg, "If you have a lot to recycle, you haven't done a very good job at reducing and reusing." If you incorporate the 3-Rs into your product decision making, and your over all lifestyle, you will certainly be on the way to living greener. And don't be afraid to ask the manufacturer how they incorporate the 3 Rs.

Now, wear the brightest, sassiest, grassiest green you can find, spring outside, and spread the word!

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



LET'S G.E.T. GOING!

By Dana Rubin

1. BUY IN BULK:

According to the EPA, collectively, we generate more than 80 million tons of waste per year from packaging and containers. To curb this cultivated waste, we as consumers, can turn to bulk purchasing. Frequently bought items such as soaps, grains and cooking staples are often less expensive in larger quantities because of reduced transportation costs and the lack of packaging of individual products. To establish a bulk order program in your community, encourage interest and establish a point person who will arrange for orders and coordinate pick-up locations. Start with a few items and work your way to experimenting with more exotic provisions.

Check your local coop market for bulk items.

2. RECYCLE OLD ELECTRONICS:

Before you upgrade to the iPhone 5,



By the Pound, Ann Arbor, MI

Cont. on page 37

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Spring Cleaning

A TIME TO PURGE & RECYCLE ...

By Clare Innes

Listen up, Old Man Winter: It's over between us. It's springtime now, and we're busting loose with the urge to purge all that stuff we have accumulated in our closets, garages, drawers, and basements during those long, dark months. But how do we get it into the hands of someone who could use it once we decide we don't need it anymore? After all, there's a reason "reuse" comes before "recycle" in the Reduce, Reuse, Recycle mantra: It means less demand on the entire manufacturing process that it takes to make a product. And it's the frugal Yankee way.

What we need is a matchmaker for stuff.

Actually, those matchmakers are all around us, online and around the corner. We just need to know where to look. Here are some suggestions:

Online: Swapping and selling sites abound. Craigslist.org, Freecycle.org, Facebook, eBay, Amazon.com, Front Porch Forum (and other local forums). It's easy, simple, and you don't have to waste gas driving something to a....

Reuse stores, charities, and drop-off sheds:

They are everywhere! Besides the usual suspects (Goodwill and Salvation Army), many charities operate storefronts where they resell used clothing, household items, and even cars (I'm lookin' at you, GoodNewsGarage.org!). Others would love to accept your duds and household treasures to give directly to their clients, such as Women Helping Battered Women (whbw.org), the Vermont Refugee Resettlement Program (refugees.org), and other local crisis and intervention centers. Many solid waste districts maintain reuse sheds at drop-off centers so you can deposit your reusables there while you're disposing of your trash and dropping off your recyclables.

ReuseMarketplace.org:

This free network, aimed at businesses, institutions, governments, and organizations in the Northeast, is where the business community can post reusable

goods for sale or to give away – or post that they're looking for a particular item or material.

Assistive technology reuse resources:

There are two resources that enable people with disabilities to get a helping hand with assistive devices: GetATstuff.com, a New England-wide website where individuals can buy, sell, or give away their items; and ATP.vermont.gov, where individuals can borrow assistive devices. There's even a special website for swapping devices among schools that have purchased equipment for a student who may have graduated or moved: Vermont.ATschools.swap.com.

Artists' swap site:

OK, here's one that I wish would come into being – an artists' swap listing. There are artists and cottage-industry manufacturers who use all kinds of things that are thrown away and fashion them into art objects and new products. Wouldn't it be great if there was a listing where you could get in touch with the artist who could use your old Barry Manilow record collection to make bowls or clocks or other items, or who needs a thousand green bottles for a project, or a steady supply of old blue jeans to make quilts? C'mon Vermont artists! Let's see it happen! There at least ought to be an app for that!

Clare Innes is the Marketing Coordinator, Chittenden Solid Waste District. For more information visit www.cswd.net, e-mail: info@cswd.net, or call the hotline: 872-8111.



LET'S G.E.T. GOING!

Cont. from page 36

consider recycling your used electronics rather than storing them in a dusty corner of the attic. Electronics are likely to contain heavy metals such as lead and cadmium, which if not disposed of properly, will lead to leaching, and potentially harm local air and water quality. **ECycling** allows tech-savvy folk to recover materials from old electronics to create new products, call it a version of upcycling! First,



look into donating your old technology to local charity programs. If you are unable to donate, look into e-cycling programs (ex. Take-back/Trade-in programs offered by Dell, Apple, HP etc.) ReSource, is a locally owned and extensive reuse center which aims to strengthen social welfare. Drop-off centers are in Burlington, Barre and Morrisville. <http://www.resourcevt.org/>

3. "GREEN PRODUCTS"

In today's market, one can easily misread labels and buy products that aren't actually environmentally friendly, so it is important to know the tricks. First, consider the composition of your product, what are the ingredients? Next, consider how long the product is going to last. Invest in commodities that will age well and can be recycled, reused and/or repurposed. What was the manufacturing process? Often products may seem sustainable but when we read the fine print, we come to learn that the manufacturing processes can counteract sustainability efforts. Sustainable companies will be energy efficient, produce minimal byproduct waste and minimize their emissions. Be a critical shopper. Environmentally sound products might cost more on the front-end, but we promise, you will reap the benefits down the road. Consider your future savings.

4. GET A FREE HOME ENERGY AUDIT

Free Home Energy Audits:

NeighborWorks H.E.A.T. Squad
<http://www.nwvt.org/homerepair.htm>

Efficiency Vermont

<http://www.efficiencyvermont.com>

MassSave

<http://www.masssave.com>

NHSaves

<http://www.nhsaves.com/>

Across New England, there are state and private programs, which allow homeowners to receive free energy assessments. Everyone should jump at this opportunity to reduce household energy loads. The first steps are reducing household energy consumption:

Lighting- Old school incandescent light bulbs are inefficient: upgrade to CFLs (compact fluorescent lights) or LEDs (light-emitting diodes), both of which last longer on less energy usage.

Programmable thermostats- Why heat or cool your house when you're not around? Find out more through Energy Star (<http://www.energystar.gov/>)

Water Aerators and Low-Pressure Faucets-... the most effective water conservation savings you can do for your home," according to Eartheasy. Check them out for information on how to tell if you need a low-flow faucet or aerator and where to find them. (http://eartheasy.com/live_lowflow_aerators.htm)

Clean Furnace Filters- like the oil filters in a car; furnace filters should be cleaned regularly for maximum efficiency. See if you can figure it out yourself with help from Saturn Resource Management on Furnace Filter Care. (<http://blog.srmi.biz/energy-saving-tips/residential-heating/furnace-filter-care/>)

Sealing Windows and Doors - Don't underestimate the energy savings that can come from sealing your windows and doors! Caulking is easy, and once it's done it's done.

5. ALTERNATIVE TRANSIT

With rising gas prices, we have two routes: continue to rely heavily on fossil fuels, or change the system at the root by changing our mobility practices. This spring, travel in a more resilient way, bike, carpool or take public transit. With the annual Way-to-Go Challenge May 13-17th, <http://waytogovt.org/index.cfm>, April is a perfect time to pump up your tires and tweak those breaks.

Now Let's G.E.T. Going! ♡



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282 Boardman St., Middlebury
- **ReNew Building Mtls. & Salvage**
16 Town Crier Dr., #2, Brattleboro

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WHAT'S MISSING IN GREEK YOGURT?

By Linda Prout, MS



Yogurt offers some remarkable health benefits: it feeds good gut bacteria we need for digestion and strong immunity; it's a great source of calcium, B-vitamins and protein; and the more we eat, the thinner we get.

Whole milk yogurt provides CLA, a fatty acid that protects us from cancer, and contributes to its slimming properties.

So what about the wildly popular Greek yogurt? Is it any more healthful than regular?

Greek yogurt is regular yogurt, strained of its watery whey. You can make it yourself: put some whole milk yogurt into cheesecloth, tie it into a bundle, and let it drip into a bowl. In a few hours you have "Greek" yogurt. You also have a bowl of whey. Don't toss this.

Whey turns out to be super-healthy: it provides what the body needs to make glutathione, a powerful and elusive anti-aging antioxidant. Whey keeps our immune system strong and protects us from cancer and other diseases of aging. Whey promotes muscle formation. It also helps keep blood sugar levels stable, protecting us from diabetes.

Many of yogurt's nutrients are in the whey. Whey contains up to 70% of the vitamin B12, 75% of the B6 and pantothenic acid and up to 90% of the thiamin, folate and niacin. Traditional Greek yogurt is lacking this plethora of health-related benefits.

Whey <http://articles.mercola.com/sites/articles/archive/2010/10/23/ori-hofmekler-on-whey-protein.aspx>

I once lived in southwest Turkey, a neighbor to many Greek islands. The Turks too strain their yogurt. This is the only version available at farmer's markets there. Knowing that whey is highly nutritious, I once asked my Turkish dairy farmer if she would sell me regular yogurt, with its whey. She reported whey is used to make a special cheese and to feed the children, and not available to me.

Of course! This gives their kids a true super food. I am sure the Greeks too keep this extraordinary dairy byproduct for

A study published in the New England Journal of Medicine reported the more yogurt participants ate, the less weight they gained as they aged. The opposite happens when you eat French fries.

their children.

If you tolerate milk, yogurt is among the most healthful of dairy foods, especially full-fat, plain, regular style. If you want your health and creamy style yogurt too, make your own Greek and keep the whey to soak your grains or add to another dish.

Don't offset yogurt's many benefits by choosing sugary or fat-free yogurt, and avoid any milk products that contain



Linda Prout with a middle eastern native woman.

hormones including rBST.

http://en.wikipedia.org/wiki/Bovine_somatotropin

Here's list of popular Greek yogurts and their relative merits. <http://www.be-foodsmart.com/blog/the-best-and-worst-greek-style-yogurts-for-your-health/>
Linda L Prout, MS, an expert in East/West nutrition is author of *Live in the Balance, The Ground-Breaking Nutrition Program*. With graduate degrees in nutrition, Linda has been using natural remedies to help clients get well for over 25 years. She specializes in pain relief, hormone balance, weight loss and restful sleep. Linda@lindaprout.com 541-485-2501 www.lindaprout.com

FROM THE YEAR OF CO-OPS TO THE CO-OPERATIVE DECADE

By Erbin Crowell



The past year has been an extraordinary opportunity for our food co-ops. Amidst devastating global recession, co-operative enterprise has shown itself to be an effective, resilient business model, from food co-ops to farmer co-ops, worker co-ops to credit unions, housing co-ops to artisan co-ops. When the United Nations declared 2012 the International Year of Co-ops, it brought unprecedented attention to co-operative enterprise as an effective tool for poverty reduction, employment, participation, and food security locally and

around the world.

People around the world began to better understand the shared impact of co-ops on the economy. Globally, almost a billion people are co-operative members — more than directly owned stock in publicly traded corporations — more than 1 in 4 Americans are members of over 29,000 co-operatives.

In October, the International Co-operative Alliance (ICA) historically approved an ambitious vision for the future. Building on the momentum created in 2012, the "Blueprint for a Co-operative Decade" will promote co-ops as leaders in social, economic and environmental sustainability. By focusing on our core co-operative identity, mobilizing member participation and communicating our differences, the document argues, co-ops can become the fastest growing form of enterprise by 2020. Download a copy of the Blueprint: www.nfca.coop/decade.

In New England and New York alone there are nearly 9,000 co-ops, locally

owned by 9.5 million members. To achieve the ICA's vision of becoming the fastest growing business model by 2020, we will need to move beyond



rhetoric of "cooperation among co-ops" to policies that put this ideal into action, prioritizing the purchase of goods and services from one another, and making mutual investments in development and collaboration on legislation. Working together is not only the right thing to do, it also makes business sense. In doing so, we raise the profile of co-operative enterprise and reinforce its relevance in a challenging economy. We strengthen our success and our ability to serve our members in more aspects of their lives. And we shift the dialog on government policies that affect our ability to grow and help more people help themselves and their communities.

The International Year of Co-ops was an important opportunity for co-ops to tell our story to millions of people hungry for an alternative to business as usual. The Co-operative Decade is our chance to demonstrate the potential of our movement and to build a more just, resilient and sustainable food system and economy at home and around the world.

Erbin Crowell is Executive Director of the Neighboring Food Co-op Association (www.nfca.coop) and serves on the board of the National Cooperative Business Association.

By putting people before profit, co-ops are able to think beyond the bottom line and invest in the future of our communities.



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Neighboring Food Co-op Association Frozen Fruits and Vegetables, available in the freezer section at our member food co-ops. Support local farmers, support your local co-ops. For a map of locations, please visit www.nfca.coop/members.

THE NEIGHBORING FOOD CO-OP ASSOCIATION
P.O. Box 93 // Shelburne Falls, MA // 01370-0093
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carbon nation
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