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Devastating Cuts To RENEWABLES IN NH

By Frederick Greenhalgh

The New Hampshire House of Representatives has voted in favor of a budget that would raid \$51 million of funding from New Hampshire's renewable energy fund to close a general-fund budget gap. This move flies in the face of broadly supported, bipartisan clean energy policies that have supported hundreds of solar jobs in New Hampshire and brought millions of dollars of private investment into the state.

This potentially disastrous move comes just as New Hampshire's renewable policy was showing signs of progress – several bills attacking the Renewable Portfolio Standard have been defeated this session, and the Governor's budget left the renewable energy funds alone completely and balanced the budget using more responsible tools.

The raid on renewable energy funds to plug holes elsewhere in the budget is not unprecedented in New Hampshire – previously over \$16 million has been raided – but the amount the House has suggested is a whole other order of magnitude. Should this move be allowed to take place, it would wipe out all renewable energy rebates in the Granite State.

The New Hampshire Sustainability Energy Association minces no words, stating that the House budget would have "devastating effects on our economy, threatening thousands of jobs and depriving towns and businesses of much-needed assistance to lower their energy costs, lower local property taxes, and keep our energy dollars here in NH's economy. House leadership has turned its back on its own public pledge to create a sensible budget for NH without raiding dedicated funds, using accounting gimmicks, or by raising new taxes. Raiding the dedicated renewable energy fund will strip ratepayer funds intended for cost-saving and job-creating energy projects, thereby creating a hidden energy tax."

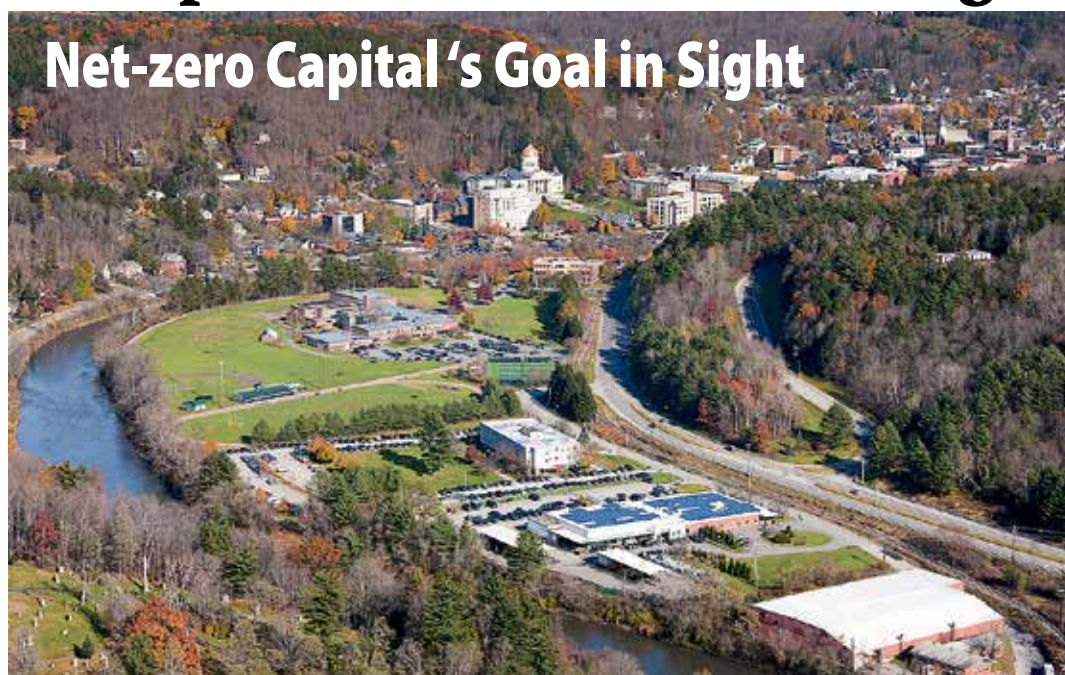
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A 7kw solar PV installation in Hopkinton, NH.
Photo: ReVision Energy.

Montpelier, Vermont ...is doing it!

Net-zero Capital's Goal in Sight



Green Mountain Power's solar roof array installed by Alteris Renewables. © 2010 Neil Dixon

By Dan Jones

It has now been a year since Montpelier City Council unanimously committed to becoming "net zero" in fossil fuel use by 2030. This big goal – meeting all the city and its residents' energy needs through renewable supplies in 15 years – is imperative. It is also aggressively ambitious and,

frankly, seems bigger and more challenging as the city goes about those actions needed to accomplish it.

Committing a city government to a course of action is one thing, but it is quite another to commit the entire community to partnering with you on that effort. That said, we need some kind of whole-

community approach across all towns and cities, in Vermont and beyond. This requires, however, a re-imagining and realigning of how people use and generate energy -- not a simple undertaking by any means, but a commitment to a healthy future local economy. The money we currently send out of town for oil and gas will, instead, create local jobs which will in turn depend on local workers, not global corporations. As we move more deeply into this effort our little city's current challenge is to figure out how to mobilize our diverse community – everyone – in a really long-term push towards getting people off of dirty, dwindling fossil fuels.

The City of Montpelier, largely under the leadership of the volunteer Montpelier Energy Advisory Committee (MEAC) is engaged in a multi-pronged effort. It is attempting to mobilize resources, inspire behavior

change and motivate Montpelier-ites to invest in fossil fuel-reducing solutions to meet our ambitious goal. MEAC has divided our strategies into different areas of energy use: heating, electric generation and transportation. We are even tentatively exploring a much more difficult issue

cont'd on p.9

MICROGRIDS FOR ECONOMIC DEVELOPMENT

By George Harvey

Communities develop where there are resources for their economies. In general, greater resources mean larger or more prosperous communities. Historically, the resources included available water for running mills, forests, mines, roads, and ports or landings, and many others. The early 19th century saw communities develop along canals as they were constructed, and later the same thing happened along railroads, wherever there were stations. The 20th century extended this as access to superhighways, high-voltage power lines, and natural gas pipelines attracted growing businesses. Whether you like these things or not, they drove economic development.

Today, the world is changing in ways many of us could not have imagined only a few years ago. The whole idea of climate change is rather new to nearly all of us. The experiences of tropical storms Irene and Sandy point to more difficult weather ahead. And it is not merely a handful of alarmists who are sounding out on

this. Scientists from NASA and NOAA who speak out are unanimous in calling climate change a serious problem. The US military says climate change is a number one security threat for our nation.

There is good news however. Communities can do something about climate change on their own. And interestingly, this can provide not only security for power for all communities of all sizes, but also a set of economic tools for developing a more stable and resilient local economy. The fact that with proper implementation, this can reduce costs for everyone while reducing environmental damage is a pleasant bonus.

One of the most important of those tools is the microgrid, an electrical system that can potentially stand alone and be self-reliant. A microgrid includes generating capacity of some sort, backup power, and the various other equipment needed to power our electric demand. Those of us who live off-grid already have their own microgrids, typically single home structures with solar panels, battery backup,

possibly a backup generator, and whatever inverters and controls are necessary to do the job.

Grid-tied microgrids are common. They are used at hospitals, emergency shelters, police and fire stations, the secure areas of all military installations, and even some apartment buildings. The main difference from an off-grid system is that the grid-tied microgrid has to have a set of switches and other equipment to detach it

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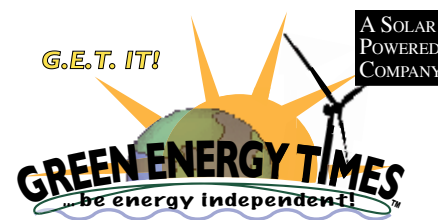
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Thank you all for your help!

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

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

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

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APRIL TWENTY-SECOND

Earth Day - Past and Present

By Green Energy Times staff

Each year, Earth Day is celebrated on April 22nd. This marks the anniversary of what many consider the birth of the modern day environmental movement. Gaylord Nelson, then a U.S. Senator from Wisconsin, created the idea of Earth Day after the disaster of the 1969 massive oil spill in Santa Barbara, California. Inspired by the anti-war movement, he realized that if the same energy were placed towards environmental consciousness, environmental protection issues could be accepted at the national level. Senator Nelson declared the first Earth Day in the U.S. on April 22, 1970.

It was a huge success. By 1990, Earth Day went global with 141 countries participating. More than one billion people



2015 Earth Day slogan.
Photo courtesy of
Earth Day Network

now participate in Earth Day activities each year. It is observed in 192 countries and coordinated by the non-profit Earth Day Network, chaired by the first Earth Day 1970 organizer Denis Hayes. Hayes declares Earth Day as "the largest secular holiday in the world."

The slogan for this year's Earth Day campaign is "It's our turn to lead." Green Energy Times provides information to help you take the lead in your community in preserving the Earth. We

hope you participate in one of the many Earth Day celebrations on April 22nd and maintain this energy throughout the year to help secure a healthy future for ourselves, our children, and the planet.

More info can be found at the Earth Day Network website: <http://www.earthday.org/>.

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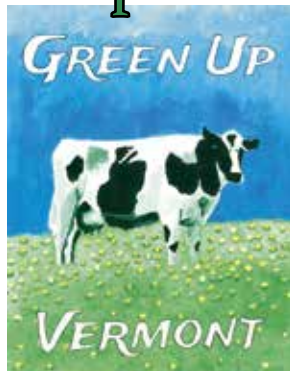


KEEPING IT LOCAL -- KEEPING IT GREEN

Green Up Vermont

By Michelle Harrison,
G.E.T. Staff Writer

Help keep Vermont clean and green! Take part in Green Up Day on May 2nd. This event is a unique Vermont tradition bringing people together in their communities statewide to clean up roadside litter. Since 1970, the first Saturday in May has been designated as Green Up Day. It was started by Governor Deane C. Davis. In 1979, Green Up became a non-profit organization. Over 20,000 people volunteer annually in picking up litter on Green Up Day. Over 40,000 bags of trash are collected annually. Green Up Day is mainly about picking up litter, but many communities provide



2015 Green Up Vermont
winning poster design by
Chloe Boyce, grade 11,
Montpelier High School.
Photo Courtesy of
Green Up Vermont.

refreshments, breakfast, a picnic lunch, barbeque dinner, and even live music and entertainment. Come out and join the community. Get involved. Find out how your community is participating and where to pick up bags at. Make a difference for Vermont! bit.ly/VT-make-a-difference

Green Up Vermont is a nonprofit organization whose mission is to promote the stewardship of Vermont's natural landscape and waterways and the livability of its communities by involving people in Green Up Day and raising public awareness about the benefits of a litter-free environment. Learn more at greenupvermont.org or 802-229-4586.

IN OUR APRIL 15th ISSUE: It's our Six (6) Year Anniversary this issue!

Our theme throughout this issue is about:

'THE POWER OF COMMUNITY': We have focused on:

1) the city of Montpelier, VT, whose goal is to be the 1st net-zero capital in the country. This goal includes energy independence, as well as meeting other important needs such as heating and food, on a community scale as well as individually. Be sure to see how they are doing since we covered it just one year ago -- last April 15, 2014.

2) We are also sharing what is quietly happening in the town of Plymouth, NH.

This rural community of under 8,000 people is simply amazing.

We only touched on a portion of their achievements! See pp. 10-11.

Be sure to read about Burlington, and Rutland, VT in this issue.

In June, look for coverage of another amazing community in MA: Greenfield Center. Guess you'll have to wait to see who else we are planning to talk about in future issues of

G.E.T. If you think we'd like to know about what your town is doing,

email us at: info@greenenergytimes.org or give us a call at 802.439.6675.

You will likely notice that our center spread is introducing you all to New York.

The time has come **'Bring G.E.T. to NY'**. Expect to read much more about what is going on over across the border. They want to not follow our example, but to become the example! Well, the end of winter is approaching, and spring has officially sprung.

Happy Spring to All! ~ Nancy Rae

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Energy Awareness, Understanding & Independence!

YES, BURLINGTON IS 100% RENEWABLE

But, are they really the first - and are they the only one?

By George Harvey

Burlington, Vermont has been much in the news of late as the first 100% renewable-powered city. One question that was asked widely, and answered often was, "Is it really the first city to have 100% renewable power?"

The short answer is, "Yes, Burlington is the first."

The long answer is a bit more complicated. Part of the problem is the question of what is meant by 100% renewably-powered. Does it count that renewable energy credits are included in the mix of power sources? Does it count if the power comes from biomass, which really has to be sustainably grown to be renewable? And come to think of it, what if the city has some anti-renewable holdout, who can maintain some devious way to keep using fossil fuels, despite the higher cost, just to spoil the neighborhood?

Another question is what is meant by the word "city." A number of cities in the United States are 100% renewably powered, by some accounts. Look at the small print, however, and we discover that what is meant is not the city and all its consumers, but the buildings and other infrastructure that are municipally owned. This is admirable, and a number of places should be praised for it, including Ithaca, New York, Scituate, Massachusetts, and others. But it is a lesser goal than what Burlington achieved.

A really good question about what is a city arises from the example of Greens-

burg, Kansas, which has been the subject of one article in Green Energy Times. Greensburg is without question 100% renewable. In fact the residents seem to be gleeful when they explain to all comers that the city has been 100% powered by wind, 100% of the time, for several years. And under definition 1d in my Merriam-Webster's Dictionary, Greensburg is a city, because it is chartered as a city. Nevertheless, definition 1a in the same dictionary says a city must be larger than a town or village, and the population of Greensburg in the last census was fewer than 900. Perhaps we should say they both deserve the title as the "first city" and the honor that goes with it, Greensburg by legal definition, and Burlington by common English usage.

There are news articles around about other cities that are going 100% renewable, including places like Palo Alto, California. Though Palo Alto did announce it would be 100% renewable by 2015, it did not formally become so until the city council approved the plan in March. Boulder, Colorado, is another city that is pretty far along, and a number of others, including San Diego have declared goals of freedom from fossil fuels and nuclear power.

In the Northeast, one city definitely worth mention is Greenfield, Massachusetts, which became virtually 100% renewably powered through community aggregation, an option that is available in

that state. Under this system, the municipality contracts with electric suppliers for power, which is then supplied and distributed to residents by the local authority as a quasi-utility. The process is nearly invisible to residents, who pay very slightly less for 100% renewable power. Of course, they have the option of staying with the standard local utility, if they choose, and pay a little extra for non-renewable power. You can read more about Greenfield on page 12 of this issue.

Towns and villages could go 100% renewable with greater or lesser degrees of difficulty, according largely to state laws. Group net metering is done frequently in Vermont and Massachusetts, but New Hampshire and New York have working systems. The ease of dealing with the states' laws varies. But such systems are intended for groups of people, rather than towns or cities.

There are other places besides municipalities that are worthy of note. Colleges and universities are especially worth mention, not the least of which is the University of Southern New Hampshire, in Manchester, on which we will most probably have an article in the near future.

Now that all the small print is exposed for those who feel compelled to read it, we are pleased to say, "Congratulations, Burlington."

A website devoted to 100% renewable places is www.go100percent.org

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MICROGRIDS

Cont'd from p.1

when the main grid loses power, without which safety issues would arise in general power failures.

A community microgrid is more extensive. Systems large enough to supply entire neighborhoods or towns already exist, but are only commonly found on military bases. Such systems continue to operate when the main grid is without power, and local disruptions usually can be addressed quickly by local crews.

Those community-scale microgrids that are powered by renewable generation sources have the additional feature that they do not need to have fuel delivered, and so can operate indefinitely in the event of a grid failure.

The advantages to a community of having its own microgrid are enormous. The fact that a community can continue operation in the event of large-scale power outage is attractive to anyone who might need to have a very reliable power source. Banks, data centers, brokerages, gas stations, restaurants, hotels, and all sorts of other businesses can benefit from such a system. This is something a community can use to attract investment; it is an economic tool.

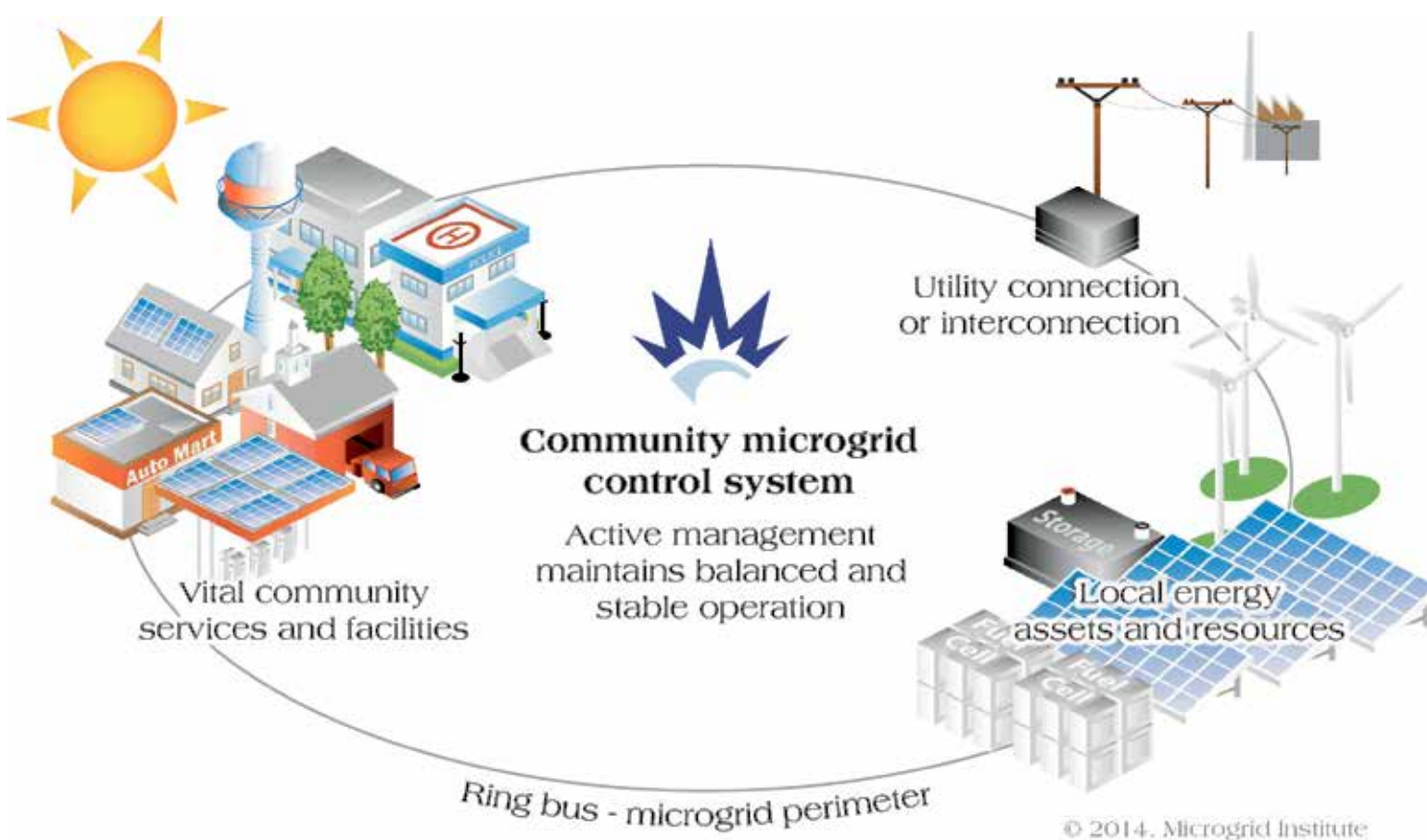
Interestingly, even if we could know that the grid would never fail in a particular area, there can be benefits of renewably-powered microgrids. The local generating equipment can supply much or all of the power to the microgrid, even when it is attached to the main grid. This means that equipment installed for power

supply resilience also functions to keep the money paid for power within the community. In a community of sufficient size, this will create employment and investment opportunities of its own. This is a second economic tool.

If the microgrid is community-owned,

then its profits could be used to lower taxes or pay for services. If the microgrid is investor-owned, then it will pay taxes, and if the investors are local then the profits stay in the community. In either case, the microgrid is a component of another economic tool.

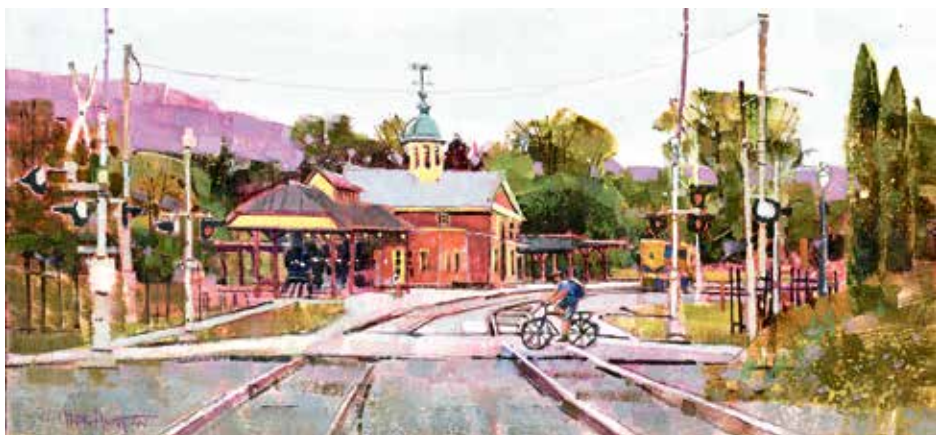
While the problem of global warming is global, some of the best solutions to the problem need to be implemented locally. Interestingly, some of those solutions can also help ensure the long-term prosperity of those communities that implement them.



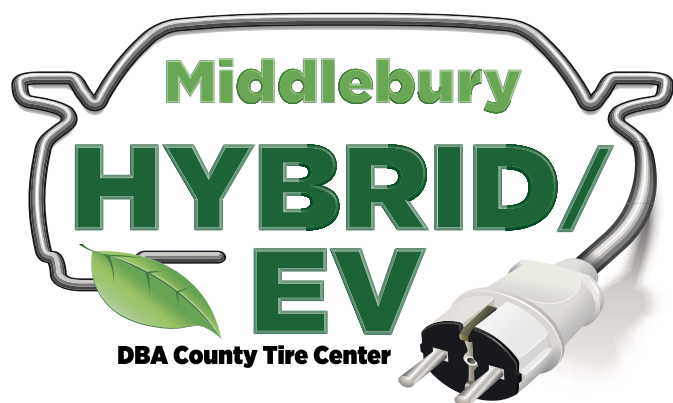
A community microgrid. Courtesy of the Microgrid Institute: www.microgridinstitute.org.

A DAY IN VERMONT
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"White River Junction"



"White River Junction, Vermont" Painting by Peter Huntoon, September 2014. From the collection, "A Day in Vermont," celebrating the beauty of Vermont through art. www.ADayinVermont.com



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TRANSPORTATION

EV Charging Equipment Rebates in NH

The New Hampshire Department of Environmental Services (NHDES) and the Granite State Clean Cities Coalition announce the availability of rebates to support the new installation of new electric vehicle supply equipment (EVSE) in New Hampshire.

Motor vehicles produce the majority of the air pollution in New Hampshire that leads to smog and unhealthy air quality. Plug-in electric vehicles (EVs) reduce those emissions through use of cleaner energy from our regional electric supply. The number of EVs in New Hampshire and the region is increasing rapidly. This EVSE rebate program will enable the development of an EV charging network in the state that will be available to New Hampshire residents and businesses, as well as to those who visit our state for business or to take advantage of our many recreational and cultural opportunities.

The rebate program is designed to support development of EVSE at strategic locations to enable operation of EVs throughout New Hampshire and connect to charging corridors in neighboring states. Targeted areas of deployment include Interstate highways and other major transportation corridors, as well as key destinations such as tourist attractions, large retail centers and large employment centers. For more information visit des.nh.gov.

Other useful links for EV's in NH are: www.plugmyride.org, www.plugmyride.org/Residential/Residential.aspx. An Alternative Fuel Data Station Locator is at www.afdc.energy.gov/fuels/electricity_charging_home.html.



EV FINANCING IS AVAILABLE in VERMONT

The Vt State Infrastructure Bank administered by the VEDA (Vermont Economic Development Authority) is offering loans to qualified buyers. With 10% down and a 1% interest rate, the repayment period (based on equipment life) is typically up to 10 years. Learn more at www.driveelectricvt.com/chargingloan

Drive Electric Vermont also shares helpful information regarding Electric Vehicles such as Vermont Electric Vehicle Charging Locations and Pricing, Types of EV's, Types of Charging, Financing, an Installation Guide and much more. Their website is www.driveelectricvt.com.

The U.S. Department of Energy offers an Alternative Fuels Data Center where you can find information about EV's that includes electricity basics, benefits and considerations, how to conserve fuels, locate stations, laws and incentives, infrastructure development, charging at home, in multi-use dwellings, and in public. For this info, visit www.afdc.energy.gov/fuels/electricity_infrastructure.html#level2

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The Alt Energy will showcase a full spectrum of both mainstream and newly-developed, alternative energy-based vehicles and technologies on July 25th, for demonstrations and option to drive up to the summit of Mt. Washington, the highest peak in the Northeast at 6,288ft!



Contact event director Ted Dillard at
ted@altenergysummit.org or (978) 621-5178

**1 Mt. Washington Auto Road, Gorham, NH
(603) 466-3988 AltEnergySummit.org**

Bikes Make Sense

By George Harvey

The cost of owning cars varies enormously. Factors include the price of the car, the cost of financing it, its age, how it is maintained, insurance, where you park it, how you drive it, cost of fuel consumed, and registration fees.

Points that are not obvious include things like how much time the car spends idling, and how aggressively it is driven. These two factors alone can shorten the reliable lifetime of the car by as much as 50%. (Ask your town manager about the life expectancy of police cruisers.)

The American Automobile Association estimates the cost of owning a car each year. Right now, costs are about as low as we might expect them to get, because of the price of gas. Even so, reducing the AAA's estimate for car ownership in 2014 to compensate for the difference, we get these average costs for car ownership:

Small Sedan	\$5993 per year
Medium Sedan	\$7615 per year
Large Sedan	\$9330 per year
SUV	\$9510 per year

If you think this is a lot, you might want to consider the other costs that AAA did not include in their calculations. We will mention some, and you can tally what you think they are worth to you. A certain Mr. Q. provided us with his evaluations.

- ◇ How much does parking cost? Many urban apartment dwellers pay over \$250 per month for their parking places. Mr. Q. gets, who gets parking with his apartment, considers it to be worth 5% of his rent, making it \$50 per month, or \$600 per year.
- ◇ How much is it worth to feel fit? You could pay \$50 per month to a health club. Biking and walking reduce body fat, increase endurance, strength, and agility, saving you that amount. Mr. Q. is rather lazy, however, and would not use a gym, so he adds a \$0 annual cost.
- ◇ How much is it worth to avoid medical costs? Exercise reduces likelihood of heart disease, high blood pressure, stroke, colon cancer, breast cancers, diabetes, osteoporosis. Would we pay \$75 per month for that, perhaps? Mr. Q. agrees, and adds \$900 per year.
- ◇ What about the value of a sense of well-being, and reduced levels of stress and depression, and even a reduced possibility of dementia. Mr. Q. (who looking surprised at being asked what he would pay to avoid dementia) says it would be as valuable as a vacation, another \$1200 per year. (We inform him that he may not change his answer to question 2.)
- ◇ A recent study says adding the environmental costs to the price of gasoline would raise it by \$3.75 per gallon. For Mr. Q.'s car, which uses 500 gallons per year, so that adds \$1875 to the annual cost of car ownership.

Assuming that a bike costs \$500, gets \$25 in maintenance each year, and lasts ten years, its cost is \$75 per year. We reduce the savings of giving up a car accordingly. Mr. Q., who drives a mid-size sedan, could save \$12,115 per year by biking and walking instead.

Clearly there are some people who cannot just drive a bike. They might benefit from considering ride shares. Many have no easy way of giving up a car. Our editor, who lives far out of town on dirt roads, making winter snow and mud season difficult, and who has to transport thousands of papers at a time does ride bikes all over the countryside, including an electric bike powered entirely by solar PVs, but her car is a necessity, at times. For such people, the only thing that makes sense for now is to keep a car that is worth the cost.

But for many, the question is, what would you be willing to do for \$12,000 per year? Would you give up the car and bike or walk? Mr. Q. has a slightly-above-average savings of \$12,115 per year, which he believes is really good pay for not being lazy. We will keep tabs.

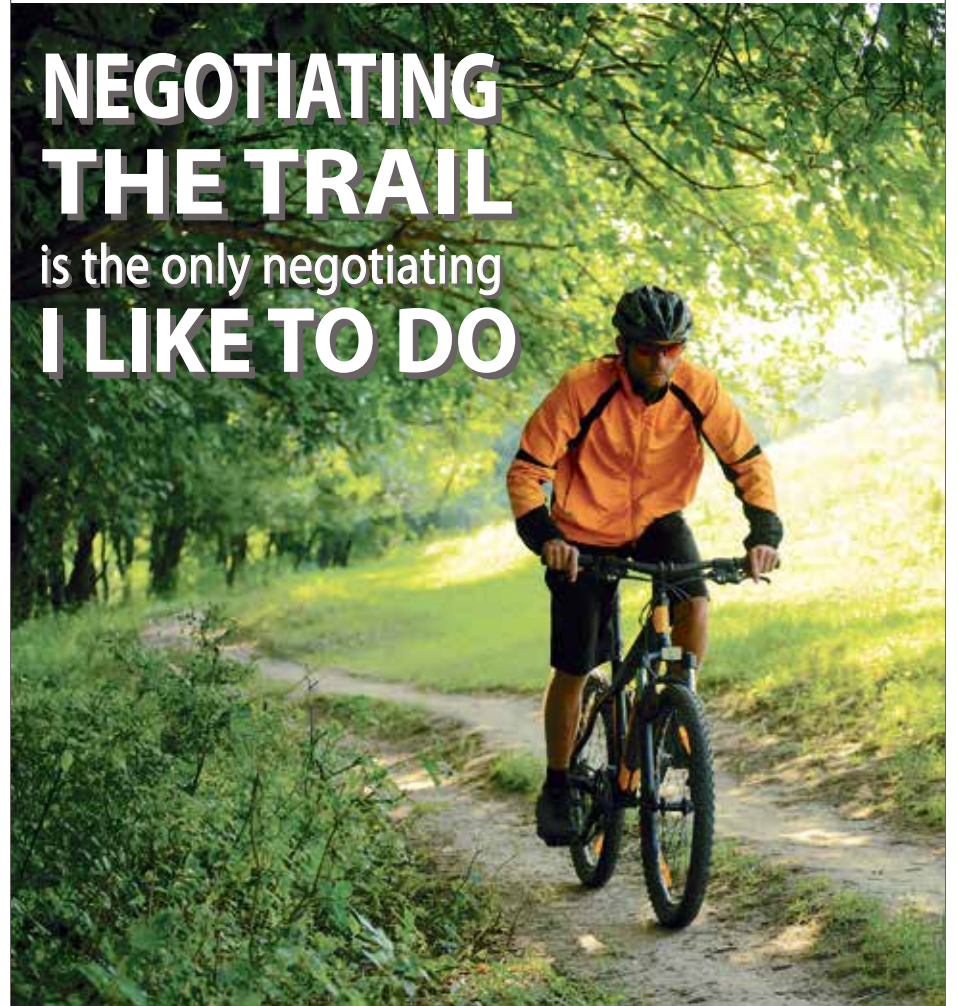


Critical Mass biking event in San Francisco. This event takes place in hundreds of cities worldwide, each month. Photo by mwparenteau, from Wikimedia Commons.

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

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

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

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

IN NEW HAMPSHIRE

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

ADVANCE TRANSIT (AT) - Free weekday bus for Lebanon, Hanover, Enfield, Canaan, NH, and Norwich and Hartford, VT. Dartmouth and DHMC Shuttles. ADA & Travel Training Services. 802-295-1824. advancetransit.com

CARROLL COUNTY TRANSIT - Services and connections to Belknap County. 888-997-2020 tccap.org/nct.htm

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

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

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

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

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

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

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

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

WINNIPESAUKEE TRANSIT SYSTEM (WTS) - Services Belmont, Franklin, Tilton, Laconia. 603-528-2496 bm-cap.org/wts.htm

IN VERMONT

UPPER VALLEY TRANSPORTATION MANAGEMENT ASSOCIATION (Vital Communities) - Works with UV employers and communities to promote and improve commuting options. 802-291-9100 vitalcommunities.org/transport/index.htm

VERMONT PUBLIC TRANSPORTATION PUBLIC TRANSIT - Lists transit, ferries and more at aot.state.vt.us/PublicTransit/providers.htm

AMTRAK - Long distance train service. Discounts for AAA members and student advantage card. (800) 872-7245 amtrak.com

CHITTENDEN COUNTY TRANSPORTATION AUTHORITY - Burlington bus service with links to Montpelier, Middlebury and commuter route to Milton. cctaride.org

CONNECTICUT RIVER TRANSIT - Services in Bellows Falls and Springfield. crtransit.org

GO VERMONT - Offers carpool matching and commuter connections in VT 800-685-7433 connectingcommuters.org

GREEN MOUNTAIN RAILROAD - Day trips from White River, Champlain Valley, Bellows Falls and Rutland. rails-vt.com

GREEN MOUNTAIN TRANSIT AGENCY - Local service in Barre, Montpelier, Grand Isle, Stowe and Lamoille. 802-223-7287 gmtaride.org

GREY HOUND/VERMONT TRANSIT - Long distance bus services. 1-800-231-2222 greyhound.com/

LAKE CHAMPLAIN FERRIES - Transport between New York and Vermont via Lake Champlain. 802-864-9804 ferries.com

MARBLE VALLEY REGIONAL TRANSIT - For Rutland, Killington, rural Manchester, Poultney and Rutland to Bellows Falls. City routes Free on Saturday. 802-773-3244 thebus.com/

RURAL COMMUNITY TRANSPORTATION (RCT) - Buses, vans, and volunteer drivers. Routes via The Jay-Lyn, The Highlander (Newport - Derby Line); The US RT2 Commuter (St. J. to Montpelier) and Free routes to rural areas. 802-748-8170 ridect.org

STAGE COACH - Commuter buses from Randolph and Fairlee to Dartmouth, Local village buses. 800-427-3553 stagecoach-rides.org

NEW! FIND ALL COMMUTER RESOURCES IN ONE PLACE

We all know there are many transportation choices in the Upper Valley, but sometimes it's not easy to find them. Now a new UV Commuter Portal has all the resources commuters want in one place.

Located on the Upper Valley Rideshare website, you'll find Carpool Matching and Benefit Tools, Transit Schedules, Bike & Walk Trails, Park & Ride Location Finder, Transportation Experts and Advocacy and more. By collecting all the resource links on one page, it is easy and quick to find information without having to hunt for resources. Each transportation provider maintains and updates its own data, so the links always bring you to the most current information.

The UV Commuter Portal can be accessed by Smart phone, tablet or computer. It is a component of the RT120 Corridor traffic reduction project that is going on now. Find the Portal at www.UpperValleyRideshare.com/commute-portal/ to find a new commute!

For information call 802-295-1824 x208 or e-mail sberry@uppervalleyrideshare.com. The Portal is a product of the 2014 RT120 Corridor Workgroup sessions.



IDLE-FREE VT INC.

ENVIRONMENTAL COURT RULES IDLING TRUCKS IN VIOLATION

By Wayne Michaud

Residents of an East Hardwick, Vermont neighborhood that endured and then fought the pollution and noise of heavy-duty truck idling daily in a Compact Residential zoning district for nearly nine years won a Notice of Violation (NOV) judgment order from the State of Vermont Superior Court Environmental Division on March 4, 2015 that effectively prohibits a trucking company from continuing operation of commercial truck tractors in that district.

John Mandeville, an appellant in the case, following issuance of judgment, stated, "...the whole neighborhood is much relieved that this is over and that we were successful in our case before the Environmental Court and, as a result, we will get our nice, quiet village back."

A summary of the facts in the case is as follows:

A trucking company has owned property in an East Hardwick Compact Residential neighborhood since 2006, with two trucking-related businesses registered at their address. Residents of two properties, who are the appellants in the case, are located next to and across the street from the trucking company. The street encompasses a quiet neighborhood of residential dwellings.

The trucking company has had two diesel-powered commercial truck tractors (that pull trailers) stored on their property, used for long- and short-haul trucking.

On-site maintenance on the tractors combined with long warm-up periods resulted in prolonged engine idling. The idling occurred for up to 45 minutes at a time at all hours of the day or night. Associated with this idling were noise, vibrations, and diesel exhaust fumes that would prevent the appellants from

opening their windows or sitting on their porches.

The Environmental Court judgment overturned a Town of Hardwick Development Review Board determination in favor of the trucking company, ruling that they were not in compliance with Town Bylaws; the Town intends to abide by the court's decision.

In the wake of this case, it is important to note that (1) engine manufacturers and experts in the trucking industry make it clear that prolonged idling is rarely necessary and (2) continued exposure to vehicle exhaust chemicals, particularly from heavy-duty vehicles, is harmful to human health. Children and the elderly are most vulnerable. These exhaust chemicals can cause cancer and respiratory illness such as asthma; Vermont has elevated levels of asthma.

Idle-Free VT Inc. is a 501(c)(3) nonprofit organization with a goal of raising awareness of unnecessary vehicle idling in Vermont primarily through education. It also encourages adoption of policies and procedures, and enactment of laws, to limit vehicle idling.

Wayne Michaud is the Director, Idle-Free VT Inc., 802-453-5857; info@idlefreevt.org; idlefreevt.org

The U.S. Environmental Protection Agency (EPA) has identified 21 chemicals in bus and truck exhaust that are known or suspected to cause cancer or other serious health effects. These include chemicals such as benzene, formaldehyde, acetaldehyde and 1,3 butadiene.

http://www.hcdoes.org/airquality/x_Anti-Idling/BusHealth.htm

VERMONT SOLAR FARM

Wins 2015 Project of Distinction Award



Final commissioning of the Stafford solar project is expected in June once all battery storage and controls are fully tested. Photo: Green Mountain Power.

Green Mountain Power and groSolar have been awarded the 2015 Project of Distinction Award for the Stafford Hill Solar Farm in Rutland, by the Solar Energy Industries Association (SEIA) and Solar Electric Power Association (SEPA). The award was presented at PV America, an annual trade show and conference in Boston, MA, that is designed to serve and advance the solar PV market by bringing together industry professionals. The award celebrates a major milestone for the Northeastern solar market and recognizes the highest achievement for a PV solar energy project of any scale.

"SEIA and SEPA commend the recipients of this year's Project of Distinction award, groSolar and Green Mountain Power," said Rhone Resch, CEO and President of SEIA. "Together, and with their partners, they have developed and constructed a very innovative project in Rutland that will provide power to thousands of homes, along with a storage component to power a shelter in the event of power outages. It's projects like this that will continue to help grow the solar industry, and awareness, nationwide with such innovation and cutting-edge technology."

Stafford Hill is an exciting new project designed to improve resiliency and safety in communities by generating solar energy that can be stored and used to power an emergency shelter at Rutland High School in the event of weather-related power outages. According to the U.S. Department of Energy, the Stafford Hill Solar Farm is the first project to establish a micro-grid powered solely by solar and battery storage, with no fossil fuels. The project also utilizes land atop a closed landfill, which was otherwise unsuitable for development.

"We are very honored by this award and thank SEIA and SEPA for this acknowledgment," said Green Mountain President and CEO Mary Powell. "Stafford Hill is a terrific example of how, working together, we can transform space that would otherwise be unusable into something that is critical to the community in times of need. This project will power the city's emergency shelter during storms, providing peace of mind to the people of Rutland."

The project, engineered and built by

groSolar, which has offices in White River Junction and Rutland, Vermont, consists of 7,700 solar panels capable of generating two megawatts (MW) of electricity, enough to power as many as 2,000 homes. The system includes four MW of battery storage, including emergency power for the nearby emergency shelter.

"We're thrilled to have this project recognized for its national significance and are confident it will lead to similar applications elsewhere. Partnering with Green Mountain Power to develop and build this innovative system is a huge feather in our cap and we are grateful for the recognition from the folks at SEIA and SEPA," said groSolar CEO Jamie Resor. "Completing this project and receiving this award wouldn't have been possible without everyone who was involved in this partnership. It's exciting to see the PV industry grow and mature in Vermont and elsewhere."

Stafford Hill is another important step in the partnership to establish Rutland as the "Energy City of the Future," where GMP pilots new technology to empower customers to lower their energy costs by using less energy while improving the comfort of their homes. This project also represents progress towards the goal of making Rutland City the "Solar Capital of New England."

"The quality of the partnership between the city, GMP, and groSolar on this project is unprecedented," Rutland Mayor Christopher Loras said. "It is the epitome of good collaboration, with wins for everyone involved."

Dynapower of South Burlington designed special equipment for the project and the Clean Energy States Alliance helped secure funding from the U.S. Department of Energy along with grant contributions from the Vermont Clean Energy Development Fund.

The \$10 million solar and battery storage project is set to be completed in May.

For more information about PV America visit: <http://www.pvamericaexpo.com/>. To learn more about Stafford Hill and other energy projects from Green Mountain Power, visit www.greenmountainpower.com, and find out more about groSolar, including its services and project portfolio, please visit www.grosolar.com

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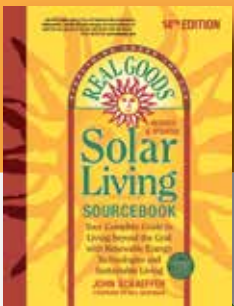


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Net-zero Capital Goal in Sight

Cont'd from p.1

of how possibly to transform our housing density, since dense, walkable cities are much more energy-efficient.

We have done a lot – but we have much more to do. And, we have a track record upon which to build, as this journey didn't start last year. It started over a decade ago with the concept of a district heating plant. It grew through the effort of our local energy teams, who knocked on doors promoting energy efficiency, and surveyed city buildings and businesses for efficiency modifications.

In 2010, after the successful procurement of a DOE grant to support a local biomass district heat system, our energy advisory committee was mandated by the city council to oversee the process.

The district heat system will replace about 300,000 gallons of oil per year, which now costs almost a million dollars. Using regionally-sourced wood chips along with local maintenance services, the project is also keeping dollars working locally. I am proud to report that this innovative project started delivering heat to state and city offices and to some downtown businesses in fall of 2014. Reports of our initial customers are glowing in terms of its reliability and realized savings.

There are other efforts afoot, too. Montpelier is now completing negotiations with a local solar energy developer

to provide 1 MW of net-metered electric generation which will cover over 70% of the city's municipal electric consumption, likely at a 15% savings under the utility tariff. The Montpelier schools are about to issue an RFP for enough solar generation to cover their needs. Our street lights are now LEDs. Even our sewage treatment plant has become a model of energy efficiency. This means that, except for

city buses and vehicles, we are in sight of achieving our net-zero goals, at least for our municipal operations.

As we have matured and accomplished more, people from around the state have noted how lucky we are to have this committee, composed of knowledgeable and committed volunteers helping to build a resilient future for us all.

City and local leadership and the hard work of a dynamic, knowledgeable and committed cadre of volunteers, have been essential. But, again, there is much more to do.

Getting homes and apartment houses in the efficiency mix is somewhat harder. Since

2006, according to Efficiency Vermont, over 500 Montpelier homes (that's 15%) have completed some level of weatherization work. Our energy committee is now in an intensive strategic planning effort to address the big energy demands of residential users and the whole transportation mix. For all of us, this work is the hardest

because there are few easy, convenient alternatives.

Our big advantages going forward will be our small size. At 8,000 people we are able to move more quickly than larger political institutions, and there is an obvious benefit to being the capitol city of Vermont. Our population doubles mid-day, which brings vibrancy and resources to our local economy. Our very healthy commercial sector is quite supportive of the energy work, especially the savings now being realized from the district heat plant.

Montpelier is also gaining in other ways from our commitment to become net zero. Recently the Department of Energy and the White House recognized our city as one of 16 Climate Action Cities in the country. This will give us a leg up in mobilizing Federal resources. We are also one of the nation's 50 finalist competitors for the Georgetown University Energy Prize.

We can boast many tangible results for a small city with such a forward looking commitment. There is much more real, hard work to do. But, if the next few years manifest anything close to the progress we have made to date, I believe it is quite



Top: This solar PV array at Green Mountain Power's Montpelier headquarters provides power to two local nonprofits, VNRC and VLT.

Bottom: Montpelier's biomass district heat plant serves downtown businesses and city buildings. Photo: Dan Jones

possible for capitol of Vermont to be net-zero by 2030.

There is so much happening in Montpelier. Stay tuned for updates in future issues of Green Energy Times -- as this city becomes the first fossil-fuel-free, net-zero capital in the country.

Dan Jones is the former chair of the Montpelier Energy Advisory Committee.

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RESILIENT COMMUNITIES

PLYMOUTH, NH IS DOIN' IT!

Staff Article

In the pursuit of community resilience, one of the most active communities in New England is unquestionably Plymouth, New Hampshire.

The Plymouth Area Renewable Energy Initiative (PAREI) is a leading organization in this pursuit. Co-Director Sandra Jones says, "PAREI's goal is for every resident in the town to consider the issue of energy when making small and big decisions at home and at work. All we ask is that people 'just think about it, think about how you choose to use energy and when you do choose to use it, take a minute to appreciate it.' We believe this very exercise leads to constructive change."

Considering the number of projects we see coming along with PAREI's help, it seems clear that approach is working. Plymouth's population is about 7,500,

including a few hundred college students. Despite the town's small size, a lot has been happening.

The latest numbers: a total of 24 solar photovoltaic (PV) systems with 101 KW of total nameplate capacity getting rebates in Plymouth. The total cost of facilities is \$412k. PVs have been installed on the Pease Public Library and the Plymouth Elementary School. The town is also planning a solar PV array at the municipal recycling center.

A number of individuals are heavily involved. Dick Flanders is one of the town's early adopters. He has been keeping track of his energy usage since the 1970s. Today, he has a solar thermal system installed by PAREI. He also has 4.59 kilowatts of solar PVs, which he calculates will have

a payback time of a bit over twelve years. His other resilience efforts include large vegetable gardens at his home.

Steve Whitman and his family are restoring a late Victorian homestead, making the property a model permaculture project. They want to reduce their ecological footprint and have a positive environmental impact. Their improvements include insulation, air-sealing, an improved heating system with computer controls, and a composting toilet. Their upgrades use locally milled lumber, clay plaster, non-VOC coatings, and locally manufactured cabinets. They have worked to repair their soil and built gardens with a view to food security, habitat care, and consideration for pollinators.

The New Hampshire Electric Co-operative (NHEC) is working with Plymouth to upgrade its streetlights. The program began in 2012 and is aimed at increasing both efficiency and effectiveness of the lights. High pressure sodium streetlights are being replaced with new LED lights. Unnecessary or redundant lighting is being removed altogether. The project will continue in phases with remaining downtown and outlying areas scheduled for conversion by 2016.

We should note that the NHEC recently voted on a new net-meter cap. They raised the cap to 3.4 MW from the previous 3.16 MW because it was already oversubscribed at 3.24 MW. The NHEC decided on their own to do this; kudos to the NHEC.

Weatherization has not been neglected in Plymouth. The town is one of three New Hampshire communities chosen to participate in the Better Buildings program. This is a three-year grant-funded program undertaken by the town with help from the New Hampshire Office of Energy and Planning and the New Hampshire Community Development Finance

"This is not a private planet. It is a community initiative."

~ Malidoma Some



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Authority. Its purpose is to provide resources and financing for energy efficiency upgrades on commercial, industrial, municipal and residential buildings. Over the life of the program, Better Buildings helped oversee 36 residential and 21 commercial weatherization projects within Plymouth with an estimated annual cost savings of over \$96,000 on participant's energy bills.

Plymouth is providing an example other communities might follow to their own benefit.



Whitman Homestead. Inset: Solar office/bioshelter on the Whitman's land, built largely from recycled materials.

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Oldies ...but Goodies

A RECAP OF STORIES ABOUT PLYMOUTH FROM PAST ISSUES OF GREEN ENERGY TIMES

Plymouth water and sewer array, February 2015



A new solar array belonging to the Plymouth Village Water and Sewer District began producing power in December of 2014. It was built with the help of a coalition of a large number of people and organizations. The project started in earnest in 2012, when water and sewer officials started looking into ways to reduce costs. Plymouth Area Renewable Energy Initiative (PAREI) and New Hampshire Electric Cooperative (NHEC) responded by giving assistance with getting a \$317,000 grant from New Hampshire's Renewable Energy Fund.

Greenest school list from Greenpeace, October 2014



Plymouth State University's environmental sustainability efforts caught the attention of the country's largest environmental advocacy group. The Sierra Club has named PSU to its list of America's Greenest Schools. According to the Sierra Club, the rankings are based on "an extensive questionnaire that asks about everything from where a campus gets its energy to whether its landscapers use native plants and its cafeterias offer recycled napkins." Brian Eisenhauer, PSU's Director of Environmental Sustainability, said he's proud of the institution's efforts in being "green."

The Common Man, October 2014



The Common Man Inn is in a building that was previously an abandoned wood mill. It had, in its heyday, manufactured tongue depressors, Popsicle sticks, and paint stirrers. Owner Alex Ray had the 60,000 square-foot mill transformed into an inn with 37 overnight rooms, two event halls, a spa, and a salon. The mill's old boiler room became a three-story-tall restaurant and lounge named in honor of its original function, "Foster's Boiler Room." The renewable energy features of the inn are impressive. As much as practically possible, natural resources are used for energy.

Energy-efficient Off-Campus Rentals, August 2014

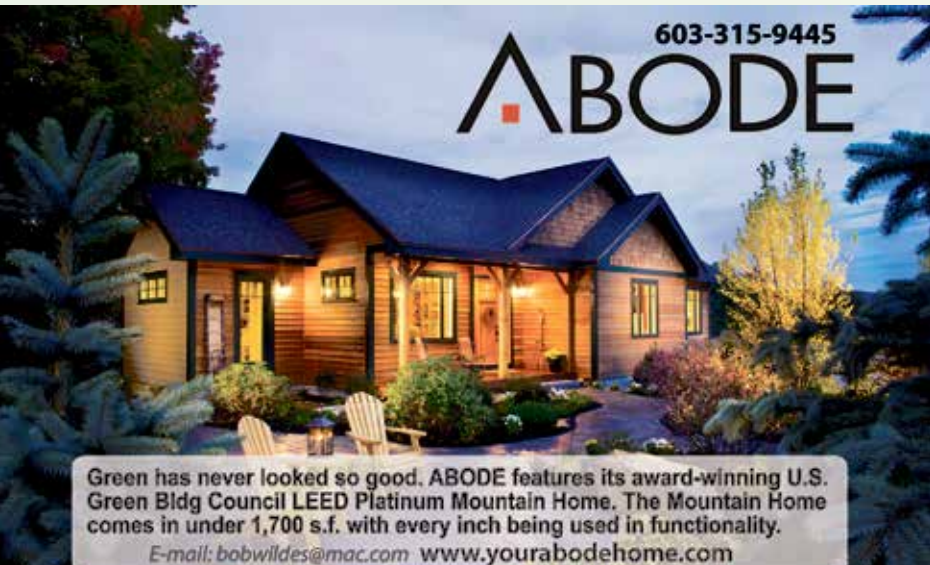


PAREI gave us two good examples of green off-campus student housing in Plymouth. Don Stoppe runs Campus Edge Apartments Plymouth. Micah McLane, operates Off Campus Rentals. Both are passionate about renewable energy and efficiency, and the results show in their rental units. Solar photovoltaics (PVs), solar thermal hot water and heat, heat pumps, and highly efficient insulation and air sealing have produced rental units that are cozy and inexpensively heated. Best of all, they are kind to the environment.

Net Zero Sun-Powered Health Care, August 2013



Dr. Jennifer Highland has an office that is close to net-zero energy use. She says, "Going solar at my medical office was a no-brainer; it was just a question of working out the details. As a doctor, I find it impossible to separate the health of the environment from the health of the individual. New scientific studies every year are documenting the ways in which toxic substances released into the environment affect human health. This applies to chemical waste and food additives, but also to noise and light pollution and climate change."



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Rand's Hardware in Plymouth, December 2012



Steve Rand, at Rand's Do it Best Hardware in Plymouth, could teach a course on fitting up old buildings for energy efficiency. He got a lot of experience refitting the building his hardware store is in, and which also has two other businesses and eight apartments. He got help with an energy audit, by Better Buildings New Hampshire and from PAREI, which eased the paperwork problems. Solar hot water, new insulation and skylights, new air sealing, new windows, and a new furnace reduced energy use impressively. Solar PVs are planned.

Pemi Baker Health Spa, June 2013



Pemi-Baker Community Health had two separate solar thermal energy systems. Design details were worked out with help from PAREI. One installation has two roof top evacuated-tube solar thermal collectors with a total of sixty tubes to pre-heat the water in a 119 gallon tank that feeds the primary electrically heated water tank. The other installation has eight solar thermal collectors, totaling 240 tubes, installed on the ground outside the facility to provide heat for the facility's 18-by-36-foot therapy pool, saving 750 gallons of propane each year.

ECOHOUSE

EcoHouse was designed at Plymouth State University (PSU) as a laboratory and showcase for sustainable living in residential settings. Both the technologies of physical structure and behavior adaptations for sustainability are considered.

The EcoHouse Project started in 2008 and was funded with a grant from the University System of New Hampshire. The building already belonged to Residence Life at PSU, and had four student apartments.

As class projects, students evaluated the house for energy efficiency and proposed projects. They had an integral role in designing EcoHouse. A number of community organizations also participated, including PAREI and D Acres of New Hampshire.

Efficiency measures included new insulation and use of integrated concrete forms for foundation repairs. Low-VOC paints, carpet, and drywall were used, as was natural linoleum flooring. Wood flooring was scrap from large projects. Other wood is local and sustainably harvested. Technology includes programmable thermostats, very low-flow shower heads, and dual-flush toilets.

PAREI and NHEC supported student design and installation of a solar hot water system. D Acres of New Hampshire helped organize and run a workshop to establish compost bins at EcoHouse. Permaculture efforts were designed and installed by students studying relationships, perennials, growing food, and closed loop systems.



EcoHouse at Plymouth State University, NH.

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1.7 MEGAWATTS and Counting...

Staff article

Solarize Upper Valley is a program of Vital Communities. It builds on other successful Solarize programs throughout the country, teaming up local communities with solar photovoltaic (PV) installers for 15 weeks of outreach. It is aimed at making solar energy less expensive through a tiered-pricing structure that brings the cost down for all participants as increased numbers of residents sign up. This makes solar power more accessible to residents.

The program's long-term goals are to double the amount of residential solar energy in each of our partner communities and spark continuing growth in the region's solar energy market. In this way, benefits may spread outside the participating communities and continue after the Solarize program is completed. The Solarize Upper Valley program demonstrates that the Solarize movement can be effective even in a rural setting and provides an open-source model to be shared with grassroots groups in rural communities everywhere.

Vital Communities coordinated two rounds of the program in fifteen towns in Vermont and New Hampshire between late 2013 and early 2015. The Round Two Report was released in March. It reports that every Solarize Round Two community met or exceeded its goal of doubling the pre-Solarize baseline of residential solar PV installations.

In the two rounds of Solarize Upper Valley, 301 homeowners contracted for solar installations, adding 1.7 megawatts (MW) of renewable energy to the region. Installing this much residential solar is an amazing accomplishment, and this is just the upper valley in VT and NH. In addition, dozens of other homeowners in partner communities were also inspired by Solarize to go solar with their own installers.

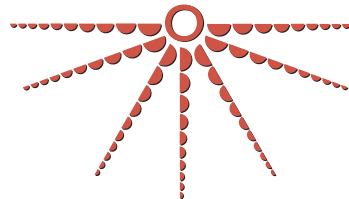
Three of the five Round Two communities had enough participation to reach their lowest pricing tiers. Homeowners in all communities saved between 15¢ and 40¢ per watt from the base price at the beginning of the program.

Solarize Upper Valley will continue to do its work. Round Three will launch in June, 2015.

For more information about Solarize Upper Valley call Sarah Simonds at (802) 291-9100 x 109 or visit their website at VitalCommunities.org/Solarize.



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<< These photos are from actual installations and events promoting the Solarize Upper Valley's successful programs. In just the Upper Valley of Vt. and Nh., total installations are now at 1.7 MW and counting!



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Hydro Site for Sale



A dam of this size with a semi-Kaplan turbine could provide 58,469 kWh per year, with a gross value of \$12,569 per year. And it's for sale! Photo courtesy of Josiah Allen Real Estate.

By George Harvey

In February, we published "Affordable Power for NH," the story of a small hydro site that had been given generating capacity and was looking for power customers. The site is operated by Steels Pond Hydro under the guidance of Lori Barg, who gave us a wealth of information.

Some time back, she did an inventory of Vermont dams and other sites that could be developed to produce power for the grid. This was part of a thorough Vermont Dept of Public Service report, "The Undeveloped Hydroelectric Potential of Vermont." It lists the potential capacity of about 300 of Vermont's 1,200 sites, for a combined potential capacity of 90 megawatts (MW). Since the study was published, over 20 MW has been developed.

(The report is available in three parts at bit.ly/VT-hydro-reports; look under "Vermont Reports" for Lori Barg's name. We wish we had similar inventories for other states, but what is there is mostly obsolete, and the US Department of Energy (DOE) is still upgrading it. It is safe to assume that other areas comparable to Vermont would have similar undeveloped existing resources.)

An earlier study by the DOE's Idaho National Labs identified 149 sites in Vermont, that could potentially produce 420 MW without a single new dam. The 420 MW potential means the sites identified by the Department of Energy could be an important resource. Assuming a capacity factor of 0.50 (meaning their average output is 50% of their nameplate capacity) Vermont's undeveloped sites could potentially produce an average of 210 MW for each of a year's 8766 hours, to produce 1840 GWh/y. That is about a third of the electricity that Vermont uses. The sites are spread throughout the state, and could potentially boost both the economy and the resilience of any community where one could be developed. A special search tool can be found at bit.ly/hydro-prospector.

The fact that the sites already exist is also important, because Vermont already has over 1,200 dams providing everything from flood control to recreation. We do not need more infrastructure in the rivers.

Just recently, we came across a hydro site in Vermont that is currently on the market, and it provides a really great example of a very small dam that could be

developed. It is a historic mill in Shaftsbury, Vermont, about ten minutes north of the main areas of Bennington. It was used by a blacksmith at one time. It has an old turbine in place, once used to grind grain. This means some permitting is not needed because the new hydro turbine would be regarded as an upgrade, rather than a new installation.

Scully Hydroelectric Consulting, in North Bennington, recently estimated that a semi-Kaplan turbine would provide 58,469 kilowatt-hours per year, with a gross value of \$12,569 per year. The site could qualify for group net metering and renewable energy credits; the precise value of the electricity produced depends not only on turbine design and weather, but the decisions on how the electricity is to be used or sold.

The building is beautifully built of stone. Dating to 1823, it is full of history, but the stone walls, history, and dam are not its only attractions. It is on a lot of 8.4 acres, much of which is open. The rooms on the first floor are simply stunning; they are very large and have beautiful massive beams across the ceiling. The thick stone walls could easily be given cushions to make attractive window seats.

The stone walls are beautiful, but stone conducts heat very easily. Though one person who lived there many years found the house comfortable as it is, it might be worth while to consider insulating the building, depending on how it would be used. Another consideration is that the mill is in a flood zone and a lender would require flood insurance. Interestingly, however, while Irene brought flooding on the land, it did not affect the house.

Despite features that might be daunting to the unprepared, it looks like the exact sort of thing some people would spend a long time searching for. Hydroelectricity is not the something a person can take up quite as easily as putting solar panels on the roof, so we would expect people who have done their homework on the subject and are still looking for a dam would be up to the challenge.

The mill property in this article is listed by Josiah Allen Real Estate/Manchester. Please see the ad for the property on this page. The property listing can be seen at bit.ly/hydro-site-for-sale.

Rutland's growing Resilience

Over 5 MW is in – Nearly 5 MW More is on the Way

By George Harvey

It is hard to keep track of all the things relating to resilience going on in Rutland. Green Mountain Power (GMP) has decided the city will be the "Solar Capital of the Northeast" and seems determined to make that happen. As hard as that might sound, the work goes far beyond a mere installation of sufficient solar to power everybody. It includes efficiency, heat, transportation, and more.

The Stafford Hill Solar Farm is in the news, together with the microgrid it powers. These have won an award, which is reported on page 7 of this issue of Green Energy Times (GET).

The solar farm provides two megawatts (MW) of power, and its microgrid includes a four-MW battery, which can supply power to the city's emergency shelter, together with nearby buildings. Among the buildings are a number of local residences. In the event of a widespread power outage, these buildings will continue being powered with electricity. The principal organizations behind the Stafford Hill Solar Farm are GMP and groSolar. The microgrid should be completed in July, and may be used as a model for others.

The number of solar farms in Rutland is impressive. NRG, NextSun, and the city have also been involved, together with customers, in over a dozen installations of varying size. They range in size from tiny to well over two MW. The total installed so far is well over 5,283 kilowatts (kW). The Stafford Hill Farm will bring the total to 7,793 kW, and there is an additional 2,253 expect to be started this spring, with help from groSolar and Green Lantern.



"Rutland Rainbow" photo taken by John Olender, Times Argus.

Making Rutland the Solar Capital includes a lot more than solar. GMP is working with NeighborWorks of Western Vermont and others on home improvements. In fact a hundred homes were targeted for complete makeovers (see the front-page article on Rutland in the June 15, 2014 issue of GET). The improvements include insulation, air sealing, and installation of ventilation systems, heat pumps, appliances, and solar panels. And in case you are wondering, yes – GMP is helping people install their own electric generating systems to reduce their electric bills.

It is our hope that Rutland will serve as a model for resilient energy systems that may become standard for communities of the future. The sorts of things that are happening in Rutland are available to other towns and cities, from the largest to the smallest. With proper planning and care, they can reduce costs right from the start, increase comfort, and lead to a more secure future for all of us.



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USDA RURAL
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USDA Rural Development Program - Rural Energy for America (REAP)

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Contact Elizabeth.Nixon@puc.nh.gov

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Contact jon.osgood@puc.nh.gov

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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.

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While we at Green Energy Times try to keep things up to date, incentives are always changing. Be sure to check with the appropriate sources for the latest information.

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

Visit www.nhsaves.com/residential/retrofit.html for more information and an online Home Heating Index calculator

NH ENERGY STAR HOMES

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

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

NH ENERGY STAR APPLIANCES & LIGHTING

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

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

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

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

NHSAVES LIGHTING AND EFFICIENCY CATALOG

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

Offered at discounted pricing for NH electric utility customers, and fulfilled by EFI. Visit catalog.nhsaves.com/ for an online version of the catalog.

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

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

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

OTHER NH ELECTRIC UTILITY PROGRAMS

See also individual utilities for additional programs and variations. NH electric utilities may offer low or no interest on-bill financing for energy efficiency projects.

Visit www.nhsaves.com/resource/ for individual utility contact information.

Business Programs

Includes programs for: small and large business, new equipment and construction,

seminars, lighting incentives and catalog, and low and no interest financing programs.

Visit www.nhsaves.com/ for information about NH business incentives for electricity efficiency.

NH Weatherization Assistance Income-Eligible Programs

Home Energy Assistance and NH community action Weatherization Assistance Program. Financial assistance paying fuel bills, and free weatherization improvements for qualified applicants. Funding from U.S. Dept. of Energy, NH utilities.

Visit www.nh.gov/oep/programs/weatherization/index.htm for application criteria, FAQs and local program contacts

MASSACHUSETTS

COMMONWEALTH SOLAR HOT WATER (SHW) PROGRAMS

Applicants must be served by National Grid, NSTAR, Unitil (Fitchburg Gas and Electric), WMECO or a participating Municipal Light Plant community.

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

Metrics for typical SHW system for 2-4 people, 2-panel roof-mounted plus 80 gal solar tank: materials/installation costs = \$10,000, MA CEC residential rebate = \$3860 including • Adder for moderate home value or for moderate income. MA State Tax Credit (use only once) = \$1000, Federal Tax Credit (30% system cost) = \$3000, Net Cost = \$2100 Visit <http://www.masscec.com/programs/commonwealth-solar-hot-water>

There will be a new residential loan program for solar PV to be announced in April or May, 2015.

MASSSAVE HEAT LOAN SHW

Through this loan program, customers may borrow at 0% interest the costs of a Solar Domestic Hot Water and/or Thermal Heating system. Apply through receiving the MassSave Energy Audit. You can borrow up to \$25,000 at 0% interest for a 7 year term.

Energy Efficiency

After conducting a free residential Energy Audit, residential customers are eligible for up to \$25,000, commercial loan up to \$100k at 0% interest heat loan with terms up to 7 years to cover the following energy efficiency improvements: atticwall-basement insulation, high efficiency heating systems, high efficiency domestic hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows

Available only to utility customers of 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.

MASSACHUSETTS SOLAR LOAN PROGRAM

Mass Solar Loan focuses on connecting homeowners who install solar electric systems with low-interest loans to help finance the projects.

The \$30 million program, a partnership between the Massachusetts Department of Energy Resources (DOER) and MassCEC, will work with local banks and credit unions to provide financing to homeowners interested in solar electricity. DOER's program design will work with banks and credit unions to expand borrowing options through lower interest rate loans and encourage loans for homeowners with lower income or lower credit scores.

Since 2008, the solar electric industry in Massachusetts has grown into a robust economic sector with over 1,400 businesses and 12,000 workers, with enough solar electricity installed in the Commonwealth to power more than 100,000 homes.

Mass Solar Loan will continue to grow this sector, while allowing more homeowners the ability to achieve the cost savings and environmental benefits of this clean, renewable energy source.

www.masscec.com/programs/mass-solar-loan

DEPARTMENT OF ENERGY RESOURCES

Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Resources (DOER) SREC program. Note: appropriate, approved Data Acquisition System monitoring must be utilized for PV systems >10kW in order to qualify to sell SRECs.

MA State Income tax credit for residential solar hot water or pv systems are eligible for a one time 15% off system cost, capped at \$1000 max tax credit.

No sales tax on residential solar hw or pv systems.

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

NEW MASSACHUSETTS SREC POLICY

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

Under the earlier version, which expired last year, credits were given regardless of where the solar system was installed. SREC II prioritizes sites, however, by using an SREC factor based on the type of installation. The credits provided for energy produced by a system are calculated by multiplying the factor times a full credit value. Full credit is given for residential, parking canopy, emergency power, or community-based systems, or any other system of less than 25 kW. Larger systems get a factor of 0.9, if they are building-mounted or at least 67% of the power produced is used at the site. If a larger system meets neither of these criteria, but is built on a landfill or brownfield site, or if it is less than 650 kW, then it gets a factor of 0.8. Systems that qualify for none of the foregoing get a factor of 0.7.

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

NEA-TOCHT FARM HOSTS WIND TURBINE



Nea-Tocht Farm Hosts GMP's Third Community-scale Wind Turbine

The winds blowing across western Addison County, a part of Vermont with rich agricultural history, are now helping to generate more clean electricity thanks to Green Mountain Power's third community-scale wind turbine at the Nea-Tocht farm in Ferrisburg. The Nea-Tocht farm is owned by the VanderWey family who milk 250 dairy cows. The family says the clean energy generated from their new wind turbine will save them \$2,200 a year on electricity.

"Generating local power fits perfectly into our farm's mission of growing local food," said Raymond VanderWey, who owns Nea-Tocht farm, along with his wife, Linda and sons Howard and Sidney. "We are so pleased to partner with GMP to install this turbine that is not only a beautiful addition to our farm, but will help our bottom line. The name of our farm, Nea-Tocht is Dutch for "never thought" and it's fitting today because we never thought we'd be milking our cows with renewable energy, but we sure are glad to be."

Green Mountain Power installed the Vermont-built Northern Power 100 kilowatt wind turbine as part of its commitment to generating more local, small-scale renewable energy in Vermont. The first community-scale turbine was installed at the Northlands Job Corps in Vergennes in 2011. The second was installed at the Blue Spruce Farm in Bridport in 2013, which is also the first farm in Vermont to put power from cow manure on the grid.

"It is so exciting to be installing a renewable energy project that is also benefitting a farm family," said Mary Powell, Green Mountain Power President and CEO. "Providing small-scale clean energy throughout our service territory helps to improve reliability and is part of our mission to provide renewable, reliable and low-cost energy for our customers."

The tower of the NPS100 wind turbine installed at Nea-Tocht farm is 121 feet tall. Each blade is 39 feet long. It can produce about 155,000 kWh per year – equal to the amount of electricity used by 25 homes. It has a 20-year life span. The manufacturer is Northern Power Systems, a Vermont company with a factory in Barre. Aegis Wind, a general contractor based in Waitsfield, Vermont installed the turbine. Ground breaking was February 3 and the project took about a month to complete. As part of the partnership with Green Mountain Power, Nea-Tocht Farm will receive a portion of the power produced through net-metering. Green Mountain Power will own, operate, and maintain the turbine.

A Geothermal Heat Pump WITH A POND LOOP

More Efficient than Air-source Heat Pumps

By George Harvey



There was a time when farms often had fish ponds on them, and many could be used for heat, in addition to other uses. This is a fish farm Sainte-Famille, ile d'Orléans, Quebec. Photo by Selbymay, downloaded from Wikimedia Commons.

Regular readers of Green Energy Times probably do not need any introduction to heat pumps. For anyone who does, a heat pump takes the heat out of a cold place, making it colder, and moves it into a warm place, making it warmer. A refrigerator has a heat pump, removing heat from inside it and moving it into the kitchen, so the refrigerator warms the kitchen while cooling the food.

Geothermal heat pumps take heat from the area just below the surface of the earth, typically five feet down or more, and move it into buildings or anything else that needs to be heated. They are more efficient than air-source heat pumps, partly because air does not transfer heat as easily as earth or water, and partly because the ground that far down is much warmer than the air on cold days. They are also more expensive because of the costs of burying a large amount of pipe, which could mean digging up a large area of a back yard or drilling a set of wells.

There is a special kind of heat pump that uses a "pond loop" as a heat source. In this case, the heat is obtained from a pond, lake, or river that acts as a thermal mass. For anyone who has easy access to a suitable body of water, this should be less expensive to install than a typical geothermal system and less expensive to run. The heat exchanger in a pond loop is often just a large coil of polyethylene pipe spread out on the bottom of the pond. The two ends of the pipe are run through a ditch to the building being heated, and anti-freeze is circulated through it, delivering the pond's heat to the heat pump.

The advantages of the pond loop depend on the unique nature of water, which many scientists regard as one of the most amazing things in nature. Water is one of the hardest things in nature to heat or cool, making it quite possibly nature's best thermal mass. It transfers heat rather easily when it is liquid, but with much more difficulty when it is ice, which covers the water, helping to slow cooling. Given a large enough pond, it will store the heat of the summer sun for a cold winter day, below the ice on the pond's surface.

Another important fact about water is that it is very unusual in the way it expands or contracts as it changes temperature. Where most physical objects contract as they cool, water only contracts until it is 39° F, at which point it starts to expand as it is cooled; so water is densest at that tempera-

ture. And as water is frozen it expands a lot, which is why ice floats so nicely. The result of this is that the temperature of a body of water of more than a few feet depth is pretty much expected to be 39° F. or higher, at least in our area. This means that we are very likely to know the minimum temperature of the heat exchanger in a proper pond loop installation will never fall below 39° F, as long as pond is big enough to give up the amount of heat needed.

A large lake is not inferior to a pond in any way for the pond loop system, provided permissions can be easily obtained. A river is a bit trickier, because the agitation of the water means we no longer know what the temperature at the bottom might be.

While a do-it-yourself pond loop heating system is probably feasible, we would not recommend it. The engineering may not be tricky, but it is vital it be done right. In all cases, we would suggest a professional installation.

One thought that would probably cross the minds of many people is that their land might be suitable to build a pond for the purpose of a pond loop geothermal system. This is a real possibility in many places. A pond is a wonderful thing to have, and there are many reasons

to install one. Having a copious supply of water at hand can lower fire insurance costs in some places. A pond can be stocked with fish, and can be used to grow edible water plants. With the strong suggestion that professionals be included in the planning process, we highly recommend the idea where it is practical.

For anyone who has easy access to a suitable body of water, a pond loop heating system should be less expensive to install and to run than a typical geothermal system.

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COLD CLIMATE HEAT PUMP WORKSHOP

Do Cold Climate Heat Pumps Make Sense for You?

WEDNESDAY, MAY 6, 2015

Cold climate heat pumps have rapidly emerged as a promising technology for Vermont. Come to a workshop to learn about heat pump options for both hot water and space heating to see if they make sense for your home. This workshop will cover the latest in heat pump technologies, the relative economics of using heat pumps versus other fuel sources, successful case studies, and resources to help you.

The workshop will be led by Jake Marin, HVAC Program Manager with Efficiency Vermont. Heat pump manufacturer reps or installers will be on-site to share information. The workshop will be held on Wednesday, May 6th from 6:30 to 8:00 pm in the Community Room of the Montshire Museum in Norwich, Vermont. Doors will open at 6:00 pm. Food and drinks will be provided.

The workshop is being organized by Sustainable Energy Resource Group and is cosponsored by the Sierra Club of the Upper Valley and Two Rivers Ottauquechee Regional Commission. For more information, contact SERG at 802-785-4126 or bwalker@SERG-info.org.

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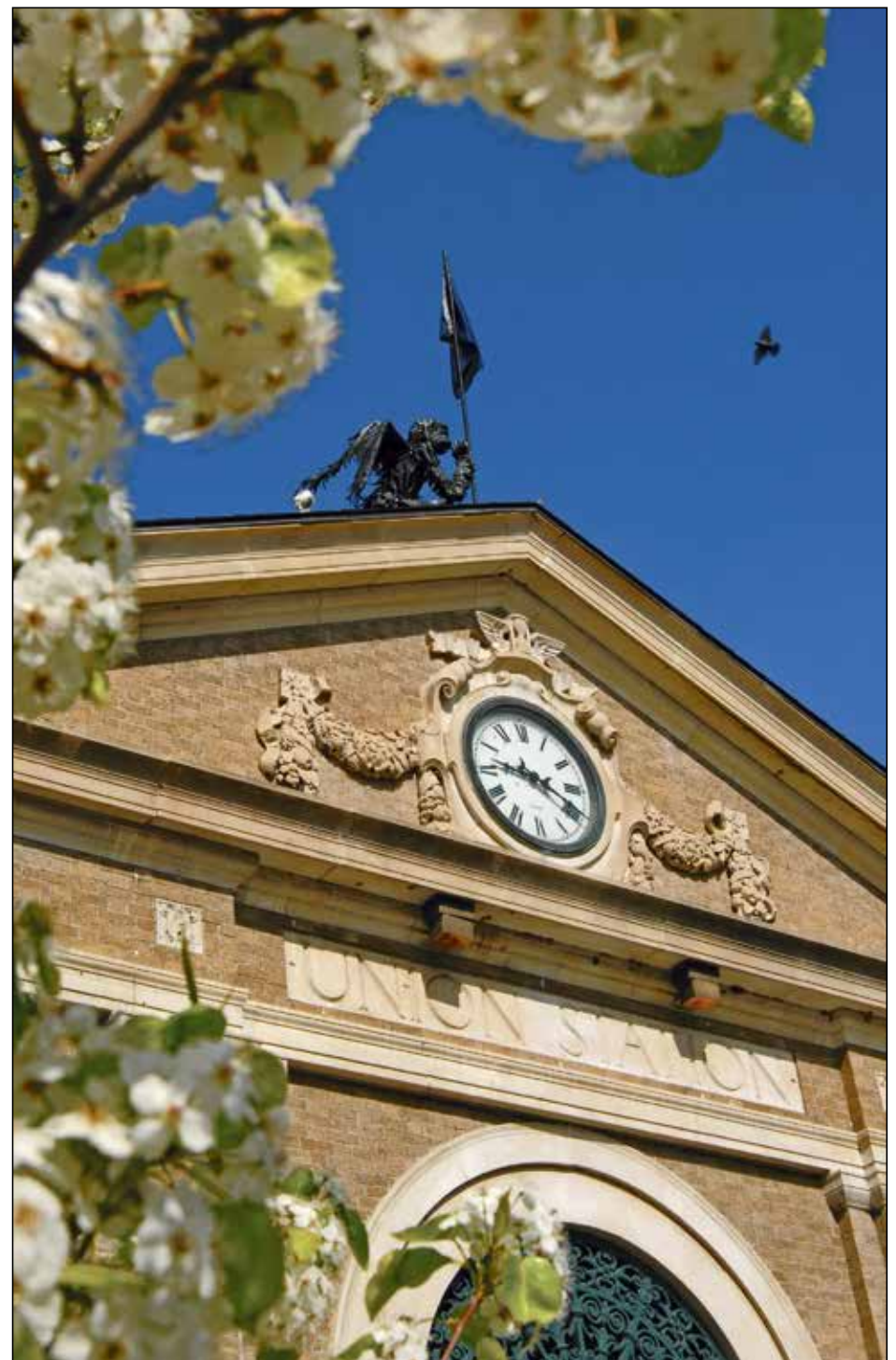
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BRINGING G.E.T. TO NY

The Story Behind 'The Times'

By Wyldon Fishman and Joanne Coons

"The mission of the New York Solar Energy Society (NYSES) is to educate children and families about energy conservation and renewable energy," stated Wyldon Fishman, who is the founder of NYSES. "In October of 2014, I peeked at the front page of G.E.T and thought, 'This is incredibly well written.' A few days later a friend said she knew of this terrific newspaper she'd been subscribing to and wanted to contact the folks at G.E.T and see if she could get copies, maybe even write some articles. Joanne said her husband liked it so much he would try to hide it and read it first. By the beginning of February we were sharing issues at the home show in Albany. By March we'd gotten a positive response from Nancy Rae and we were on our way to bringing G.E.T into NY. Time to roll up our sleeves, sell ads and find distributors. The pent-up demand is huge for a well written resource publication that's free." Coons concludes with, "Sound information is the key to positive change and we feel that GET provides this. We hope New York State will lead, not follow in making good energy choices."

STEPS TO ENERGY INDEPENDENCE

IN NEW YORK STATE

By Joanne Coons

Historically we controlled the candle, the fireplace, the horse. For a century we have incorporated cleaner on-demand energy to providers and now we are dependent on them. Convenient! Flip the switch! Today with new technology and the Sun providing us with more than enough energy even at our latitude to cover our energy needs, maybe it is time to rethink how electricity is provided to us and to become independent in terms of electricity use. Here are some steps to help you streamline your conversion to sun-powered electricity known as photovoltaics or "PV."

1. Reduce your electrical usage, or "shed load." Load is the amount of electricity used to operate your home. You've probably changed a few light bulbs or bought a new Energy Smart refrigerator. You've made a positive step for your pocketbook and for your carbon footprint. The best way to save energy is not to use it. Each watt saved is a "negawatt." Where to start? New York State Energy Research and Development Authority (NYSERDA) has a sensible, comprehensive list of steps you can take. Some of these steps require behavior changes and some of them require smart consumer choices when purchasing

electrical devices. Here's the link: bit.ly/NY-energy-saving-tips

2. After taking action to reduce your load ("load shed") by yourself, it's time to get a home energy audit or assessment. This step will be more technical and will dig deeper into how you can save energy. For most this will be a free assessment followed by financial incentives! When completing recommended improvements, a discount covering 50% of the cost of eligible energy efficiency improvements up to \$5,000 per project for single-family homes is available. Two-, three- and four-unit homes with income-eligible residents may qualify for a discount of up to \$10,000. Every unit with a meter in a condominium gets \$5,000. bit.ly/NYSERDA-how-it-works

3. Now it is time to look for a solar installer. You can approach the solar project a couple of ways. You can try to cover your whole remaining electrical load with the necessary amount of PV, or you can budget a certain amount of money and purchase the maximum amount of PV to offset your load. Please take into consideration here why it is so important to reduce your load. Why would you purchase PV to power extra load? It is really

cont'd on p. 24

Solarizing N Y's Capital Region



Solarize NY Capital Region Campaign. Photo courtesy of Solarize Albany.

By Stephen Andersen

Citizens are working with fellow citizens to bring solar energy into their communities. Today, volunteer "Solarize" campaigns are growing in popularity throughout New York, giving both residents and businesses new options for installing solar power while saving money.

The Solarize framework was developed by the US Department of Energy (DOE), and debuted in 2009 in Portland, OR. Two years ago there were only two Solarize campaigns in New York State. Now there are 26, and many more across the country.

Why is Solarize becoming more popular? Because it addresses three obstacles to solar:

- Cost - Solarize campaigns lower the cost of solar for homeowners 10 to 20 percent by organizing bulk purchasing among dozens of community members to install solar from a selected installer.
- Technical complexity - Both solar panels and the businesses that install them can vary in quality. By securing experts to review projects, Solarize campaigns provide an extra level of quality assurance.
- Extended decision times - when individuals solicit proposals from several solar installers, it can be overwhelming. An individual can take months or even years to choose a solar installer. Solarize groups address this by securing an optimal installer and equipment, then making that solution and discounted pricing available for only three to four months.

Solarize campaigns also encourage neighbors to get to know one another. As individual homeowners install solar power, neighborhoods are inspired by their example. Neighborhoods are strengthened.



SUNY students visit a Dual Axis Tracking installation through SolarWorksSchoharie. Photo by Revolution Solar

This year, New York State is providing resources for Solarize campaigns through the Community Solar NY program. These resources include marketing materials, software, technical assistance, funding and a community to share best practices to help projects succeed.

cont'd on p. 24

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NET ZERO

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AN INTERVIEW WITH THE OWNER OF A NET ZERO HOUSE

By Green Energy Times Staff

Can you briefly describe what a Net Zero energy home is?

It makes more energy than we use.

When or how did you first hear about Net Zero energy homes?

Through reading and attending conferences like NESEA Green Building.

What were your motivations for transforming a 1830's historic farmhouse into a Net Zero energy home?

We had tinkered with renewable energy at our last home which was an 1852 Greek Revival home. Our children were grown up and it seemed like a good time to downsize and this farmhouse was sitting vacant for 10 years. We felt it was a shame to lose it to development since it had character and charm.

Do you think it was a worthwhile investment?

Absolutely.

Why?

Great location, (passive solar, sited facing south) as stated already, charm and character, comfortable living.

Compared to previous homes you've owned, how does this one compare with regard to energy efficiency?

Since we had totally gutted this home, we had control over air sealing and insulation which allowed us low energy needs to operate. By building the home right we could reduce our heating and cooling.

Could you describe the different energy-efficiency technologies employed in your home?

Heating and cooling is taken care of by ground source heat pump, air exchange by Life Breath, original windows on south side with magnetic storms and exterior storms for triple layer, all other windows were replaced with Marvin Integrity windows, closed-cell spray-foam insulation, 8.4 kW ground mounted PV, solar hot water for domestic hot water, whole house dehumidifier, energy star appliances, low flow faucets and toilets, honeycomb shades with tracks to control heat gain and loss, CFL and LED lights, induction range, cool roof, solar clothes

dryer, recycling, reuse, look for products that have recycled content to reduce embodied energy.

What's your favorite thing about owning a Net Zero energy home?

Low cost of living and the comfortable environment inside the home (and to watch the meter spin backwards).

How would you describe its performance in the summer vs. the winter?

Equally comfortable, there isn't a swing in temperature or humidity.

Would you recommend building a Net Zero energy home to other home owners?

First steps are load reduction and insulation; it can be a process, not an event. Doing something is better than nothing. I am amazed at how many people don't take advantage of NYSERDA energy audit, this is a great first step.

What was the building-renovation process like?

Fun because it is a real learning experience. Solving problems such as design to provide form and function is something my husband and I enjoy. We attend lectures, read, go to conventions and network with many people.

What kinds of questions did you ask your builder going into the process?

My husband had just retired and needed a "project" so he was the GC. We talked about solutions to problems daily through the planning stages and construction. Our architect and engineer were very helpful. Measure twice, cut once. Planning is key.

How long did the renovation take from start to finish?

One year

What kind of financial incentives did you use/receive when installing the system?

NYSERDA incentives and Federal tax credit.

Could you describe the process of applying for/receiving the incentives?

Our solar installer, Kevin Bailey, pretty much took care of the incentives since he received the money and our tax pre-



Original old house. Photo: Joanne Coons



Believe it or not, this picture shows how the house now looks, after the restorations were done, complete with the solar Photovoltaics. Photo: Randall Perry

parer is knowledgeable about renewable energy tax credits due to another job she has had.

Did you or will you receive any tax credits because you built a Net Zero energy home?

Yes but anyone installing renewable energy would. It doesn't have to be Net Zero.

Was NYSERDA helpful in getting the home built? If so, how?

Yes, made installation of the renewables more affordable.

Is this home a New York ENERGY STAR® Certified Home?

Yes.

If you could say one thing to people who have never heard of a Net Zero energy home, what would it be?

We know how to build an energy efficient, comfortable home that saves energy, reduces fossil fuel consumption, and ultimately cost much less to operate. It would be in our best interest to adopt these practices for a healthier future.

Anything else you'd like to add?

Since we have an excess of electrons (energy) we "dump" them into our cars, an all-electric LEAF and plug-in Prius. This also helps reduce our fossil fuel consumption. We use an electric snow blower, grill, lawn mower, weed whacker. We use electric whenever we can so we can use our own home-grown electrons.

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Photo by Ellen Strauss, architect.

Remarks of a Local Windows Pro

LOEWEN WINDOW CENTER OF VT & NH

By N. R. Mallery

New window technologies have improved both efficiency and comfort. We also have an ever-expanding range of options. Selecting the right window for a home requires tradeoffs among efficiency and other issues to achieve the most desirable results, so understanding of some basic energy concepts is essential.

We have asked the owner of a local window company carrying many different lines of windows to help us understand some of these things. Steve Cary, who runs Loewen Window Center of Vermont and New Hampshire, in downtown White River Junction, has been kind enough to help us out.

At the store website we are told, "We specialize in high performance windows and doors from North America & Europe. Our products emphasize quality, durability and exceptional energy performance at a range of pricing levels. Our philosophy is simple; provide solution oriented, extraordinary and friendly service before, during and after the sale."

Steve knows the need to stand behind the window lines he carries, and this is an important factor to take into consideration when deciding where to purchase new windows. Many companies claim to have the "world's best energy-efficient windows," and not all claims are true.

Windows' features or specifications are not all of what is important. Durability and the follow-up of manufacturers and dealers count for a lot. (One day I will tell you about how all my own windows, from another company, failed. My advice is,

keep it local; keep it professional.)

Steve had these observations and suggestions on different subjects.

Insulating value and condensation resistance.

The entire window structure has to be taken into account to measure thermal performance to get a U value, and the lower the number is, the better. The sealed units of the double or triple glazing are filled with argon or krypton gas to reduce heat transfer and eliminate condensation on the interior surface of the glazing. Good frames for thermal performance have low conductivity from thermal bridges. Solid aluminum does not perform as well in this regard as wood, fiberglass, or vinyl (PVC). [Aluminum cladding is a separate issue. -ed.]

Solar Control and UV Protection

Thin, metallic, low-E coatings are important for solar control and ultraviolet protection. Typically, a greater number of low-E coatings reduces heat gain and will result in a darker tint. A further step for UV control can be taken by using laminated glass like that used for cars.

Daylight and view

The best performance means greater numbers of low E coatings, but that may darken the glass too much. A compromise to get more light in is to use triple glazing.

Ventilation and air-sealing

Window and doors can swing either in or outward, or they can slide. Large openings are in fashion and can provide

energy efficiency.

Manufacturers test for design performance (DP) and performance grade (PG). The PG test takes into account wind, water and structural performance. Usually a casement, awning, or tilt-and-turn type window will perform better than one that is double hung.

Sound Control

Double- or triple-insulated glass will definitely reduce sound. A special sound transmission glazing is available for greater reduction.

Privacy, Safety, and Security

For privacy there are dozens of choices such as frosted and sandblasted glass. Safety glass can be tempered and laminated to resist flying debris from storms or impacts.

Maintenance, Durability, & Lifetime

Wood windows should be made from decay-resistant species like Douglas fir. Pine should be treated with preservative and sealed well. Various exterior treatments include aluminum, vinyl, UPVC (plasticized PVC, which is a more durable and less harmful type of plastic), fiberglass, or

a new solid composite material made of acrylic polymers called Compositewood.

Installation

Strictly follow the manufacturer's instructions. Pay special attention to doors, as they are the industry's greatest callback cause, and many problems relate to installation.

Economics

PVC is the lowest cost window-frame material, then composite, fiberglass, and aluminum-clad.

The website for Loewen Windows of Vermont and New Hampshire is www.loewenvtnh.com.

Steve Cary has been in the construction business since 1977 and has been specializing in windows since 2000.



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MAKING ENERGY SINCE 1939

A History of the New Hampshire Electric Cooperative

By George Harvey

In the 1930s, getting electricity to a farm was expensive. It cost \$2000 to \$3000 per mile to bring power from the nearest utility pole to a farm, and very few people could afford it. Unsurprisingly, most of the farmers in this country did not have electric service. The Rural Electrification Agency (REA) was set up to change that in 1935.

With some help from the Grange, the New Hampshire Electric Cooperative (NHEC) was formed in 1939. It signed on members very quickly; 1329 were signed on in the first eight months alone. Part of this was due to the fact that the NHEC offered its members deals that were hard to pass up. It charged \$2 to wire a house, though we might well remember that wiring was pretty simple in those days. Other

deals included offers of 95% financing with 6% interest, paid back on the electric bill.

(As a child, I lived in a house in New Hampshire that got its electricity through the REA and still had its original wiring. The kitchen had two outlets and an overhead light on a pull chain. The dining room had two outlets. The other rooms had one each, except for two rooms that had none at all. Our appliances were a refrigerator, a washer, and a radio. It was simple, but I remember people talking about how thankful they were for the safety of electricity, compared to the open flames of kerosene lamps or candles.)

Seth Wheeler, of NHEC, had some interesting points about the rural electrification in New Hampshire. One thing he mentioned is that there were thousands of farms in the state that had been abandoned, and electricity made it possible for people to move back to them and reestablish their lives in them.

In time, the NHEC grew to have 80,000 members in 116 towns and cities. As it grew, it responded to the changing

demands of the times. One important turning point was in 1973, when the country suddenly found it was out of gas and short of home heating oil. The NHEC responded with a number of measures that sound surprisingly forward-looking.

The NHEC introduced weatherization and other efficiencies. It provided energy audits, complete with blower door tests. If the member acted on the results, the cost of the audit could be waived.

In the 1980s, the NHEC started to get interested in renewable power. It bought power from the Tug Mountain Wind Farm in 1984, with ten turbines of 60 kilowatts each. This was the fifth wind farm installed in New England and somewhat experimental. The output of the turbines was disappointing, mainly because winds at the site were less powerful than expected, so the turbines were taken down and sold in 1988. It was, however, a start.

The 1990s saw energy audits taken to a new level. They went beyond measuring heat loss and the quality of air sealing to examine the performance of individual appliances. Today, NHEC offers a program that allows members to turn in an old refrigerator or freezer and get \$30 for it. The program contractor even provides free pick-up!

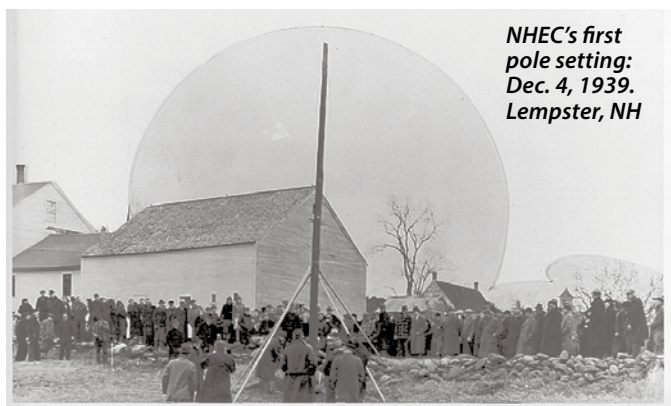
Help was not only with energy audits, but with finding and applying for incentives. Just as it had done with energy audits, the scope of assistance to members was not limited to electricity, but to other forms of energy and efficiency. For example, there has long been help for conversions to solar thermal water heating. In fact, there is help to be had for members who want to do just about any efficiency or renewable energy improvement that can operate on a practical level. A special fund was set up just for this purpose in



NHEC headquarters campus in Plymouth has solar thermal. Wind turbines of the Groton Wind Farm, not owned by NHEC, are in the background. Photo: NHEC.

2007, and it has been run since.

The programs that the NHEC has today are numerous. Whether a heat pump is needed or a member wants to install a solar photovoltaic system, there is likely to be something just for the purpose. This is true for both residential and commercial accounts. Truly, there are too many to list here, with nine residential programs and eight business programs. We highly recommend that Co-op members who can use them find out by going to the NHEC website and following at the "Co-op Energy Solutions" link. The website is www.NHEC.com.



NHEC's first pole setting: Dec. 4, 1939. Lempster, NH

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89 WAYS TO SAVE

From NYSES (New York Solar Energy Society)

1. Use your own shopping bags.
2. Shop near home; support a business.
3. Join a "CSA" (community sustainable agriculture) for fresh local food.
4. Buy Fair Trade.
5. Organic foods save the soil and are better for you.
6. Eat what's in season.
7. Use a refillable water bottle.
8. Buy in bulk to reduce excess packaging; reuse jars and sacks.
9. Eat less meat. Livestock accounts for 20% of CO2 gas.
10. Use cloth for napkins and cleanup.
11. Wash clothes in cold water.
12. Only pre-wash dishes if necessary; open the dish-washer door to dry.
13. Turn off the water while shaving and cleaning teeth; take short showers.
14. Sunshine to heat water is free.
15. Use a clothesline or a drying rack.
16. Organize baking so dishes are together or one right after the other.
17. Consider very-low-energy appliances.
18. Use organic, chemical-free cosmetics and shampoos.
19. Concentrated soaps use less packaging.
20. Keep the freezer full but the refrigerator with air space.
21. Use glass storage containers for refrigerated food.
22. Clean your refrigerator coils.
23. Take public transportation.
24. Unload and lighten your car for better mileage.
25. Keep your car tuned, and tires aligned.
26. Ride-share, carpool, bike or walk.
27. Drive a hybrid, diesel, or EV.
28. Turn lights off when not in use.
29. Put lights on dimmers or motion sensors.
30. Switch off devices on standby, such as TVs or computers.
31. Unplug chargers that are not in use.
32. Get a library card.
33. Go toxin-free at home.
34. Clean with baking soda, 10% vinegar in water, or citrus products. Reduce use of bleach and ammonia.
35. Use a local organic cleaners. Drop off and pick up with a garment bag.
36. "Hold the plastic!"
37. Skip hotels' mini shampoo bottles.
38. Learn to "square foot"-garden.
39. Learn to compost, then do it.
40. Use non-powered tools and mowers.
41. Catch rainwater in barrels.
42. Avoid food grown with GMOs.
43. Shrink the lawn; feed it with compost.
44. Carry, wash, and reuse plastic utensils.
45. Ask to be deleted from mailing lists.
46. Print on two sides of the paper.
47. Bring unused items to a thrift shop.
48. Look for swap meets.
49. Buy things that will last.
50. Try products made from bamboo: sheets, towels, cutting boards, flooring.
51. Use tea balls.
52. Keep your coffee hot in a thermos.
53. Caulk drafty leaks.
54. Install ceiling fans; use only as needed.
55. Remember, LED lamps save money.
56. Get rid of incandescent bulbs.
57. Use power strips for easy on-off.
58. Pack a small carry sack.
59. Tell your town you want to save energy.
60. Shield outdoor lights to point light down.
61. Volunteer at your local park.
62. Plant a community garden.
63. Start a community greenhouse.
64. Purify indoor air with plants.
65. Build a solar cooker or oven.
66. Carefully recycle old electronics.
67. Make old homes more efficient.
68. Use awnings to cool and protect your furniture from UV light.
69. Plant deciduous trees for summer shade and winter solar gain.
70. Fix leaky faucets and toilets.
71. Buy things that are reusable.
72. Use solar-powered battery chargers.
73. Carry a handkerchief or bandana.
74. Wash diapers in hot water with a bleach substitute; do second rinse with $\frac{3}{4}$ cup white vinegar.
75. Coffee shops will refill your mug.
76. Discuss conservation and sustainability.
77. Keep your investments green.
78. Give solar panels as gifts.
79. Evaluate new appliances and vehicles for efficiency before you buy.
80. Driving safely saves on gas.
81. Change snow tires without delay.
82. Compare fuels to heat efficiently.
83. Use programmable thermostats.
84. Keep your hot water temperature turned down. Time your showers.
85. Insulate pipes well.
86. If you have a warm-air heating system, consider sealing and insulating it.
87. There are good low-tech, do-it-yourself ways to air-sealing doors and windows.
88. There are many cooling options available in addition to air conditioning.
89. Microwaves are very energy-efficient.

NEW LOW-INTEREST FINANCING FOR ENERGY IMPROVEMENTS IN VERMONT

Efficiency Vermont has recently announced two programs that provide low-interest (0% to 1.99%) financing for making home energy improvements, including energy audits and weatherization, cold climate heat pumps and water heaters, pellet boilers and furnaces, and much more.

Efficiency Vermont received DOE funding to buy down the interest rates on their Property Assessed Clean Energy (PACE) financing and The Department of Public Service has recently created a new Heat Saver Loan program. To take advantage of the PACE financing, homeowners must live in one of the 30 towns in the state that have adopted PACE, but the Heat Saver program is open to everyone in the state. Financing efficiency measures at these low rates can result in energy savings larger than financing payments, so you save money and save energy at the same time.

To learn more about PACE, go to bit.ly/VT-PACE-overview. Click Heat Saver Flyer or Program Comparison to download pdf files of the Heat Saver program and a flier comparing the two programs to each other.

NH PROGRAMS THAT MAY BE ABLE TO ASSIST YOU WITH IMPROVING YOUR HOME

The Weatherization Assistance Program is available for low-income households in all 50 states and is funded by the US Department of Energy. Comprehensive services are provided by a network of Community Action Agencies that serve all areas of New Hampshire. Details about the program can be found at bit.ly/NH-program-details. If you work with one of the local agencies, check "NH Weatherization Assistance Program Auditor I Certification" to see if a full member of the Residential Energy Performance Association works there and request that person for the audit.

The New Hampshire Electric Cooperative has a number of rebates and incentives to help NHEC customers improve the efficiency of their homes or incentives to help meet Energy Star® Program requirements. Information can be found at bit.ly/NHEC-solutions.

NHEC also offers zero interest loans that can be paid back through the monthly electric bill. See bit.ly/NHEC-zero-interest.

NHSaves is a collaborative effort utilities in New Hampshire, NHSaves provides important information on improving the efficiency of your home and provides rebates and incentives to reduce your costs. www.nhsaves.com.

Solarizing NY's Capital Region

cont'd from p. 20

Community Solar NY is part of Governor Mario Cuomo's NY-Sun initiative. This \$1 billion program will advance the scale-up of solar and move the state closer to having a sustainable, self-sufficient solar industry. It is also an important strategy under the governor's Reforming the Energy Vision plan, which seeks to create an energy grid that is clean, reliable, affordable, and one that can lead New York to path of reducing greenhouse gas emissions 80 percent by 2050.

Here is a list of Solarize campaigns in New York's Capital Region. Please follow-up with the campaign in your area to request a solar proposal for your home or small business, or to volunteer to make the campaign in your community a success!

Albany County. Active project. Installations planned in 2015. Contact Dave Hochfelder: 609-948-4668 or solarizealbany@gmail.com.

Clifton Park (Town). Project being formed. New team members welcome. Contact Joanne Coons: 518- 522-3173 or coonjoan@gmail.com.

Saratoga Springs (City). Project being formed. New team members welcome. Contact Rayna Caldwell: 518.424.9304 or solarizesaratoga@gmail.com.

Schenectady. Project being formed. New team members welcome. Contact Gary Lessard: 518.346.2290 or lessard-gary@gmail.com.

Schoharie County. Active project. Installations planned in 2015. Contact Sandy MacKay: 518-234-2817, c: 908-967-3088 or solarworks@midtel.net.

Troy (Rensselaer County). Active project. Installations planned in 2015. Contact Jean Howard or Chris Bystroff: 518-276-3185, 518 833-0744 or Solarize@xtroy.org.

Stephen Anderson is known as "The Johnny Appleseed of Solar." He volunteers his time to plant seeds of Solarize projects in the Capital Region, and plays a significant role in inspiring each project. His background in solar includes having graduated from the Hudson Valley Community College Solar PV program, and is NABCEP certified.

ENERGY INDEPENDENCE IN NYS

cont'd from p. 20

easy to purchase PV because it is up to the installer to size the system, design it, fill out the paperwork to tie the system to the grid, apply for local building permits, install the system and "commission" it.

4. Buy or lease? When you lease, you will typically save between 10 and 50% of what you would pay the electric utility. When you purchase your annual rate of return, or payback, can range from 10-30% depending on your location, state incentives, and property characteristics, and after the payback period, you will get free electricity for decades.

Understanding the installation process can be mind-boggling and we encour-

aged you to find out about it but don't let that get in the way of participating in adding PV to power your home. In fact once you produce your own energy, energy becomes more precious and you may find yourself more conscious of the weather, your energy use and choices. You will also find that living a 'PV' lifestyle doesn't mean you suffer, you just make smarter choices.

Joanne Coons is an adjunct professor at Hudson Valley Community College, TEC-SMART facility teaching Photovoltaic Theory and Design. She has a BS from SUNY Cortland and an MS from SUNY Albany in secondary science education.

BACKYARD ROOTS!

By Lori Eanes, 190 pages, Skipstone Books, \$21.95

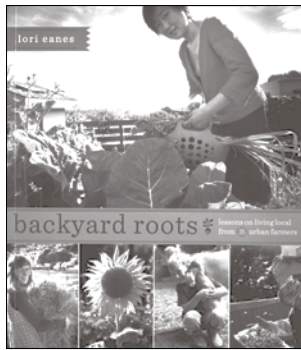
Book Review by N. R. Mallery

Backyard Roots is a collection of stories about people who farm on what small pieces of land they have available in crowded, mostly urban, areas. They all live in West Coast areas of the United States or Canada, but the lessons they have are for all of us who garden.

The thirty-five people or groups whose stories are told all have started and run micro-homesteads, and so they have a lot in common. They are very different in other ways from one to another, however. They farm for different reasons, some to get the best organic food they can, others to have available supplies of the vegetables of their distant homelands. They are of different ages from quite young to very old. They farm using different methods, some simple, and some very high-tech. But they share a common thread of micro-homesteading.

The things they do are sometimes surprising. While just about every one of them raises vegetables, many have livestock of one type or another. Some keep bees, and some keep chickens or even ducks. There are fish farmers raising tilapia in urban aquaponics systems. There are urban goats. Somehow the idea of operating a dairy farm in a city puts me into a contemplative mood.

There are discussions of different farming methods. Composting is discussed, both for methods of dealing with waste and to provide fertilizer. Water is another issue of importance, and collecting rain water in the urban environment is covered.



Visit the Backyard Roots blog: <http://www.backyardrootsbook.com/>, for lots more stories and a link where you can buy the book. Your head will spin with resiliency ideas and know-how!

The organization of farms is as varied as the products. Many of these people work alone or with their families. Others have community organizations, and some of these work with greenhouses or recovered lots that had previously only grown weeds and collected trash. One has a rooftop garden and a community kitchen.

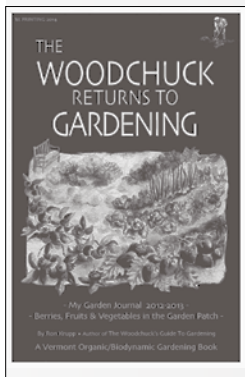
In addition to the stories, Backyard Roots has a large number of tips for those who might want to have urban farms. Some of these are simple suggestions or observations on how best to do things, but others go into details about some very specific issues. For example, suppose a person wants to raise poultry in an urban setting, but zoning or city ordinances forbid it. The book addresses the questions of what things can be done and how to do them.

Backyard Roots is a book I could not put down. Not only does it have value to anyone who might want to run a micro-homestead, it is just plain fun to read. Clearly, I recommend it highly.

The Woodchuck Returns to Gardening

By Ron Krupp, 247 pages, Whetstone Books, \$18.

Book Review by George Harvey



The Woodchuck Returns to Gardening is one of those books that may be exactly what you want it to be. It could be an introductory book on vegetable and fruit gardening, for those who need it, or a highly readable reference, for those

who are more experienced. Or perhaps, it is just something to enjoy.

The book starts with a journal of the years 2012 and 2013, comparing the two years on a month-by-month basis. This is useful, because it contains a basis for planning the month-to-month goings-on of preparing the ground, planting, tending, harvesting, and preparing food. Unlike most chronologies of garden activities, however, by comparing months from two very different years, it illustrates the potentials, what to expect and what to be ready for.

The journal is followed by three sections, one each on vegetables, berries, and fruit. Each section begins with a general description of the tools, methods, and knowledge needed for the plants it covers. Preventing plant disease is one important aspect of this, but so are other principles. The amount of light exposure, the type of soil, soil pH, temperature ranges for growing, and other information are all covered generally. This is followed by a list of types of plants, each covered with a number of its own specific

details, such as information on growing the different varieties, what they need, and what they are like.

Each section has commentary about things ranging from the politics of sugar to the history of fruit. The author's background includes not only organic gardening, but also biodynamics, which was developed by Rudolph Steiner, founder of the Waldorf educational system. The book has many references to religion and spiritual practices as items of interest. There is plenty of information about heirloom seeds, both old varieties and new, and a few species most of us have not grown, but might now, because of climate change. People in New York, Vermont, and New Hampshire are starting to cultivate pawpaws and kiwis, for example.

The book does not neglect the harvest once it has been gathered in. Brief descriptions of how the food might be prepared are given. The material on pickling does not go into detail, for example, but it does point the gardener in what might be a valuable new direction.

Ron Krupp is a resident of the South Burlington area, and the gardening he describes is the gardening he does there, with conditions in that part of Vermont. That said, nearly everything he says can apply to any of the Northeast. Given the rule of gardening that he often repeats, "It Depends," what he says could apply to just about anywhere.

There are many illustrations, both photographs and artwork providing visual interest for *The Woodchuck Returns to Gardening*. There are also poems, observations, stories, and wit in abundance.

I highly recommend this book.

PREFABULOUS + ALMOST OFF THE GRID

YOUR PATH TO BUILDING AN ENERGY-INDEPENDENT HOME

SHERI KOONES FOREWORD BY ROBERT REDFORD

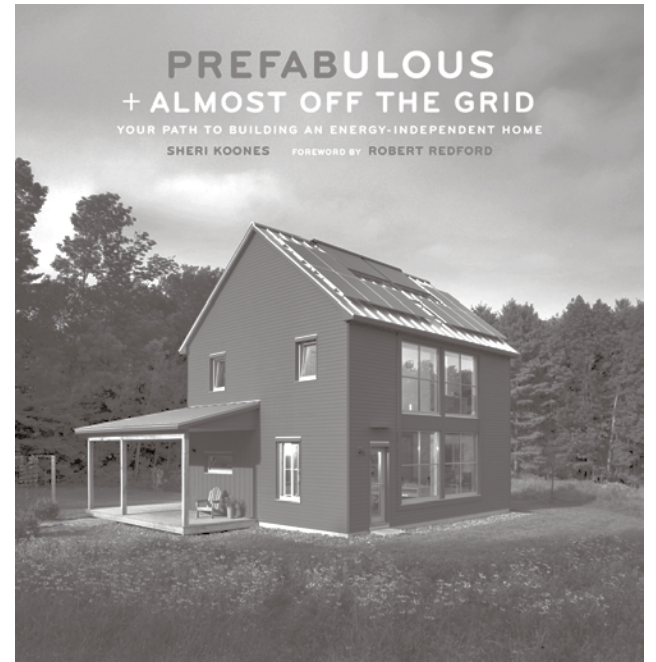
Review by N.R. Mallery

Some time back, Sheri Koones watched as a pre-fabricated house was being built. She was impressed by the speed and efficiency of construction. She was also impressed by the beauty of the finished product, but when she talked with friends about this, she found them disbelieving. It turned out they were thinking of very different construction from what she had seen.

She started writing about prefabricated housing that most people did not know anything about. These are beautiful, spacious, comfortable. They could also be expensive, even though they were built as modules in construction plants, instead of out in the field. Prefabulous + Almost Off the Grid is one of several books she has written on these homes.

The fact that they were built of modules also does not preclude purchasers having homes that are uniquely their own, as many readers of Green Energy Times might know. The homes built in the controlled environment of Bensonwood's plant in Walpole, New Hampshire were covered in GET's June 15, 2014 issue. Most of them are entirely custom designed by architects for the customers who order them.

Sheri Koones covers Bensonwood's more moderately priced Unity Homes series in this book as one of over thirty designs she describes in some detail. Here, however, her interest goes beyond what is efficient and beautiful to what is highly efficient without sacrifice of appearance. This makes it really an inspiration. The houses she covers are not necessarily intended to be entirely passive, but they are all getting close to that goal. They are also approaching it in a way that is highly



durable and practical in the long term because of the construction advantages of modular construction.

The combination of efficiency and beauty was not lost on actor Robert Redford, who wrote the book's introduction. We live in a time when we need to find new and better solutions to the problems we have with pollution and resources protection. He clearly points out the fact that residential buildings account for thirty-eight percent of all of our energy use. If we can reduce that to the smallest amount possible, then we will have gone a long way toward preserving our environment.

Sheri Koones tells us about one way we can save the environment and at the same time live more comfortably, in more beautiful surroundings, often at lower cost. It might possibly not be the only way of achieving those goals, but it is most certainly one of them.

This is a book that anyone who is considering building a home should read. Doing so will not only benefit the reader, it will very likely benefit all of us.



As pictured above, Koone's book includes designs and descriptions of Unity Homes, who you have seen many times in the pages of Green Energy Times (Bensonwood). They build prefabricated homes here in the northeast! Be sure to pick up a copy of this book and her others, written to help you find this path to an energy-independent home. Photo courtesy of Bensonwood.

Devastating Cuts to R/E in NH

cont'd from p.1

If you wish to carefully compare the two budgets, see the Governor's budget at bit.ly/gov-2015 and the House budget at bit.ly/house-2015.

The next step in NH's budget process is to send the House budget to the Senate, and then on to committee of conference. The committee is tasked with getting the Governor's budget aligned with the budgets of the Senate and House of Representatives, which are currently very out of sync. A final bill must be passed by June 25 by both bodies, in order to be ratified by the Governor in time for the beginning of the fiscal year, July 1st.

What can you do?

See <https://legiscan.com/NH/bill/HB2/2015> to find out how your representatives voted. Then go to: <http://www.gen-court.state.nh.us/house/members/wml.aspx>, look up your legislators' info, and let them know what you think of this attack on renewable energy funding! It will be most effective to send your comments to your State Senators and to the Governor. Let your legislators know that:

- Solar currently supports over 600 jobs in New Hampshire from more than 68 companies (37th in the USA).
- In 2014, over \$11 million was invested in solar installations in New Hampshire, a number poised to double this coming year.
- Solar energy prices continue to decline -- 8% decline just in this last year, and 50%

from 2010. Solar energy rebates are still required to drive solar's rapid growth, as it allows homeowners and businesses to leverage federal incentive programs and lock in electric rates below utility.

• The first-ever "Value of Solar" study in Maine found that solar's benefit to Maine ratepayers was roughly double the compensation offered under net metering. This means, far from being a burden, NH's net-metering laws are in the public interest, and every solar installation that is put in offers a huge value to ALL ratepay-

ers, not just the entity going solar.

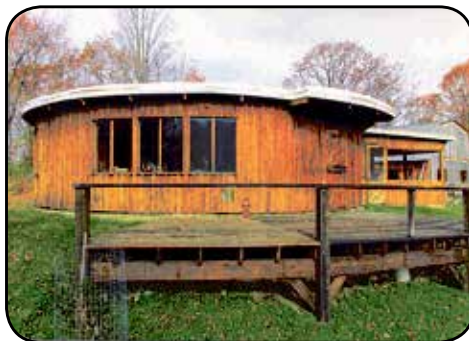
- Nationwide, 31,000 solar jobs were created in 2014; solar jobs grew by 20% while all other industry sectors added jobs at 1.1% rate.
- New Hampshire's 8MW of installed solar offset an estimated 3,524 tons of carbon pollution in this last year and saved solar customers an estimated \$1.2 million in electricity costs.

Frederick Greenhalgh is the digital marketing manager for ReVision Energy in Exeter, NH. (207) 221-6342 x 205.

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Mike Duclos is a principal and founder of The DEAP Energy Group, LLC, a consultancy group providing a wide variety of Deep Energy Retrofit, Zero Net Energy and Passive House related services. Mike is a HERS Rater with the Massachusetts New Homes With ENERGY STAR program, a Building Science Infrared Thermographer, and a Certified Passive House Consultant who certified the second Passive House in Mass. Mike holds a BS in Electrical Engineering from UMass Lowell, and two patents.



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Energy Efficiency From the Ground Up Building with ICF's and SIPs

By Alison Moynihan

There is a ton of advice out there for how to build energy-efficient buildings, and more important, there are a thousand different ways to successfully construct an energy-efficient building. That said, I propose that Insulated Concrete Form (ICF) foundations and Structural Insulated Panels (i.e. stress-skin panels or SIPs), should rate high on your list of good options.

While the ground doesn't get as cold in the winter or as hot in the summer, it is still outside our comfort range. Therefore we need to insulate between our conditioned space and the ground. The easiest way to get a fully insulated foundation is a true floating slab with continuous insulation underneath or with a crawlspace and an insulated 1st floor deck. However, in New England we love the storage and the place to put all our mechanicals provided by a basement. That means we need to figure out how to insulate our basement walls so we can have a completely insulated building shell. The debate rages: do you insulate inside, outside, both, or in the middle of your concrete wall?

Middle: Thermally ideal, excellent durability, but requires careful structural design and some designs have significant thermal bridging.

Inside only: Excellent durability, easy renovation, but can cause dew-point on inside of concrete

Exterior only: Concrete can act as thermal mass, but can be difficult to connect to slab insulation and has durability issues.

Insulated Concrete Forms: Good thermal performance, can eliminate the need to use conventional forms, but has durability issues for exterior half of insulation.

Once you have weighed your basement wall insulation options and committed to continuous slab insulation, the final piece

is the footing. Many high performance designers just wrap the footing with insulation or put a foam gap between the wall and the slab. The foam gap means that your basement wall is no longer fully supported by the slab which means the footing needs to be much deeper to resist the weight of the soil pushing inwards. Foam under the footing risks your wall settling as the weight of the house compresses the foam. Of the two, the foam gap is better because you can compensate by making the footing deeper, whereas foam under a footing makes engineers wince at all the potential problems.

Once you have dealt with protecting your building from the ground you must deal with the brutal cold of a New England winter. There are two ways for your above ground walls to affect the energy use of the building: one is managing heat flow through conduction, and the second is managing heat flow through air infiltration. SIPs are inherently better at limiting both conduction and air infiltration losses.

To address conduction of heat, it is all about the whole surface R-value. The most common insulation material for SIPs is EPS (expanded polystyrene), which has a reasonably good R-value of 3.85 per inch. However, the real savings is in the structure, the structural elements of the SIPs are the skins, and there are no studs except where necessary for point loads. In a standard 2 x 6 foot wall between 18% and 35% of the R-value is lost to the studs; in a standard SIP wall only 5% to 20% is lost. Regardless of your construction type, the more windows there are, the higher the framing percentage will be. SIPs have an inherent advantage over regular stud construction, even when comparing to double stud walls. SIPs have a higher whole surface R-value for the same thickness. Put another way: a 6.5" EPS panel

performs at the same level as an 8" cellulose filled double stud wall.

The second and often the more important energy saving factor is air tightness. Any building that is trying to achieve energy performance should be using an HRV or ERV with a balanced ventilation system to recover as much of the heat as possible that is lost through required ventilation. All SIP buildings are tight enough that they require mechanical ventilation. While conventional construction with planning and a very careful crew can be air tight, SIPs can reach the highest levels of air tightness with Foard Panel's default joinery.

Why choose SIPs?

Because you get more performance with less materials, less time on site, less waste, and less floor area given to wall thickness. When asked if SIPs are cheaper, the question is what are you comparing it to? A 6.5" SIP wall is almost certainly cheaper than an 8" double stud wall detailed for air tightness, but it is not usually cheaper than a typical code minimum 2 x 6' wall.

The final piece of any high performance envelope is the windows. They do everything the wall does, plus they have to be transparent and operable. They have the unique opportunity to help heat the building, not just conserve heat, but they can also overheat the building in the summer if you do not plan for exterior shading. In New England, windows should be minimized everywhere except the south side of the house and you need to be thinking about very high performance windows. The air sealing of your windows is just as critical as the air tightness of your walls. Any energy modeler will tell you that the quality, quantity, and layout of your windows has a whole lot more influence on the energy performance than thermal bridging or that even that extra inch of insulation in the walls, roof, or slab.



Even with the snow piled high this space is warm. The deep windows provide an ideal spot for plants, or just a place to sit and soak up the sun on a winter afternoon.

An example of a high performance SIP building is the Wagner Residence. Garland Mill Timberframes and Foard Panel built the home with 10.5" EPS R-39 SIP walls and an insulated slab. Working together Garland Mill and Foard Panel created structurally sound detailing to further minimize thermal bridging around windows and at the sills. This residence is 1,560 square feet in the northern New Hampshire and remains warm and welcoming all winter long. Occupied since December 5th, 2014, it has only used 2400kWh to power its air to air heat pumps. Anticipated annual heat demand is 3000-3200kWh, which is less than \$500 for a whole winter!

Alison Moynihan is a project manager for Foard Panel Inc., West Chesterfield, NH. Learn more at www.foardpanel.com. The phone number is 603-256-8800.

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Clean lines and wood siding showcase an elegant lakeside home, built to minimize the costs of living. Photos courtesy of Garland Mills.

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A Few More Thoughts About ... Windows in Double Wall Construction

By Michael Goetinck

A reader sent me an email about a window condensation problem he has in his home. I've taken the liberty of sharing our correspondence. The text from his email is in italics. My response follows.

Your article on Deep Energy Retrofit Windows in the Feb. 15 issue of Green Energy Times was of interest to me as it was the first time I had seen anything written about where to best place a window in a double-style wall. What I found missing in the discussion was the humidity/condensation aspect of placement. I have R-40 walls, 16" thick, and not being very savvy then, when my house was built, I agreed to the windows being mounted flush with the exterior of the walls. This was not a good choice as in my tight house (45-50% humidity) the double and triple pane windows (Inline - fiberglass frames) will get wet and even have frost on them near the bottom (below 20 degrees outside). This is mostly due to their deep placement and the resultant difficulty of heating them from the room's heat because the convection flow is constrained. As many windows have a high temperature source of heat beneath them in the form of baseboard heating, this is less of a problem than my case, low temperature floor heating. How to solve my problem? I'm thinking a low flow battery powered air fan in each window or maybe several ceiling fans - not an elegant solution but cheaper than having the windows reset to a better position within the wall.

As you imply, one of the additional benefits of placing the windows in the middle portion of the wall assembly is that it is closer to the interior conditioned air. I also think that having flared window openings on the interior is important because the window units are not as removed from the interior conditioned air as it moves around the house. Essentially a larger opening is created which allows more warm air to come into contact with the interior side of the window unit. The air undulates into



Flared window opening being prepared for interior storm windows in a retro-fit project.

the window openings instead of having to turn corners.

That being said, I have two small windows in my basement that are in rectangular openings as opposed to flared ones and they don't experience any condensation or frost. I suspect that both the location of the window units in the wall assembly and interior relative humidity levels are contributing to the condensation problem at your place. Is there any way for you to reduce the relative humidity (RH)? Also, there are fans available that can be set on the wood stove which do a very effective job of increasing air circulation. Here's a link to the one I've used in the past: www.caframo.com/hearth/hearth_products_woodstove.php. The only reason I'm still not using it is because it got knocked over at some point and it is no longer quiet.

I'd appreciate hearing back from you



to know if lowering the RH or using a fan improves things for you.

Enjoy, Michael

Windows and doors are the weak link in thermal performance (assuming everything else is done correctly). Maybe someday this won't be the case, but for now; no matter what you do they will not perform as well as a high performance wall assembly. Placement, air circulation, and interior moisture management have to be part of the plan. Heat recovery ventilators (HRVs) can help with indoor air quality and moisture management. Relative humidity levels in the 40-50% range are typically recommended for comfort and building durability, but it may need to be lower to rectify the concern raised by the reader. For what it's worth, my house typically runs at 20-30% and we're very comfortable.

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Interior relative humidity is an important consideration in any building and even more so in the context of high performance/super insulated ones. Condensation on the windows is annoying, but resulting problems are visible and usually easily managed. Condensation in the wall and roof assemblies is annoying at best and damaging to the building and inhabitants at worst. I'll talk about that in another article.

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


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PASSIVE HOUSE: A Response to Climate Change

By Mike Duclos

The energy crisis of the 70s kicked off a renewed interest in using energy directly from the Sun to heat our homes. Energy prices soon retreated, as did most, but not all interest. Less expensive fossil fuel energy catalyzed our economy, further increasing energy consumption. Some looked to the future and predicted peak oil. Others looked further into the future and realized the real problem would not be running out of fossil fuel-based energy too soon, but too late.

Passive House is a German building design standard with technical origins in the US 'passive solar' experiments of the 70s, intended as a direct response to climate change, by capping annual energy consumption, with the side effect of resilience to disruption of the grid by the forces of the changing climate.

Germany embraced the Passive House standard by creating substantial subsidies for each square meter constructed to the standard. This has catalyzed their local industries to create advanced windows, mechanicals, insulation, and air sealing systems, which have become the 'new normal.' They are now in the position to export these technologies, further bolstering their economy, while providing a desirable path to greenhouse gas reduction and energy independence. The movement in Europe continues to expand; for example Belgium has

adopted a variant of the Passive House standard as building code.

The mission of the Northeast Sustainable Energy Association – nesea.org – is to promote sustainable energy practices in the built environment. The NESEA Building Energy Masters Series is an extraordinary series of online educational opportunities for all interested in outstanding buildings.

These courses run the gamut from the underlying physical principles which should (but so often are not) used to design, construct and commission our buildings, to 'keeping track' of what actually happens to the energy and indoor environment. These extraordinary learning opportunities include Marc Rosenbaum's popular Zero Net Energy Design, and the newest offering from Andy Shapiro and Building Energy Analytics.

cont'd p.30



Falmouth Passive House, designed by the author, the second Certified Passive House in MA. Photo Credit: Steve Baczek, Architect of the project.

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EMERGING FRONTIERS IN BIOENERGY BIOMASS TO BIOFUELS growing grains in the northeast



Durum wheat was the wheat most commonly grown in ancient Israel. Image from wikimedia.org

By Deb Heleba

Farmers throughout the Northeast have been growing grains for animal feed on dairy farms for years, although cereal grains have not been grown on a large scale since the 19th century. Back then, wheat and other grains were large parts of the agricultural economy; in fact, in the 1880s, Vermont had been dubbed the “bread basket of New England” because of its high production of wheat.

Within the past 10 years, demand for locally grown grains of all types—from wheat and oats to barley and rice—has drastically increased across the Northeast due to interests in producing more home-grown livestock feeds and diversifying farm products to meet growing consumer demands for local products.

As a result, farmer organizations, local mills and malt houses, and on-farm research trials have been sprouting up to support the renaissance of a small grains industry in our region.

One example is the Northern Grain Growers Association. Created in 2004, the association of farmers, bakers, agriculture service providers, and local food enthusiasts encourage and support the production, processing, and marketing of grains in Vermont and the surrounding regions. The association works closely with researchers at the University of Vermont Extension, and together have worked to rebuild a grain industry in Vermont. Some accomplishments include the following.

- Hundreds of grain varieties have been evaluated under the climatic conditions we experience here in the Northeast; these have included commercially available wheat varieties as well as heirloom wheat, barley, and oats. Numerous on-farm research trials have been conducted to identify optimum weed control strategies, fertility management, and planting dates for these grain crops.

- A university-based cereal grains quality testing laboratory has been established that provides analyses on quality parameters used by the baking industry as well as food safety screens.

- Culinary milling and baking trials have been performed as well as public tasting surveys to assess consumer preferences of local wheat varieties.

- Traditional, participatory breeding of five wheat crosses—some using the germplasm from 19th century varieties bred by UVM botanist Cyrus Pringle—have been implemented. These crosses have been grown out on-farm for more than six years where farmers have been improving them through annually selecting for favorable traits. A public release of these varieties may occur in 2015—the first wheat varieties developed in Vermont since 1901.

Visit the Northwest Crops & Soils Program at www.uvm.edu/extension/cropsoil/grains.

Similar farmer-to-farmer, farmer-to-baker, and farmer-to-researcher partnerships have formed throughout the Northeast region, including New York and Maine, all with the goal of supporting locally grown grains.

Grain trials and research have also been instrumental in the local production for local use biodiesel production model developed by the Vermont Bioenergy Initiative. UVM Extension research and collaborations with farmers active in the Northern Grain Growers Association have helped to identify the grain varieties which grow best in the Northeast that are richest in oil content which can be converted to biodiesel to supply fuel to farm equipment and feed for livestock. Learn more at www.vermontbioenergy.com.

Deb Heleba is Sustainable and Organic Agriculture Program Coordinator, University of Vermont Extension.



Vermont sunflowers growing. They support both energy and local food sectors in Vermont. Photo: Vermont Bioenergy Initiative

Re-using Greywater At Home

Using “greywater” from sinks, showers and washing machines to irrigate outdoor gardens is a great way to increase the productivity of backyard ecosystems while reducing household water use by as much as 30 percent. Pictured: A backyard garden watered with residential greywater. Credit: Jeremy Levine, courtesy Flickr



by Roddy Scheer and Doug Moss

Now that solar panels are so commonplace on rooftops across the country, reusing so-called greywater—that is, the waste water from sinks, showers, tubs and washing machines—for landscape irrigation may be the next frontier in the “greening” of the American home, especially if you live in an arid region where water use is restricted. In fact, reusing your graywater may be the only way to keep your lawn and garden healthy without taking more than your fair share of the community’s precious freshwater reserves.

“Using water from sinks, showers and washing machines to irrigate plants is a way to increase the productivity of sustainable backyard ecosystems that produce food, clean water and shelter wildlife,” reports Greywater Action, a California-based non-profit dedicated to educating and empowering people to use water sustainably. According to the group, a typical U.S. single family home can reduce water use by as much as 30 percent by installing some kind of greywater reclamation system while simultaneously reducing pollution into nearby water bodies by filtering out contaminants locally. Capturing and reusing greywater can also be part of the battle against climate change, given that you’ll be helping grow plants that sequester atmospheric carbon dioxide while reducing demand on a regional wastewater treatment facility that’s likely powered by fossil fuels.

The simplest way to get into home greywater reuse is to install a “laundry-to-landscape” system that sends washing machine wastewater outside via a diversion tank and hose that can be moved around to irrigate specific sections of the yard. Equipment costs for such a set-up max out at \$200, but labor and expertise may tack on another few hundred dollars. Handy homeowners can do much of the work in setting up such systems themselves,

though those without much home repair or plumbing experience might at least consult a professional. Greywater Action suggests one way to reduce costs is by digging trenches for diversion pipes and mulch basins yourself -- or enlist friends who want to support the effort and learn about residential greywater reuse in the process.

A more comprehensive system can draw wastewater from sinks, showers and tubs, too—and then filter and distribute it to backyard landscaping via a drip irrigation network. Getting such a system professionally installed can run upwards of \$5,000.

Either way, once the greywater diversion system is in place, you’ll need to be careful about what goes down the drain, given the ways in which it might affect the plants and soils right outside. “In any greywater system, it is essential to put nothing toxic down the drain — no bleach, no dye, no bath salts, no cleanser, no shampoo with unpronounceable ingredients, and no products containing boron, which is toxic to plants,” adds Greywater Action.

For more information on installing a greywater reuse system yourself, check out the resources section of Greywater Action’s website, where you’ll find diagrams, written instructions and even videos to make the job go smoother. Those more inclined to hire a professional can browse through listings of qualified installers across the country. And if you want to see how it’s done first-hand, sign up to attend one of Greywater Action’s one-day workshops on how to install a greywater catchment and diversion system in a residential setting.

Contact: Greywater Action, www.greywater-action.org.

EarthTalk® is written and edited by Roddy Scheer and Doug Moss and is a registered trademark of E - The Environmental Magazine (www.emagazine.com).

PASSIVE HOUSE: A Response to Climate Change

Cont’d from p.29

Passive House Design, another Building Energy Masters Series course beginning next on May 4, explores the history, development and practical application of the refinement of the passive solar design experiments of the 70s, into the Passive House Standard. In the US, William Shurcliff, a physicist at Harvard, analyzed and documented a wide variety of passive solar homes, but popular interest soon waned. In Germany, Dr. Wolfgang Feist, another physicist, leveraged Shurcliff’s foundational work to create the Passive House standard, which has been used to construct tens of thousands of highly efficient homes in Europe.

The Passive House standard rigidly con-

strains annual energy use, and relies upon the principles of detailed quantification and control of heat and energy flows. It is so challenging to achieve in colder climates that the locations of windows, and where hot water is used, must be carefully considered in the floor planning stage - this was the topic of a free webinar promoting Passive House Design.

We cover the impacts of the basic design form, including single-story and two-story, using homework quantifying the consequences of these choices, which are neither obvious nor intuitive. Thermal bridging is addressed by video and homework illustrating how the value of inches of insulation can be destroyed

by poorly conceived design or construction.

With some basic physical principles in hand, we survey the types of building assemblies applicable to realizing a Passive House. Another free lecture, All About Windows, explores how this most critical component of a Passive House is designed, specified and used to advantage by design choices which cannot be left to those unaware of the implications.

With these dramatic improvements in the building envelope, space heating, cooling and DHW mechanicals can be simplified. A continuously operating ventilation system is a new concept in homes, but delivers consistently high indoor air quality, also new to

existing homes. Case studies provide insightful perspective from real-world experience.

The capstone project is the challenge of designing a Passive House that meets the stringent space heating and primary energy criteria. Students design a simple home, making decisions on floor-planning, windows, insulation, mechanicals and renewable energy using feedback from PHPP Lite – a simplified interface to the complex Passive House Planning Package that is used to design and certify Passive House. Those completing this project gain knowledge and experience from which they will never look back. This knowledge can be directly applied to any new home design.

Rain Gardens

Ensuring clean runoff for homes, businesses, roadsides, lakes, streams, wetlands, and parking lots ...

DESCRIPTION:

Rain gardens are attractive and functional landscaped areas that filter rain runoff.

PURPOSE:

Rain gardens are designed to capture and filter runoff from paths and impervious surfaces. They collect water in bowl-shaped vegetated areas, and allow it to slowly soak into the ground. A rain garden reduces the potential for erosion and minimizes the amount of stormwater flowing from the lawn and impervious surfaces into lakes.

HOW TO INSTALL A RAIN GARDEN:

Rain gardens can vary in size, but are most effective when built to 20-30% of the drainage area. Rain gardens for single-family homes will typically range from 150 to 300 square feet, but even a smaller one will help reduce water pollution problems.

- The garden should be a shallow bowl-shape, with the lowest point of the garden no more than 6" below the surrounding land.
- The sides should be gently sloping towards the center to prevent sudden drop-offs that could lead to erosion problems or walking hazards.
- Rain gardens are often placed in a preexisting or created depression within a lawn, or in a location that receives roof runoff from a downspout.
- To avoid flooding improperly sealed foundations, build your rain garden 10' away from existing structures (including septic tanks), and direct water into the garden with a grassy swale, French drain, gutter extension or other device.

Rain gardens can be placed in sunny or shady regions of your lawn. Plant the lowest point with wet tolerant species, then use the most tolerant species for the sides closest to the center and the edges of the rain garden should be planted with moist to dry or dry tolerant plants. It is also important to check the permeability of your soil. Sandy soils only need compost added, but clay soils should be replaced with a mix (50- 65% sand, 15-30% topsoil, 2 -30% compost). After construction of the garden is complete, the entire area should be covered with a thick layer of mulch.

DESIGN GUIDANCE FOR PLACEMENT:

To test the drainage of the possible rain garden location, dig a 6-8 inch deep and wide hole and fill with water. If the water does not drain within 12 hours, the location is not appropriate for a rain garden. Rain gardens should be placed where their potential can be maximized. For example, although placing a rain garden under a mature tree will intercept runoff, the tree is most likely taking up more water than the garden would take up; therefore, a rain garden is unnecessary in this location. Also, do not locate a rain garden where there is existing vegetation that would need to be cleared.

MAINTENANCE:

Overall, once plants mature, the maintenance of a rain garden is very low. Watering is important during the first growing season, and some weeding is necessary after planting. As the garden matures, some of the perennials may need to be divided if plantings become too crowded.



A small rain garden with native plants captures and filters runoff from rain events. Source: Vermont Low Impact Development Guide for Residential and Small Sites.

LAKE BENEFITS

Rain Gardens capture and treat stormwater flowing from the lawn or impervious surfaces and prevent it from entering the lake or other waterways.

MATERIALS

Replacement soil mixes and Erosion Control Mix are available at local garden centers. Native plants can be bought from your local nursery. Please see Planting and Renaturalizing Areas from this series for planting specifications. Do not use fill that may contain invasive plant material.

Links:

For more details on how to properly construct a rain garden, check out the Vermont Low-Impact Development Guide: http://www.vtwaterquality.org/stormwater/docs/sw_LID%20Guide.pdf, And The Vermont Rain Garden Manual developed by the Winooski Natural Resources Conservation District: <http://www.uvm.edu:8889/~seagrants/communications/assets/VtRainGardenManual.pdf>.

Courtesy of Vermont Agency of Natural Resources ~ Lakes & Ponds Program ~ watershedmanagement.vt.gov/lakes.htm

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A small rain garden with native plants captures and filters runoff from rain events.

Rain Garden in a neighborhood setting



Plant Choices

Choose native plants based on need for light, moisture, and soil. Vary plant structure, height, and flower color for seasonal appeal and butterfly habitat.

Location

Rain gardens are often located at the end of a roof gutter or drain spout as a buffer between the lawn and the street or waterbody

Size

A rain garden is typically 5 to 10% the size of the impervious surface that generates the runoff..

Depth

A typical garden is between four and eight inches deep. This depth, proportionate to surface area, helps assure water will infiltrate quickly and not pond.

Soil Amendments

A good soil mix for rain gardens is 65% sand, 15% topsoil, and 25% topsoil, and 25% compost.

Adapted from illustration by Doug Adamson. Source: www.sleepycreekwatershedassociation.org



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The Wells Reserve at Laudholm is Now 100% Solar



The Wells Reserve at Laudholm, in Wells, Maine. Aerial photovoltaic array of the solar array on the Maine Coastal Ecology Center building. Photo: Flickr.com

The Wells Reserve at Laudholm in Wells, Maine, is the first nonprofit in the state to meet 100 percent of its electricity needs with solar energy. Over the past two years, the reserve installed 248 solar panels that are expected to generate 73,000 kilowatt-hours of electrical energy while preventing 45 tons of carbon from entering the atmosphere each year.

"This action moves us toward full energy independence, lightens our carbon footprint, and sets the bar for Maine's nonprofits and business community," said Nik Charov, president of Laudholm Trust. "We want this project to show Mainers this can be done. The science is clear on what is happening to our world and the solutions to our climate problem are right in front of us." Maine has the capacity to reach for energy independence and a sustainable future.

Paul Dest, director of the Wells National Estuarine Research Reserve, led the

reserve's effort to conserve energy and convert to renewable sources for electricity. "We set some aggressive goals and in less than 3 years we met them. Cutting our energy costs is a tangible reward that will strengthen our science, education, and conservation programs."

"More importantly, we are doing our part to reduce carbon emissions, taking a critical step toward limiting climate change," Dest added.

U.S. Senator Angus King (I-Maine) was on hand for the announcement.

"With rising seas and warming waters, estuaries serve as valuable barometers to monitor the mounting effects of global climate change," said Senator King, a member of the Senate Energy and Natural Resources Committee. "So it is only fitting that the Wells Reserve at Laudholm, a valuable part of NOAA's national network of estuarine research reserves, is also at the forefront of

the important transition to renewable energy sources and the fight against climate change. This major solar power milestone will help combat climate change by reducing oil consumption and curbing carbon emissions, helping to protect and preserve this treasured area in southern Maine for generations to come."

The reserve's \$200,000 investment in solar infrastructure was made possible by grants from the National Oceanic and Atmospheric Administration, the Mattina R. Proctor Foundation, and the Davis Conservation Foundation, with additional support from the Town of Wells and generous donors to the Wells Reserve at Laudholm. The reserve also received rebates through Efficiency Maine.

The four solar arrays, installed by Portland-based ReVision Energy, "helped us accomplish our initial goals, but we're not done yet," said Dest. "As we grow we want to ensure that all our power needs are met through renewable resources."

The Wells Reserve at Laudholm is a National Estuarine Research Reserve with its headquarters listed on the National Register of Historic Places. The reserve serves as a center for research, education and training, land stewardship and conservation, as well as preservation and protection of a sustainable future. Learn more about the Wells National Estuarine Research Reserve at well-sreserve.org/solar or call 207-646-1555.



System Facts

Four solar arrays – 3 rooftop and 1 ground-mounted
248 individual panels
63kW combined system output
90,000 pounds of CO2 offset annually
Cost: \$207,157

Additional Solar Energy Investments

4 air-source heat pump water heaters
1 air-source heat pump heater

Conservation Efforts to Complement Solar Gains

Smarter operations and aggressive conservation
Purchased 4 Energy Star Refrigerators
Replaced thermostat controls for reduced consumption
High-efficiency boiler replacements
Replaced all light bulbs with LED lights

Wells Reserve Hosts Workshop on "Blue Carbon" Science

Scientists from around New England met at the Wells National Estuarine Research Reserve on December 5, 2014, for a workshop focused on "blue carbon" science and policy. For the first time, scientists from throughout the region gathered to share research results, identify gaps in knowledge, and plan future collaborations involving carbon in coastal habitats.

The term "blue carbon" refers to the ability of salt marshes, seagrass meadows, and mangrove forests to take up and store carbon dioxide and other greenhouse gases from the atmosphere. Coastal wetlands capture carbon and store it at rates even greater than rainforests.

"Carbon held naturally in coastal wetlands is not entering the atmosphere as a greenhouse gas, so these habitats have real potential to mitigate climate change," said Dr. Kristin Wilson, Wells Reserve research director, who co-coordinated the workshop.

HOW GREEN IS THE HARRIS CENTER BUILDING?

CONVAL HIGH SCHOOL FRESHMAN LEARN HOW TO CONDUCT AN ENERGY AUDIT AT HARRIS CENTER IN HANCOCK, NH

By Jeremy Wilson and Margaret Baker

Hancock's Harris Center for Conservation Education remodeled their building in 2003 to very high green building standards. Most of us would assume that even close scrutiny of the building's energy efficiency today wouldn't turn up much that needs attention. A group of freshmen from ConVal High School proved that assumption wrong when they conducted an energy audit of the building in the fall and winter.

The Harris Center has collaborated with ConVal School District classroom teachers to provide a wide range of environmental programming for more than four decades. Elementary students explore the environment around their schools, sixth-graders learn about climate and agriculture, eighth-graders study forest ecology, and sophomores do an invasive plant survey. As part of this continuum of programs, freshmen learn about what is involved in a building energy audit as an applied component of the high school science curriculum's focus on energy transfer. Last year, ConVal freshmen studied the nooks and crannies of an empty farm-

house. This year, they turned their focus to the Harris Center itself.

Janet Altobello, Harris Center teacher-naturalist worked with Ted Stiles, a Harris Center adjunct teacher and an energy auditor with Yankee Thermal, and ConVal earth science classroom teachers, such as Dana Wood, to teach the students about a building energy audit and then apply what they learned to the real-life situation at the Harris Center. Students made observations with their eyes and hands, and also with tools, such as thermal imaging cameras and air pressure gauges, as they evaluated the building's design and performance.

Through the course of the audit, students visited and made observations at six stations located throughout the building. These stations included typical high-problem areas such as the basement and attic, an outside reconnaissance, and some that examined some of the "greener" features of the building. Ted Stiles showed them how to use a blower door test to determine how airtight a building is and expose where the worst leaks occur. Janet taught them how

to test the interior temperature of single-, double-, and triple-pane windows. In other areas, they applied their math skills to determine how much water the Center's composting toilets save, or calculate how much forest area is required to sustainably grow the amount of wood used to heat the building in the new pellet boiler. They found it was nearly 20 acres.

Ultimately, the work of the Harris Center and local teachers is to provide lessons that connect curriculum concepts to students' everyday life. "We're trying to do things with the kids where they can say, 'I can do this at my house, or I know how to make my house more energy-efficient,'" says Altobello. Using the Harris Center building as a teaching tool allows this to happen.

And though the Harris Center was only renovated 11 years ago, students were finding areas that could be tightened up — the result of oversights during the design and construction, problems caused during post-renovation repairs, and general settling of the building. The energy audit classes will continue this spring, so the Center doesn't



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Shalie Alfonso and Emma Simila of Peterborough conduct an energy audit at the Harris Center.

have the final results and recommendations of the audit yet, but they're eager to apply what the students learned to advance the Center's sustainability. Stay tuned!

To learn more, contact the Harris Center at (603) 525-3394.

Jeremy Wilson is the Executive Director and Margaret Baker is the Communications Specialist for the Harris Center for Conservation Education in Hancock, NH.



WHAT WE HAVE DONE AND WHAT WE CAN DO

By Braydon Burt

The Earth is over 4 billion years old, and in those 4 billion years, modern humans have only been around for 200,000 years. The early Earth was devoid of oxygen, but full of carbon dioxide. This environment could not possibly sustain any life. But, eventually primitive life forms such as Sino and Archio bacteria formed. They endured the harsh climate, feeding off of the energy produced by the sun. Over time, these organisms altered the atmosphere, broke up molecules, and filled the atmosphere with oxygen. This slowly changed the environment into one that could sustain life. Humans lived peacefully, causing little harm to their environment nearly 3 billion years later. But in the last few centuries, the damage to the Earth has been extensive.

Increase in CO2 in our atmosphere: Past Humans are constantly striving to do better. We have created technology beyond anyone's imagination. We have landed people on the moon, and even have landed a probe on a comet. But all of these advancements in technology are taking their toll on the Earth. The Earth has a protective layer that surrounds it known as the ozone layer. When fossil fuels are burned, they produce harmful chemicals, including CO2, which eat away at this protective layer. This allows the Sun's harmful rays to get through easier. Usually the majority of the rays would be

absorbed by the ozone layer, but due to the destruction of the ozone layer, these harmful rays are getting through easier, heating the Earth up. This is what most people refer to as global warming. Natural gas, coal, oil, petroleum, etc., are all responsible for the pollution of the Earth. But what if we found energy from clean sources, such as solar energy?

Increase in CO2 in our atmosphere: Future

The Sun emits a vast amount of energy in the form of solar radiation. When harnessed by solar panels, usable energy (electricity) is produced. It is estimated that if the whole world, every square meter, were to harness the power of sun at once for a period of time, it would produce over 400 terawatts of electricity. This much energy is insane. If every power plant in the world were to run on full for a period of time, it might reach 1 terawatt. If the world were to convert to clean energy, instead of burning fossil fuels, whether it were solar, hydro, wind power, or even a combination, the CO2 levels would drop dramatically, and the ozone layer would repair itself. If we catch it in time, the natural order of things may even go back to the conditions existing before the era of industrial technology. The ice caps would stop melting, rivers would stop drying up, and the air in big cities would be cleaner. If people petition for a cleaner and more



Braydon Burt, a 15-year-old student at Sugar River Valley Regional Technical Center in Claremont, NH

efficient Earth, they would not only be helping themselves, but also their children, and even their children's children. Solar energy in my opinion would be the best way to go because it is, for a fact, efficient, cheaper, and easily accessible.

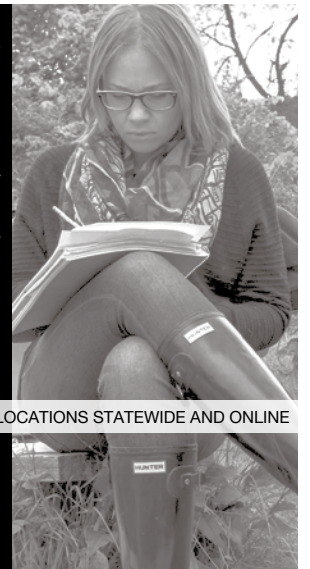
In conclusion, the rising CO2 levels are very alarming. But it isn't too late for humans to clean up their act. They can stop using so much fuel and put solar panels on their roof. This would power a great

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majority of their electric utilities throughout the day, and fuel would be used in situations when useful solar radiation is not available. CO2 is literally the Earth's poison. Perhaps if our government would finally realize that our world is slowly becoming more and more toxic, they would also be motivated to change to cleaner, greener, and more efficient energy.

Braydon Burt is a 15 year old student at Sugar River Valley Regional Technical Center in Claremont, NH. He wrote this essay for his Building Sciences and Green Energy Class, taught by Mitch Sidd. Look for more essays from Braydon in future issues of Green Energy Times.

CORNELL OKS BLACK OAK WIND FARM'S ENERGY



Photo: www.energyandresources.vic.gov.au

By Blaine Friedlander, Cornell Chronicle

Making a stride toward reducing carbon emissions, Cornell University has agreed to purchase all electricity generated by the proposed Black Oak Wind Farm in Enfield, New York, which is pending municipal approvals. This purchase represents 20% of the university's total annual electricity use – enough energy to power approximately 5,000 homes.

The Cornell University Board of Trustees approved the power purchase agreement this fall. The Town of Enfield Board accepted the final environmental impact statement on Nov. 12. The Enfield board is preparing a findings statement to complete the mandated State Environmental Quality Review, which is expected to be finalized by early next year.

Situated on some of the windiest hills in the Southern Tier, the Black Oak Wind Farm is expected to generate 11.9 megawatts annually by using seven efficient, state-of-the-art General Electric

1.7 megawatt turbines. The Black Oak Wind Farm would be New York's first community-owned wind farm.

"Wind is a very reliable source of renewable energy and contributes zero carbon into the atmosphere while generating electricity. As we use more wind, we reduce our dependence on carbon-produced electricity. This is a major step toward Cornell becoming a carbon-neutral campus," said KyuJung Whang, Cornell vice president for facilities services.

Cornell's Climate Action Plan, developed by Cornell faculty, students and staff in 2009, seeks to cut carbon emissions to net zero by 2035. Since 2008, the university has reduced gross carbon emissions by nearly 32%.

Another sustainability initiative, the Cornell Snyder Road Solar Farm – with 6,778 photovoltaic panels on an 11-acre plot that adjoins the Tompkins County Regional Airport – started producing electricity Sept. 19. It is expected to produce about 2.5 million kilowatt hours annually, enough to power 320 homes. The array will reduce the university's greenhouse gas emissions each year by 650 metric tons.

About Cornell Sustainability: Cornell supports research, scholarship, and the practical application of knowledge that address one of humankind's greatest challenges: achieving a sustainable world for all.

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Colton Evans (5), of Bradford, VT drew this picture in his pre-school class recently.

We found it quite interesting that he related solar energy to making something useful. In this case, it is a "color making machine!" Who knows just what the power from the Sun will bring us in the future?



RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: groups.google.com/group/350-Vermont
American Council for an Energy-Efficient Economy: Consumer guide to home energy savings - aceee.org/consumer
American Solar Energy Society (ASES): www.ases.org
Backwoods Solar: Specialty: solar, off-grid - www.backwoodssolar.com
Buildings Energy Data Book: buildingsdatabook.eren.doe.gov
Clean Power Estimator: www.consumerenergycenter.org/renewables/estimator
Consumer Guide to Home Energy Savings, Heating, Appliances, Refrigerator Guide, Building Envelope, Driving: <http://aceee.org/consumer>
Dept. Public Svc. (CEDF): publicservice.VT.gov/energy/ee_cleanenergyfund.html
Dsireusa.com: www.dsireusa.com Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.
Efficiency VT: This is a must go to site for immeasurable amounts of info. www.efficiencyVT.com
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Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html
Energy Guide: Unbiased advice about today's energy choices. Find ways to save, lower your bills & help the earth's environment - www.energyguide.com
Energy Star Federal Tax Credits: www.energystar.gov/tax_credits
Federal Energy Regulatory Commission (FERC): www.ferc.gov
Federal Energy Regulatory Commission(FERC): www.ferc.gov
Find Solar: www.findsolar.com
Fossil Fuel Freedom: Group working to make Vermont's energy plan 100% free of fossil fuels:
To join this group go to: groups.google.com/group/fossil-fuel-freedom
Greywater Info: www.oasisdesign.net/greywater
Home Energy Saver: Interactive site to help you identify & calculate energy savings opportunities in your home. A lot of great information! - hes.lbl.gov
Home Power Magazine: www.homepower.com
IREC/ Interstate Renewable Energy Council: RE educational info. www.irecusa.org
NABCEP/ North American Board of Certified Energy Practitioners: This organization that tests & certifies PV system installers. Individuals are Certified, companies are not. www.nabcep.org
NESEA/ Northeast Sustainable Energy Assoc.: www.nesea.org
National Association of Energy Service Co. (NAESCO): www.naesco.org
National Renewable Energy Laboratory (NREL): www.nrel.gov
National Solar Institute: www.nationalsolarinstitute.com
NeighborWorks® Alliance of Vermont: Low-cost energy loans - www.vthomeownership.org
New Hampshire Sustainable Energy Assoc. NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. www.nhsea.org
New York Solar Energy Industries Association/NYSEIA www.nyseia.org
NFRC independent rating & labeling system for the windows, doors, skylights www.nfrc.org/
NH Office of Energy and Planning: www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm
Renewable Energy World: www.renewableenergyworld.com
Renewable Energy Vermont: www.revermont.org
SEIA/ Solar Energy Industries Association: The SEIA Tax Manual to answer your solar related tax questions. www.seia.org
SmartPower: www.smartpower.org
Solar Components: www.solar-components.com
Solar Living Source Book: realgoods.com/solar-living-sourcebook
Solar Power Rocks: Impressive data and info ,including per state. www.solarpowerrocks.com/
Solar Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. SolarStoreofGreenfield.com
Tax Incentives Assistance Project (TIAP): www.energytaxincentives.org
The Energy Grid: www.pvwatts.org
The Office of Energy Efficiency & Renewable Energy (EERE): develops & deploys efficient & clean energy technologies that meet our nation's energy needs - www.eere.energy.gov
Track the Stimulus Money: www.recovery.gov/Pages/home.aspx
Vermont Energy and Climate Action Network (VECAN): works to start and support town energy committees as a powerful, people-powered response to realizing a clean energy future. www.vecan.net.
Vermont Tar Sands Action: Group working to stop the XL Pipeline and any other developments stemming from the Alberta Tar Sands. To join this group go to: groups.google.com/group/vt-tar-sands-action
VPIRG: understand the clean energy resources available to VT - www.vpirg.org/cleanenergyguide
VT Energy Investment Corporation (VEIC): nonprofit organization that issues home energy ratings for new & existing homes. 800-639-6069 - www.veic.org
Weatherization, Energy Star & Refrigerator Guide: www.waptac.org
www.susdesign.com/tools.php Online info for solar benefit with house design. i.e. window overhangs, sun angle & path...

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Sunnyside Solar Store's Secondhand Solar "There are Always deals!" A 10% spring sale on everything in the store going on right now. Two Shell 165W PV panels, a renewables library with lots of very in \$1 pre-owned renewable energy books for sale, and old and new books, "Eat More Kale" T-shirts in various sizes and colors for \$15, Light my Shed complete kit, with PV panels, controller/battery and light for \$95.00 (-10% with the spring sale) and PV lawn ornaments in various versions with PV panel and night lighting bulb in varying colors with 10% discount is \$24. We love DIY solar tinkerer's. Stop by soon and Shop Local for affordable Solar! 499 Marlboro Rd. Brattleboro, VT. 802 376-3838.

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Definition of Sustainable:

"Sustainable, means that the people living in a given politically or geographically defined area do not live beyond the limits of the renewable resources of that area for either input (energy and matter) or output (food, material goods, and absorption of pollution).

- Purchase or trade from environmentally conscious sources for those necessities that cannot be locally satisfied.
- Live both in numbers and in a manner that allows present and future generations of all life in that area to enjoy a healthy habitat over the long term."

Will your organization or business adopt a similar definition? *Learn more at vsp.org.*
This has been adopted by the VT Chapter of the Sierra Club and G.E.T.

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Ingredient of the Month

By Larry Pleasant

BRAIN HEALTH 102

As promised, here is part two of the Brain Power series.

This month we focus on omega 3 and omega 6 edible oils. These are the cod liver oils they tried to give your great grandmother when she was a kid. The oils were supposed to be a preventative for nearly everything that ails you. Turns out they were pretty much spot on.

Every mammal on earth has enzymes to re-manufacture various types of food oils (oils are also called fatty acids) that the body requires to work properly. And one of the body parts which require these oils is YOUR BRAIN. Some current thinking suggests that most humans on earth vanished about 70,000 years ago during a 10-year volcano-induced winter that was followed by a thousand years of ice age. According to this idea, all humans alive today may have descended from the handful of survivors from those times; which shows how closely related we all in fact are.

Humans lost the ability to manufacture two types of necessary oil molecules during this turbulent era. This forced us all to ingest them from food or become sickly, depressed and forgetful. "What was I just talking about?" Because you need them and must eat them, these oils are called essential fatty acids, or EFAs. Now that YOU know this you can adjust your diet or supplementation to compensate and move on to the next great adventure.

Land and sea insects make a lot of EFAs, and critters that eat them pass them on up the food chain. That is why eggs from hens allowed to roam free and supplement their diet with bugs are so much healthier for us. Fatty, cold water fish like cod, salmon and trout have a lot of EFAs in them too.

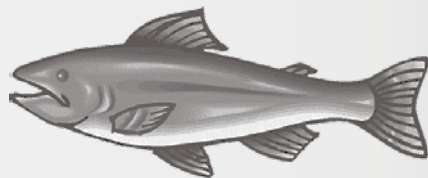
People who like to take supplements should consider krill oil. Five or six tiny microcapsules a day provide an excellent buffer for your brain health. Because they are so small and potent, krill oil capsules are easy to swallow and easy to digest.

Vegetable-based alternatives include flax and hemp seed oils. Like the animal based products, these oils degrade quickly with exposure to air, light and warmth. Keep oil-based supplements refrigerated regardless of their source, and never buy liquid flax or hemp seed oils that were not refrigerated in the store, as they will spoil rapidly upon opening. Capsules bypass all this by cutting off the oxygen in the air from getting at the oils.

Our settler ancestors ate salmon several times a week (or more) and all eggs were "free range." I also suspect they ate more than a few insects when they had to. Essential fatty acid deficiencies are a widespread problem in modern societies. Are YOUR children eating ANYTHING that contains these health-giving oils? If the answer is, probably not, then supplement their modern stripped-out diet with fish and with oils.

Their brains will thank you for it. And a big thank-you to Woody Allen for reminding us all that your brain should be your second favorite organ too!

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



Safer and More Effective Sunscreens

by Roddy Scheer and Doug Moss

Skin cancer is by far the most common form of cancer in the United States, with more new cases each year than breast, prostate, lung and colon cancers combined. And the rate of newly diagnosed cases of the most deadly skin cancer, melanoma, has tripled over the last three decades. But many of the sunscreens on the market do not provide enough protection from the sun's damaging rays. Also, some of them contain chemicals that can also cause health problems in their own right.

According to the non-profit Environmental Working Group (EWG), which assessed the safety and effectiveness of more than 1,400 "SPF" (sun protection factor) products for its 2014 Guide to Sunscreens, only one in three sunscreens for sale on the shelves of American stores offer good skin protection and are free of ingredients with links to health issues. "That means two-thirds of the sunscreens in our analysis don't work well enough or contain ingredients that may be toxic," reported the group.

A big part of the problem is the lack of tougher rules from the U.S. Food & Drug Administration (FDA). "The FDA's first major set of sunscreen regulations, 36 years in the making, took effect in December 2012 and proved far too weak to transform the market," reports EWG. While the new rules did restrict some of the most egregious claims on sunscreen labels (such as the "patently false" "waterproof" and "sweatproof" claims) and ended the sale of powder sunscreens and "towelettes" that were too thin to provide protection against ultraviolet rays, they didn't address inhalation threats from spray sunscreens or take into account the risks of exposure to so-called "nanoparticles" from zinc oxide and titanium dioxide varieties.

While the FDA is currently reassessing its stance on sunscreens, EWG warns it may be a while before new rules address these and other concerns, especially given push-back from regulatory-averse members of Congress and some manufacturers. So what's a health-conscious sun worshipper to do about sunscreen?

For starters, read labels. Some common sunscreen ingredients to watch out for and avoid include: oxybenzone, which can cause allergic reactions and



The Environmental Working Group says only a third of the sunscreens for sale on the shelves of American stores offer good skin protection and are free of ingredients with links to health problems. Photo: Bruce A. Stockwell, Courtesy Flickr

hormone-like effects; vitamin A (AKA retinyl palmitate), a skin irritant and possible carcinogen; and fragrances which can contain allergens and chemicals. Also, spray sunscreens are suspect because inhaling some of the ingredients can irritate breathing passages and even potentially compromise lung function. And EWG warns to avoid products with SPF ratings higher than 50, as their use can tempt people to apply too little and/or stay in the sun too long. Sticking with products in the 15-50 SPF range and reapplying often makes much more sense.

Some of the best choices are those sunscreens that employ either zinc oxide or avobenzone, both which have been shown to block the most damaging ultraviolet rays effectively without the need for other potentially troublesome additives. Some of the leading brands that meet EWG's criteria for both safety and effectiveness include Absolutely Natural, Aubrey Organics, California Baby, Elemental Herbs, Goddess Garden, Tropical Sands and True Natural, among others. Find these and other winners on the shelves of natural foods retailers as well as online. For a complete list of all 172 recommended sunscreens and to learn more about the risks, check out EWG's free online 2014 Guide to Sunscreens.

Contact: EWG's 2014 Guide to Sunscreens, www.ewg.org/2014sunscreens.

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4 PESTICIDES YOU MIGHT BE EATING

By Davis Jones

Yeah, we are what we eat, but an Amy isn't an amitraz, and a Ted shouldn't be a tetrachlorvinphos. It's an unfortunate truth that many of our favorite fruits and vegetables contain pesticide residue. Even more unfortunate is how consumers are expected to decipher the health effects themselves. To help, we're naming a few pesticides sometimes found on your favorite produce. All of our selections have great organic alternatives, which means you don't have to stop eating your greens (sorry, kids -- both your own mother and Mother Earth will approve).

1. Grapes: Chlorpyrifos

Smell rotten eggs? You might be getting a whiff of this organophosphate insecticide, which was re-registered by the US EPA in 2006. While it is not toxic in its original state (white/colorless crystals), chlorpyrifos actually becomes toxic once

your body processes it, taking a new form called chlorpyrifos oxon. What's particularly alarming is the insecticide's studied effects on children -- one study showed that babies born with chlorpyrifos in their systems by way of their mothers' blood displayed increased signs of developmental delays, attention deficit disorders, and hyperactivity disorders than babies without chlorpyrifos in their bloodstreams.

2. Spinach: Permethrin

This insecticide keeps a lot more than mosquitoes away; Permethrin has proven highly toxic to wildlife like honeybees and fish. It's obnoxiously tough to get rid of once it comes into contact with the sediment of aquatic systems, and it can remain absorbed in sediments for more than a year. Also, Permethrin has been classified by the EPA as "likely to be carcinogenic to humans" when it is ingested.

3. Apples: Carbaryl

We'd like to bet that your favorite apple variety doesn't involve la saveur de pet-care product. A 2008 study by the US EPA estimated that this chemical was treated on roughly 40% of the nation's apple crop per year. Because it is designed to disrupt the nervous systems of insects, young, growing children may be susceptible to negative long-term health effects. You can thankfully breathe a little easier for your pets, as the US EPA announced in 2009 that flea collars would no longer include carbaryl.

4. Sweet Bell Peppers: Methamidophos

Bell peppers Sometimes used on peppers grown in other countries, methamidophos has displayed the ability to slowly eat away at mild steel and copper alloys. This insecticide is rapidly absorbed by humans once you touch it, taste it, or smell



Photo by botahoratiu/istock

it. Much work has been done to limit its worldwide use, because there's nothing sweet about overstimulating the nervous system for the sake of stimulating your taste buds.

Davis Jones is an editorial intern at Sierra. His love for the outdoors began when he stepped on a fish hook as a 12-year-old and cried, in a burst of epiphanic clarity, "I'm too young to die." He attends the University of San Diego and enjoys camping, hiking, backpacking, and other activities that more or less benefit the mosquito population.



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Earth Day

5th Annual 5K Run & Free Fair
Celebrate Earth Day in Londonderry, NH

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Start of 5K race. Photo courtesy of LOCO Sports and Stonyfield

On Saturday, May 16, Stonyfield, the local organic yogurt maker, and LOCO Sports, will host the fifth annual Stonyfield Earth Day 5K & Fair. The event will be from 10 am to 1 pm at the Stonyfield Yogurt Works, 10 Burton Drive in Londonderry, NH. This family-friendly road race and fair is open to the public so all can join the fun! Rated one of the top ten 5k races in New England with about 2500 runners and 4000 attendees at the free fair, this is one opportunity locals won't want to miss!

Runners and walkers should sign up early to take advantage of new offers. The first 1400 pre-registered 5k entrants get an Adidas custom tech race tee. The first 200 kids to register for the children's race will get free passes to The NH Children's Museum and a pass to Charmingfare Farm.

Smuttnose will bring their well-known race beer tent (non-runners must pay for

beer). Complementing that will be free local pizza at the Rustic Crust pizza truck. A Market, Applegate, Pete and Gerry's Eggs and Pretzel Crisps will provide free, healthful food.

Pat and The Hats, a local-to-New Hampshire band, will play live music for the duration of the fair. Frank FM (106.3) and 105.5 JYY will broadcast live all day. The "Bunny Hop" will return this year, to bring attention to the endangered New England cottontail rabbit. Stonyfield will donate a portion of race proceeds to help support species conservation efforts.

NH Roller Derby, a non-profit sports organization, will provide a demo for fair goers. Kids will be able to enjoy a whole array of fun things, including face painting, laser tag, a chance to meet Gurt the Stonyfield Cow and several other mascots, and much more.

A dedicated runners' tent will be on site, complete with three chiropractic prac-

cont'd on p.38

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MONTPELIER, VERMONT NECI ON MAIN

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By N. R. Mallery

With our highlights on Montpelier's goal as the first net-zero capital in the country, we thought it was fitting to include a Montpelier landmark for our dining in the green feature. In this exemplary city in Vermont you will easily find NECI on Main, located at 118 Main Street. NECI on Main is now a charter member of the Green Restaurants in the Green Mountain State (GRGM) advancing to the Environmental Leader designation by meeting eight core environmental standards.

NECI on Main has developed an Environmental Action Plan to minimize the environmental impacts of business operations, using many different practices to "green" their business.

For energy conservation, these include lighting upgrades, purchase of Energy Star appliances and refrigeration equipment, heating system upgrades, and improved weatherization. Water conservation methods include low-flow dishwashers, sinks, and toilets. Resource conservation and sustainability is achieved through bio-based dinner and to-go ware, buying locally sourced products, maximizing reuse and recycling, collection of plant materials and food waste for composting, and the use of green cleaners and post-consumer recycled paper products.

NECI on Main is an award-winning fine dining restaurant featuring locally grown, sustainable, farm-to-table fare. Some of the measures it has taken to achieve Green certification are composting more than five tons of kitchen prep and plated waste each month, totaling approximately 500 tons of compost since inception of the program. Philip Stevens, the digital content coordinator for the restaurant,

described their policy more as being "chronic composters."

They recycle 600 pounds of plastic bottles and aluminum cans, and more than 1,000 pounds of cardboard each month. Incandescent light bulbs have been replaced with LED bulbs. They changed refrigeration motors to energy-efficient models, and installed two new induction cooktops, saving in excess of 7,500 kWh each year. Additionally, as a Vermont Fresh Network founding partner, NECI on Main is well proven in its local food movement, not only supporting Vermont farms but significantly reducing its carbon footprint.

NECI on Main is a production lab for New England Culinary Institute. The New England Culinary Institute was founded in 1980, and is widely recognized for its innovative immersion style of education featuring small classes, hands-on learning, and personal attention. Its graduates are sought after for their level of skill and preparation.

Imagine the entire state of Vermont as a food experiment or as its own laboratory where food products are grown and created for this particular climate; seasonally, organically, and sustainably. For 30 years they have been teaching students to make connections with farmers, between the landscape and food, and between seasons and culinary traditions. Sometimes they include food items that express a particular sense of place from outside Vermont, or culinary traditions from other cultures, and use those items or experiences to enhance the foods grown here in Vermont. Their menu is no exception in this teaching philosophy, and reflects the best that Vermont's farmers, and America's next generation of young chefs have to offer.



Top rt: The patio at NECI on Main in the summer with tapas and a glass of red
Left: Students prepare daily specials at the action station of NECI on Main.
Photos courtesy NECI.



Some of the locally sourced food that they prepare into their culinary wonders comes from Black River (Springfield, VT) for all of their meat, which comes from local farmers. Some of these farms even go so far as to grind the grain that feeds their animals. Other local vendors they partner with include King Arthur Flour, Vermont Creamery, and more. For more information about the New England Culinary Institute, or NECI on Main, go to www.neci.edu, or www.neci.dining. To have a look at their menus, go to www.neci.edu/neci-on-main/menus. They are open Sunday for a brunch buffet from 10 am to 2 pm. Tuesday through Saturday for lunch at 11:30 to 2 pm, for lite fare from 2:30 to 5:30 pm and for dinner from 5:30 to 9pm. Their number is 802. 223. 3188.



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SUTHERLAND WELLES ON MY DECK



By N. R. Mallory

My deck was built twelve years ago. Since that time I have used a number of finishes on it, none of which was satisfactory. The last one I used was put down three years back, and I was so disappointed that I power-washed it off. The cedar wood of the deck was weathering and wearing in ways that I did not want to permit, and so I turned to Mary Goderwis of Sutherland Welles, Ltd., in North Hyde Park, Vermont, for help. Aside from the fact that I had been impressed by their products for other applications, I prefer doing business with local companies.

I got some Sutherland Welles' Exterior Polymerized Tung Oil. Going from my weathered deck to a beautiful finish was not going to happen just by applying the oil, of course, so I started by cleaning the deck, preparing it for the application of

oil, exactly according to the Mary's instructions, and were online, too.

The first two applications had their stain mixed in for color. Sutherland Welles has a number of stains to choose from so I could get the exact color finish I wanted. I chose a warm pine color, with Mary's help. This was mixed with the tung oil, again with care to follow instructions. The final coat was just the tung oil. All coatings were cured accordingly. The tung oil also had two additives for protection of the finish,

one being protection against the harm of ultraviolet light, and the other a material called "mildewicide."

I should start by saying that my house has a lot of beautiful wood exposed, and this makes it very important to me that it has a natural wood finish look. The process of applying the tung oil was accomplished in three sessions with appropriate curing periods in between. When the tung oil was newly finished, it looked and felt exactly as I had wanted. It had taken a deck that was in clear need of a lot of work and made it something to be proud of. Neighbors marveled at the change. And, I could feel very good about having a natural finish on my deck.

This winter was brutal, and had the advantage of providing an absolutely perfect product test. Anything that could stand up to the elements in such a winter



clearly has some impressive advantages.

Now, having gone through a winter of watching to see how the tung oil finish stood up, I can give a report on it. It looks exactly as it did last summer, except that it might have a slightly more natural appearance.

I would highly recommend this product to anyone who loves the appearance of wood and wants to protect it. Sutherland Welles not only has a great product, but also easy to follow instructions, and great support, if you need it. I'm hooked!

The website for Sutherland Welles is www.sutherlandwelles.com.

5th Annual 5K Run & Free Fair

cont'd on p.36

tices, and massages for all by Seacoast Career School. Grace Limousines will provide shuttles to and from nearby parking lots.

General registration is \$30 and tickets can be purchased from March 1 through

May 12 midnight. Race day registration may be available, pending space. The Kids Race is for children 10 and under and is free; children can be registered at the fair. Affordable youth pricing for big kids over 10 is also available for \$20 a ticket. Runners can head to <http://stonyfield5k.com/> for more information.

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THE HOME AND LIVING STORE

Six Ways to Control Weeds

By Jessica Barber Goldblatt

Weeds are many homeowners' and gardeners' biggest enemy. Roundup and other chemicals may seem like a weapon in the arsenal against weeds. However, they can leach into fruits and vegetables. They also run off and trickle down into groundwater. There are better, safer ways to prevent and control weeds before they take over. Here are strategies for preventing weed growth, and methods of controlling unwanted weeds.

1. Crowd out weeds with thick lawn cover. Keeping the lawn thick and healthy prevents room for weeds to grow. Re-seeding lawns in the fall, when many weeds are already dead, means less competition for space as grass seeds try to take root. Ground cover and thick plantings crowd out weeds in decorative beds.

2. Keep your plants healthy with fertile, aerated and well-drained soil. Carefully hoeing the topsoil can effectively control some weeds but should consist of short, shallow strokes that simply cut off the weeds at soil level.

3. Mulching garden beds is the most important factor in preventing weed growth. Nearly any barrier that blocks light works as mulch. Bark, dried leaves, straw, cardboard... Organic mulches improve soil structure, and add nutrients, keep the soil cool and moist.

4. Cover the ground with landscape fabric. They are typically made of plastic, but may also be sheets of burlap or other natural fibers, or recycled plastics, and are effective at blocking weed growth while allowing water and air into the soil. Use in conjunction with compost and mulch.

5. Keep an eye on weeds and pull them before they can go to seed to keep them from getting deeply established and spreading. Two years of vigilant pre-flower weeding can have long-term advantages.

6. Vinegar and other organic herbicides aren't all made of nasty chemicals. Organic soaps, plant oil blends and even common household products are all used as natural herbicides. While some research suggests vinegar, or acetic acid, is not always effective, other research shows drenching targeted weeds with vinegar can kill them, without any risk of toxic runoff. It is not selective, so beware that this means that it may kill everything it strikes.

In Conclusion, none of these methods will work by itself, but vigilance, regular control of undesirable plants and proper care for desirable plants should minimize weed growth without the need for any chemical controls.

Also consider controlling your reaction to weeds. Some homeowners and even experts suggest a live-and-let-live philosophy.

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

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Autumn Road by Peter Huntoon

'Autumn Road' was painted by Peter Huntoon in October 2013. This painting holds a special memory in his heart, full of love and meaning.

Local Artist, Peter Huntoon's A Day in Vermont, launched two years ago, on March 16th, 2013.

Peter said, "Wow. Time flies doesn't it? Since we began two years ago 4000 new friends have joined us here on A Day in Vermont, exploring the state we love and celebrating her beauty through art".

Since this adventure began, 159 original paintings have been collected together and thanks to his followers, have found their way to happy homes. See Laughing in the face of fear, a story we ran on page 29 of the Dec. 15, 2013 issue of Green Energy Times. This story about Peter and his Day in Vermont endeavor can be found at greenenergytimes.net/wp-content/uploads/2013/12/GET-DEC-2013-WEB.pdf.

"It's my sincere pleasure and privilege to share this creative adventure with you each week," stated Huntoon, in his newsletter on the anniversary date.

See more Vermont paintings by this amazing artist and keep your amazing support and inspiration going his way. Sign up to see his weekly painting from his website at peterhuntoon.com

We would like to extend big congratulations to Peter Huntoon and A Day in Vermont, from Green Energy Times. -- Nancy Rae, George and our whole team.

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- Jeannette

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I developed these products while working in malaria infested zones in Liberia, West Africa. They both contain the same awesome essential oil blend. The lotion lasts a solid 4 hours before renewal. The spray lasts about 40 minutes but is good when you need something quick and is good to go over your clothing and on your hat. Be sure to use the lotion on your ankles and exposed feet near sunrise and sunset.

Bring along 16oz of our Tea Tree Castile soap. Use it to wash hands, clothes, dishes, washing out cuts and scrapes etc. If you are traveling in rural village areas this is not an option. Lots of people will want to shake your hand. Bump fists instead.

Be sure to pick up a 2oz tin of our shea butter. It works incredibly well on sunburns, scrapes and bites and lips. Shea butter has a mild spf of 2-3 (naturally occurring). Bring a big floppy hat like a TILLY hat as your first line of protection. I have never met a natural formulator who recommends the regular use of sunscreen on themselves or on their kids and I don't either except for episodic protection in extreme conditions.

Best of Luck, travel in threes and bring emergency CIPRO antibiotics just in case.

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