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## Solar Farms Are Sprouting Up All Over

### Breaking News: 2 MW of Solar Coming for Chester, VT

By George Harvey

Solar farms are springing up ever faster, and we often hear of projects few people know about. A two-megawatt solar farm in Chester, VT is a good example. The engineering, by Solar Design Associates, is complete. The permitting process is now in its final phase. Green Mountain Power will take the power on a 25-year contract under Vermont's Sustainably Priced Energy Development (SPEED) program. The developer is Solar Renewable Energy Development, LLC, of Mechanicsburg, Pennsylvania. Clearly, this is a collaborative effort, involving many people and companies.

The land to be used for this solar farm is a 93-acre lot along Route 103. The solar array itself, however, is will only occupy a little more than 10 acres. In siting the array, consideration has to be given to how the land lies relative to the sun's path, so the sun's light can be used to best advantage. The engineers have other criteria to work with, however, and esthetics is one. The array is sited so as to produce as little visual impact as possible for people of the area. Since solar power is so quiet, sound is not an issue.

The example in Chester is not the only project in the state. In fact it may not be not the only example in Chester, as we hear rumors that another project also under way there. But certainly there are other projects all over the state. Williston, Bridport, Monkton, Rutland, Putney, and Brattleboro all have solar farms being planned or constructed in their communities. Municipalities, consumer groups of different types, school districts,

*Cont. on page 25*



SunGen Sharon 2.2 MW Solar Farm in Sharon, VT  
Photo Credit: SayCheeeeeee

## BUILDINGS FOR A FUTURE

### Solar Design Associates build with Net Zero as goal



(top) 21st Century Net Zero Farmstead in northern New England, (right) Tin Mountain Net-Zero-Energy Conservation Center in the Mt. Washington Valley of New Hampshire



*Feature Section: Buildings For A Future see pp 20 - 23*

## THIS OLD HOUSE G.E.T.S A PLACE IN THE SUN

By Ken Wells

Twenty-five years ago, my wife and I fell in love with an old house in Andover, NH. We first saw it on a day when mud season had exploded into glorious spring.



Ken and Lee Wells, happily show off their place in the sun in Andover, NH. Note the solar hot-water panel on roof.

Daffodils were poking up. Mt. Kearsarge loomed in the distance. Pileated woodpeckers were nesting in a hollow tree by the barn. But once the place was ours, we

*Cont. on page 15*

#### - Staff article

Every now and then, when least expected, you learn about something or someone that leaves you saying "My goodness - this is just amazing..."

Well, that's exactly what happened when we learned about Solar Design Associates.

Solar Design Associates, a Harvard, MA-based solar design firm is a group of engineers and architects dedicated exclusively to renewable energy and Zero-Net-Energy buildings. While they work all over the world, they have solid connections in our region. Here are just a couple of smaller examples of what they do:

#### 21st Century Net-Zero-Energy Farmstead

This traditional New England farmstead is a primary residence that was built to be Net-Zero-Energy, powered completely by renewable energy. The fully Net-Zero farmstead - also includes the owners' transportation. The site has spectacular mountain views in northern New England, where, as we all know, the climate is a challenge with about 8,750 degree-days and modest solar resources.

SDA achieved Net-Zero with an integrated solar electric roof of high efficiency solar modules for the traditional 'out barn.' The PV system was configured to support an array sufficient to cover fully the electrical needs of the house, including charging stations for EVs and PHEVs.

The 'main barn,' is attached to the house. It houses the garage and a workshop for the owner's collection of classic motor-

cycles. The upper level is a studio space. It hosts a generous solar thermal array that provides space heating and domestic hot water. Both systems are designed with Solar Design Associate's trademark fully integrated solar roofs - where the solar becomes the finished weathering skin of the structure.

Radiant heat is employed throughout - including the insulated garage area. The house plan, materials and details are authentic to early New England farmhouses. The owners have no energy bills.

#### Net-Zero-Energy Environmental Center

New Hampshire's Tin Mountain Conservation Center provides education programs that foster greater awareness and understanding of the natural environment for school children, adults, and families. When the organization decided to build their new headquarters and Nature Learning Center, they asked SDA to help create a Net-Zero-energy home for the organization.

SDA worked with Meredith, NH architect Chris Williams to develop a design that responded to the site and met the client's requirements while obtaining all its energy from on-site renewable sources.

Timber harvested from the site when the building area was cleared, was cut and assembled by local craftspeople. It frames the dramatic 'great space.' High levels of

*Cont. on page 21*

Save your Fruit Trees-Invasive Bug in New England: p.3 • Global Warming Solution for New England: pg 29  
Sustainable Food Systems: p 30-31 • Aquaponics, Bees, Grow Biodiesel pp 32-33

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# SAVE YOUR FRUIT TREES!

## Climate Change Brings Invasive bug to New England

### Staff article

One of the gifts Hurricane Irene may have left behind is a new invasive species for New England. It is called the Spotted Wing Drosophila (SWD). A native to northern Japan, small numbers were seen in New England in 2011. This year it is expected to do extensive damage to fruit crops, varying in effected areas from light to almost 80%.

The SWD may be hard to handle for a while. Contrary to some reports, it does not limit its damage to berry crops, and will attack all sorts of soft-bodied fruit, including cherries, peaches, grapes, and others. It has no local predators to keep it in check – at least not yet. There is a tiny wasp that attacks the larvae of the SWD, and will doubtless also move in. Since this will happen whether we want it or not, the wasp may be introduced artificially to help protect crops. There are also other natural predators in places to which SWD is native, and some may be useful here.

There are a number of things growers can do to protect their fruit. First off, when fruit is harvested, all the fruit should be removed, whether it is good or not. Bad fruit has to be disposed of. Eggs and larvae usually survive crushing, and survive imperfect composting in sufficient numbers that it is not recommended as a control method. There may be alternate ways to compost fruit that will kill them,

and these might prove useful, but there are no reports on them in yet. They will not survive if the fruit is buried more than two feet deep.

Traps can limit the numbers of the SWD, if they are put out intensively. Vinegar traps can be helpful if there are 60 to 100 per acre. Leaving traps through the winter can help reduce the numbers of SWD that



Male SWD, showing wing spots. The female has none.

overwinter.

Perhaps the best preventative a grower can use right now is a fine mesh covering. Openings should be 0.98 mm (0.039 in), or finer. This can be used to cover individual plants, or in tunnels over rows of berries. Unfortunately it is expensive.

Since SWD is a new invasive, research on it is just now underway. We can expect more and better information on how to combat SWD in the future. ♀

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## GMP AWARDS CONTRACTS FOR SOLAR FARM AT RUTLAND REGIONAL, ENERGY INNOVATION CENTER

**RUTLAND, Vt.** – Two Vermont solar installers have been selected to build the Solar Center at Rutland Regional Medical Center and the solar installation at Green Mountain Power’s planned Energy Innovation Center.

SameSun of Vermont, based in Rutland, has been selected to build the 150-kilowatt Solar Center at Rutland Regional, and SunCommon of Williston has been selected to build 18.3 kilowatts of solar on the EIC rooftop at 68 Merchants Row. The EIC project includes two types of solar collectors, including a ballasted 13.7-kilowatt roof-mounted array and a 4.6-kilowatt rack-mounted system. Both projects will include educational components and will welcome visitors to learn about solar energy and related topics.

The Solar Center at Rutland Regional will be built on property surrounding two stormwater retention ponds just south of Allen Street, adjacent to the hospital’s walking path.

GMP, which will own and maintain the solar center under a 25-year lease agreement with Rutland Regional, will credit the hospital for 10 percent of the project’s output. The remaining energy will go onto the local electric grid and will be consumed by local GMP customers.

The project awards were based on requests for proposals issued in April and distributed to all Renewable Energy Vermont members. Once permits are in place, both solar projects are expected to begin construction later this summer.

The projects are part of GMP’s ongoing effort to make Rutland the solar capital of New England, the city with the highest solar capacity per capita of any city in New England. The effort supports Vermont’s

effort to substantially expand renewable generation, and GMP’s efforts to support new economic development in Rutland.

GMP has already completed the Creek Path Solar Farm, a 150-kilowatt project on Cleveland Avenue and purchased an ownership stake in the Green Lantern project off Woodstock Avenue. The company is also about to issue an RFP for developers interested in building the Stafford Hill Solar Farm in Rutland, which is expected to have capacity of about 2.3 megawatts, and numerous other project discussions continue.

“We were very happy with the bidding on the Solar Center at Rutland Regional and the EIC project, and pleased to be able to award the contracts to companies that are making a real impact in meeting Vermont’s energy goals,” said Mary Powell, GMP’s president and CEO.

“We look forward to working with GMP on the final design of the Rutland Regional project,” Rutland President Thomas Huebner said. “It will be a nice addition to our campus and will help reduce the environmental impact of local energy consumption.”

“We are gratified to win the bid to design and install this solar project, which will have a wonderful educational presence,” said Philip Allen, co-owner of SameSun. “We are excited to work with Green Mountain Power again, and particularly proud to be doing this work for Rutland Regional Medical Center.”

**ABOUT GREEN MOUNTAIN POWER**  
Green Mountain Power ([www.greenmountainpower.com](http://www.greenmountainpower.com)) generates, transmits, distributes and sells electricity in the state of Vermont. The company, which serves more than 250,000 customers, has set its vision to be the best small utility in America. ♀

## CLIMATE CHANGE ADAPTATION



Satellite Photo of Hurricane Irene

Photo: NASA

### From the VT Agency of Natural Resources

“The time for debate over the realities of global climate change is over. Global climate change is occurring, and every Vermonter will experience its impacts on the quality of life for which Vermont is justifiably famous.”

- GCCC, 2007

The climate of Vermont has been changing quickly in recent decades, as increased concentrations of greenhouse gases in the atmosphere drive changes in the global climate. These changes in regional climate have and will continue to affect Vermont’s landscape: agriculture, forests, streams, lakes and wildlife. In addition, much of the societal infrastructure of Vermont was designed under the assumption that climate would change little from decade to decade. This is no longer true, so a more adaptive approach is needed for the rest of this century, if we are to preserve the environment and quality of life we enjoy in Vermont.

The primary driver of climate change

is the increase of atmospheric CO<sub>2</sub> from the burning of fossil fuels. Atmospheric CO<sub>2</sub> has now reached 390 parts per million (ppm). This is 30% above its highest value in the past million years, and it is still increasing by 2ppm per year. Stabilizing CO<sub>2</sub> in the atmosphere will require an 80% reduction in our global emissions. Even if stabilization is achieved, the climate will continue to warm for many decades. For this reason, natural resource managers and state agencies cannot focus only on mitigation efforts to reduce our CO<sub>2</sub> output. We must also pursue adaptation strategies that will increase our society’s ability to adjust and respond to the effects of climate change.

Vermont can expect to see a wide variety of effects as a result of climate change, and the Agency of Natural Resources is developing an adaptation plan to protect the most vulnerable resources, areas, and sectors in the state. Source: <http://www.anr.state.vt.us/anr/climate-change/Adaptation.html> ♀



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# VOLKSWAGEN TURBO JETTA HYBRID LEAVES COMPETITION IN THE DUST

By Alexandra Binder

GREENLAND, N.H. — Debi Altberg wasn't searching for a hybrid when she recently visited Seacoast Volkswagen intending to buy a second VW, but when the decision came down to which vehicle had the best fuel economy and highest miles per gallon, Altberg was sold on the new turbocharged VW Jetta Hybrid.

"We were looking at the regular Jetta," Altberg says, "but the hybrid stood out because of its great gas mileage." The Jetta Hybrid gets an impressive 48 highway mpg and 42 city mpg.

Don Turbide, Seacoast Volkswagen's business developer manager, acknowledges the stigma associated with hybrids, saying that "most hybrids are pretty boring when you come down to it, and they aren't as fuel efficient or nice driving as advertised. But the VW Jetta Hybrid is different."

Unlike most hybrids, the Jetta Hybrid is turbocharged, producing 170 horsepower and 184 foot pounds of torque accompanied by a smooth and balanced drive.

Altberg, whose other car is a VW TDI, really enjoys Volkswagens for their great performance and reliability, so she was "pleasantly surprised that VW had a hybrid and that it was such a nice car."

Turbide points out that even though Volkswagen is still new to the hybrid world — its first hybrid being the 2011 Touareg Hybrid SUV — it has always been an environmentally conscience corporation. "VW has been designing cars for awhile with materials that are recyclable, and they were a leader in this."

Besides the green aspects of the cars themselves, the Seacoast Volkswagen



dealership itself is incredibly sustainable. The dealership is home to LED lighting, solar panels and its own personal wind turbine.

The company as a whole also has sustainability on its agenda, committing to plans that will cut its overall carbon emissions by 30 percent in 2015 compared



to 2006 levels. It also has committed to making every new generation of a given car line 10 to 15 percent more efficient than the car it replaces. Volkswagen proves that drivers need not lose anything to gain sustainability.

"Most people purchase VWs for their performance, and even though the VW Jetta Hybrid is a hybrid, it stays true to Volkswagen's high performance commitment," Altberg says.

Seacoast Volkswagen is a proud business partner of the Green Alliance, a union of local sustainable businesses

promoting environmentally sound business practices and a green co-op offering discounted green products and services to its members. Now through the end of April, Green Card holders save 15 percent on all parts, accessories and service. Plus, they get \$1,000 under invoice on any new TDI Green Diesel or Hybrid Volkswagen. Furthermore, save \$45 on a \$300 repair or \$120 on an \$800 repair.

For more information about Seacoast Volkswagen, [www.seacoastvw.com](http://www.seacoastvw.com). Alex Binder is a writer for the Green Alliance, [www.greenalliance.biz](http://www.greenalliance.biz), and a senior English major at the University of New Hampshire. She is also a committed member of the UNH Student Environmental Action Coalition.

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## THE TESLA IS A VERY DIFFERENT CAR

By George Harvey

I went out for my first ride in a Tesla Model S with Jason Cooper, the first person I know to have one. It reminded me a bit of my first ride in the Prius, in the sense that both cars have impressive technology. But the Tesla is a very different car, and it is stunning. I am not surprised that it got the year's highest rating from Consumer Reports.

Like the Prius, a driver only needs a moment's instruction on different new features to be ready to drive. Unsurprisingly, the Tesla is a good deal quieter than a Prius, which has been known as a very quiet car. The Tesla also outshines the Prius on gas mileage.

The Model S is a family car, but it can do 0 to 60 in 5.4 seconds. Its top speed is 125 MPH, which is much faster than I will ever drive. The main battery is mounted below the floor; it is very shallow, but nearly as wide as the car, and runs from axle to axle. Since much of the weight of the vehicle is in the battery, the center of gravity is very low, with the result that the handling is superb.

The dashboard has a large display with a touch screen for commands. It can do just about anything from telling you how far you can go on the current battery charge to answering the phone for you. A backup camera shows a picture of what is behind you on the screen, so you see just about everything as you back up. You also have a good sense of how far away any object behind you is. Thoughtfully, the image is reversed, as it would be in a mirror, putting your left on the left and right on right, instead of how it would be



on a normal television.

Other features include door handles that are flush with the body most of the time, but move out automatically for use when a person with a key approaches the car. To start the car, a person with a key needs only to step on the brake. The car can be elevated slightly off a dirt road at the touch of a button, to reduce likelihood of damage. I could use pages describing features.

There is no gas. A full charge can take you hundreds of miles, and you can get a fresh charge at a high speed charging station while you have lunch. Public charging is free almost everywhere. There are no oil changes, no emissions, and no mufflers to go bad. Your first maintenance is likely to be either getting new tires or replacing the windshield wipers.

Considering the difference in overall costs, the Tesla is much less expensive than its sticker price might make you think. There is bad news, though, because the waiting list is long. But there is more good news, because other car companies are adopting the technology.

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## AN EV HELPS TO DISTRIBUTE G.E.T. -- A PERSONAL EXPERIENCE

by George Plumb

I have been driving an all-electric vehicle, a Mitsubishi, since last October and it has been a fascinating and enjoyable experience. With the fold-down rear seats I can load thirty bundles of Green Energy Times (G.E.T.) to distribute all over central Vermont. My bicycle also fits in it for taking it to the start of bicycle trips.

Making the big leap to an EV has been a thrilling experience for me. I haven't stopped at a gas station in all those months which feels really great. I just take about thirty seconds to plug it into my 110-volt regular outlet when I get home and by the next morning it is ready to go again. There are also now two public

charging stations in Montpelier so sometimes I use one of those to get an extra boost. Because of the difficulty of finding a public parking space in Montpelier I can almost always just park at one of these vacant spots and the charge is also free. These public chargers are what are called Level 2 chargers and charge much faster than a 110-volt home charger. Level 2 chargers can also be purchased at an extra cost for home use also.

Although it has a low road clearance and I have bottomed out a few times in the spring ruts the dealer says that there is no damage or problem. The only disadvantage to the car is that if you turn the heater or defroster on in the winter it draws the battery down a little



George Plumb distributes Green Energy Times with his all electric Mitsubishi Miev. Here he is picking up a load of the April 15th Issue from Bradford, VT.

faster, depending how much heat and blower demand the settings are at. But

I just bundle up a little more and it hasn't been difficult for me.

This model has a driving range of approximately 62 miles. That varies with the slope of the land. Going

downhill it actually generates electricity but going uphill it uses more electricity. The most energy efficient driving speed is about 55mph so it would not be good for someone who likes to drive faster.

Drive Electric Vermont has a lot of useful information on its web site including an interesting map showing the number of EVs registered in each town and the location of all the public charging stations. <http://www.driveelectricvt.com/>

## IDLE-FREE VT VERMONT ENACTS STATE LAW PROHIBITING UNNECESSARY IDLING!

Governor Peter Shumlin signed into law S.150 – An act relating to miscellaneous amendments to laws related to motor vehicles. Two sections in S.150 relate to the idling of motor vehicles.

Sec. 28 – Prohibited Idling of Motor Vehicles – has the general prohibition, “A person shall not cause or permit operation of the primary propulsion engine of a motor vehicle for more than five minutes in any 60-minute period, while the vehicle is stationary”. This applies to all motor vehicles. There are exceptions where this does not apply, such as for safety and emergency vehicles, passenger bus comfort, trucks that need to power certain auxiliary equipment, and for occupied truck sleeper berth compartments. Those in violation of the law will be assessed a penalty of \$10 for a first violation; \$50 –

second violation; \$100 – third and subsequent violations.

Sec. 28 takes effect May 1, 2014.

Sec. 29 – Driver Training Course – states, “All driver education courses shall include instruction on the adverse environmental, health, economic, and other effects of unnecessary idling of motor vehicles and on the law governing prohibited idling of motor vehicles”. Sec. 29 takes effect July 1, 2013.

<http://www.leg.state.vt.us/docs/2014/bills/Passed/S-150.pdf> (pages 41-42)

## GENTLEMEN (& LADIES), STOP YOUR ENGINES! ROAD CONSTRUCTION PAVING PROJECTS

With some big road paving projects underway around the state, while motorists welcome these improvements, a significant downside is the excessive idling of vehicles in traffic delays throughout the workday. These long lines of idling vehicles impact us in many ways:

**OUR HEALTH.** Emissions contain toxic chemicals that can affect our respiratory systems. Children, the elderly, and individuals with asthma are especially vulnerable.

**FUEL WASTE.** An idling vehicle gets 0 MPG. 10-30 seconds of idling uses more fuel than shutting off and restarting.

**ENGINE WEAR.** Many owner's manuals state to limit idling to avoid increased engine maintenance and shortened engine life.

**CLIMATE CHANGE.** Greenhouse gas emissions from vehicles, including carbon dioxide (CO<sub>2</sub>), contribute to climate change.

**ENERGY WASTE.** The Dept. of Energy states researchers estimate that idling from light-duty and heavy-duty vehicles combined wastes about 6 billion gallons of fuel annually in the U.S.!

Please consider shutting off your



engines in these types of traffic delays, except in inclement weather. It is legal to do so and is a recommendation supported by Lt. John Flannigan, Vermont State Police St. Albans Station Commander and formerly with the Traffic Safety Unit. We'll do our planet a favor and we'll all breathe easier.

Idle-Free VT Inc. is a 501c3 nonprofit organization with a primary goal to raise awareness of unnecessary vehicle idling (idling when parked) in Vermont by encouraging adoption of policies, practices, resolutions and curricula to reduce vehicle idling. It also advocates the enactment of local and state laws, regulations, and rules to limit vehicle idling. [www.idlefreevt.org](http://www.idlefreevt.org)

## AIRPLANE EXHAUST VS AUTO EMISSIONS ON THE ENVIRONMENT

While air travel today accounts for just three percent of worldwide greenhouse gas emissions, the carbon dioxide (CO<sub>2</sub>) and other pollutants that come out of jet exhaust contribute disproportionately to increasing surface temperatures below because the warming effect is amplified in the upper atmosphere.

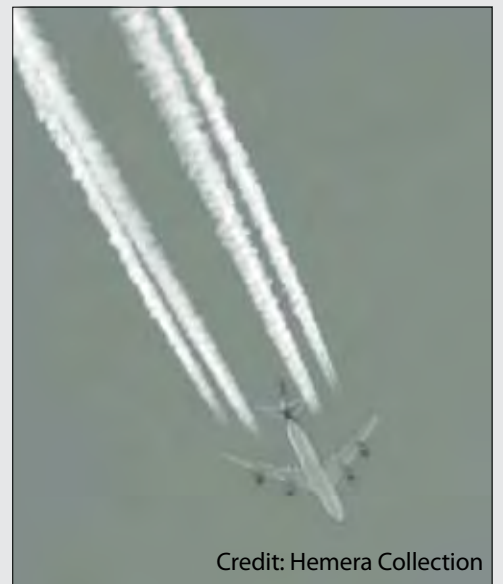
The Intergovernmental Panel on Climate Change (IPCC), a scientific intergovernmental body set up by the United Nations (UN) to provide comprehensive scientific assessments of the risk of human-induced climate change, reports that CO<sub>2</sub> emitted by jets can survive in the atmosphere for upwards of 100 years, and that its combination with other gas and particulate emissions could have double or four times the warming effect as CO<sub>2</sub> emissions alone.

Modern jet engines are not that different from automobile engines—both involve internal combustion and burn fossil fuels. But instead of gasoline or diesel, jet fuel is primarily kerosene, a common home heating fuel used around the world. Just like car engines, jets emit CO<sub>2</sub>, nitrogen oxides, sulfur oxides and soot.

Beyond their contributions to global warming, airplane emissions can also lead to the formation of acid rain and smog, as well as visibility impairment and crop damage down on the ground. The U.S. Environmental Protection Agency (EPA) reports that aircraft engines contribute about one percent of total U.S. mobile source nitrogen oxide emissions and up to four percent around airports in some areas.

What worries environmentalists is the fact that the number of airline flights is on the rise and is expected to skyrocket by mid-century, meaning that if we don't get a handle on airplane emissions, our other carbon footprint reduction efforts could be for naught. The U.S. Federal Aviation Administration (FAA) reports that commercial flights grew nine percent from 2002 to 2010 and will rise another 34 percent by 2020.

Jet emissions standards are based on guidelines established under the U.S. Clean Air Act and are set by the International Civil Aviation Organization (ICAO). Current standards were created in 1996 and updated in 2006, but environmental leaders want even stricter limits on



Credit: Hemera Collection

Caption: The Intergovernmental Panel on Climate Change reports that CO<sub>2</sub> emitted by jets can survive in the atmosphere for upwards of 100 years, and that its combination with other gas and particulate emissions could have double or four times the warming effect as CO<sub>2</sub> emissions alone.

greenhouse gas and other emissions.

The IPCC recommends funding more research into aviation's effects on climate to guide the development of aircraft and engine technology, promoting more efficient air traffic operations and expanding the use of regulatory and economic measures to encourage emissions reductions.

In regard to economic measures, the European Union (EU) is leading the way with new rules that assess fees on foreign airlines based on their CO<sub>2</sub> emissions. The new system, which would require airlines using an airport in Europe to trade for or purchase permits corresponding to the amount of greenhouse gases they emit, was supposed to go into effect in 2013 but has been postponed due to intense opposition from foreign governments which consider it a barrier to trade. EU officials have threatened to put the plan into effect nonetheless if airlines or their governments can't agree on new stricter emissions limitations.

Contacts: IPCC, [www.ipcc.ch](http://www.ipcc.ch); FAA, [www.faa.gov](http://www.faa.gov); ICAO, [www.icao.int](http://www.icao.int).

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# THE ROXBURY ENERGY COMMITTEE A LITTLE TOWN WITH BIG IDEAS!

By Michael Feiner

The little town of Roxbury at the geographic center of Vermont boasts some big ideas when it comes to bringing solutions-based efficiency and energy

reduce the town's energy expenses, and position us to achieve significant energy savings in the future.

Sidelined temporarily by Tropical Storm Irene, the committee stayed the course and over the next year organized and

completed a substantial insulation, air sealing and weatherization upgrade of the town's Community Hall; a nearly \$18k project was completed for just over half that amount out of the town's building funds with the help of grants and incentives! According to the final building performance test conducted by Efficiency Vermont, the project achieved outstanding marks for air sealing of over 64% reduction, and a total estimated heating energy savings of over 38%.

With one big project on the docket at a time, we still find time to host events and workshops, and take on smaller projects like getting the town's 16 antiquated streetlights upgraded to high-efficiency LED models as part of the state's Municipal Streetlighting Program in 2012.

At the beginning of 2013, the same four-member committee sat down to devise our next big endeavor. Since we began, the alternative energy landscape

saving strategies to our community, and we're doing it with just a handful of dedicated volunteers, patience and perseverance.

The Roxbury Energy Committee (REC) is one of over 100 self-organized, citizen-activated energy committees around the state whose missions, while they vary, all seek to minimize our communities' reliance on non-renewable energy sources, increase local alternative energy production and enthusiastically promote efficiency and conservation.

Roxbury's committee came together gradually and organically. Initiated in 2009 by a single community member with an interest in solar energy and efficiency, the nascent committee rallied together to support the idea that there were some things we could do to save money and promote alternatives at the town level.

In 2011, the then four-member committee really hit the ground running with a \$4400 grant from the Central Vermont Regional Planning Commission and the U.S. Department of Energy. With that seed money, and comprehensive energy audits of four town buildings in hand, the committee set out to plan an energy savings and efficiency initiative that would greatly



Roxbury Community Hall/Senior Center



Roxbury's New Energy Efficient LED Streetlights

has changed across the state with new incentives, programs and purveyors popping up all over the place. Solar installations specifically are springing up everywhere from rooftops to farm fields, and as some of these panels track the sun; we've been tracking the trends.

It was time the committee got back to its roots so to speak, and revisited the seed that started it all... We are right now working with a number of different solar contractors in the state to explore the very real possibility of installing a municipal solar array in town with zero upfront costs to offset our reliance on non-renewable energy, reduce the town's energy expenditures, and hopefully inspire greater community interest in alternative energy and efficiency.

Look for an update here later this year as we continue to work on this and other exciting energy projects.

Michael Feiner is a freelance writer, greenhouse builder and Chair of the Roxbury Energy Committee... See what he's up to at: [www.vineripe.net](http://www.vineripe.net).



Insulation & Air Sealing of the Community Hall Renovation by Energy Smart of VT

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## WHAT FELDHEIM PAYS TO BE 100% RENEWABLE

Staff Article

The village of Feldheim was the first community in Germany to operate on 100% renewable power, which comes primarily from wind and biogas. This made Feldheim somewhat famous, and brought in many visitors to see what they were doing and how.

Today, we know the price they are paying for electricity. While the rest of Germany is typically paying €0.27 to €0.30 per kWh, the villagers in Feldheim pay €0.166. So the price of going 100% renewable was that they have a discount of more than 38%.

They admit they did get some help getting to their new status, in the form of various incentives. They also admit that what they have done is not necessarily possible to do quite so easily elsewhere. Nevertheless, experts on energy regard the community as an example of what can be achieved.





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## SolarFest's Nineteenth Annual Sustainable Living Festival JULY 12, 13 & 14!

This year SolarFest celebrates its 19th Annual Sustainable Living Festival on July 12 - 14 at Forget-Me-Not Farm in Tinmouth, Vermont. This is the only event of its kind in the northeast - maybe even this side of the Rockies - where a traditional sustainable living fair blends harmoniously with a music and arts festival. This unique blend is what keeps people coming back year after year.

The entire festival, including the main performance stage, which has incredible sound and light shows, is powered entirely by renewable energy. "One of the best testimonials is that SolarFest itself has been solar-powered for years--and by its existence, challenges scores of other large-scale temporary events to do the same," says Shel Horowitz, a former SolarFest workshop presenter.

SolarFest has spent the last 19 years creating a family-friendly environment for like-minded people to come together to learn, connect, and recharge. "SolarFest is awesome." Says festivalgoer Kim Fernandez, "The people are wonderful and there is so much to learn. Theatre in the woods is not to be missed and the music is most enjoyable. It's such a wonderful community of people all sharing, learning and experiencing together."

2013 is shaping up to be one of the best ever. The 2013 Sustainability Conference will feature workshops on a broad range of topics including, Renew-



Sun Gods welcome festival attendees from near and far.

able Energy, Green Building, Sustainable Agriculture, Climate Change, and Thriving Locally. Highlights include a Community Solar How-To, an on-site Tiny House Build, a trash-to-fashion show and contest, and an entire series of workshops in partnership with 350Vermont on Climate Change Activism.

The Main Stage will feature world-class musicians such as Max Creek, The Skatalites, Jesse Dee, Jatoba, Kina Zor, Sparkplug, Seth Yacovone, Melodeego - SolarFest's first ever bicycle powered band, Soule Monde and The Solar Fest House Band. There are



2012 Racking competition at SolarFest

also activities and workshops for kids throughout the weekend along with Theater in the Woods, and a Contra Dance.

The keynote speaker will be Ben Cohen, co-founder of Ben & Jerry's Ice Cream. Today, Ben is President and "Head Stamper" at the Stamp Stampede an organization whose goal is to help build the movement to amend the constitution to get money out of politics. The Stamp Stampede's Amend-O-Matic Stamp Mobile will also be on hand and operating throughout the weekend.

One more exciting new offering for 2013 is the introduction of the first ever SolarFest Mini Maker Faire®. Inspired by Make Magazine, Maker Faire® is a community-based learning event that inspires everyone to become a maker and connect to people and projects in their local community. Yet, Maker Faire® is a "fair" that is fun and engaging. The SolarFest Mini Maker Faire® will run Sunday during the festival.

A weekend pass costs \$35 pre-sale and \$39 at the gate. Single day tickets are \$15. Children 14 and under are free when accompanied by an adult. There is also on-site camping available.

Forget-Me-Not Farm is located at 12 McNamara Road in Tinmouth, VT. For more information about SolarFest, visit [solarfest.org](http://solarfest.org).

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# MULTI-PURPOSE SOLAR DESIGN

*Vernon, VT: Renaud Brothers' Inc.*



The dual purpose Commercial Car Port provides a new roof space with direct access to the sun for the solar project, as well as a place to park their commercial vehicles.

This spring, Renaud Brothers, Inc. contracted with Integrated Solar Applications Corp. to design and construct a unique solar photovoltaic facility that pushes the boundaries of what can be done with solar design and metal fabrication. The 74.88kW solar array provides 100% of the power needed at the Renaud Brothers facility, while providing a multi-purpose carport structure for the company's metal fabrication business. Incorporated in the structure is a tracked crane system that allows Renaud Brothers to lift and maneuver metals. Mike Renaud, vice president and owner of Renaud Brothers stated that the crane system "allows us to efficiently store large quantities of metals underneath the solar structure that can be easily organized, accessed and maneuvered". Renaud Brothers are a well-known contractor in Vernon, VT specializing in bridge building and metal fabrication around New England.

Integrated Solar, a Brattleboro based renewable energy design and build firm, worked with Renaud Brothers on the concept and design. Michael Whigham, the lead designer with Integrated Solar, stated "we were really excited about the opportunity to work with Renaud Brothers on this unique project. In the beginning, we had a hard time finding a site for a standard ground mounted

system, and the existing buildings could not accept the additional weight of a solar array. This pushed us to come up with a creative design that meets the energy needs of Renaud Brothers but that can also be applied to other projects". The steel structure was first designed to meet the needs of the crane equipment, and then was adjusted to account for the optimal solar design. "A lot of thought went into the engineering and design of this unique approach to solar racking and the outcome was outstanding!" said Whigham. The 74.88kW system includes 312 SolarWorld modules, a pad mounted inverter from Solectria, and solar mounting rails from Schletter. Mike Renaud stated that "beyond creating a facility that meets our energy needs, we wanted to explore designs that can be applied to other projects such as solar carports and other unique multi-purpose structures." The hope is that the concept and design can be incorporated at other businesses, schools and municipalities where covered carports or other types of utility structures make sense. These dual purpose structures can provide a new roof space giving direct access to the sun for a solar project. That's a great way to optimize a design and gain a higher rate of return on the investment.



From left to right: Mike Renaud, Vice President and owner of Renaud Brothers, Inc. and Mike Whigham, lead designer with Integrated Solar are standing in front of the Solectria inverter and combiner boxes. Above them you can see the back of the array.



'Reaching for the Sky' at Renaud Bros., with the 312 SolarWorld modules that complete the 74.88kW solar photovoltaic system.

Info: Integrated Solar (802) 257-7493  
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# SOLAR PHOTOVOLTAICS

## Solar Electricity Basics

The advantages to buying a solar electric system include:

- Saving a significant amount on your electric bill
- Increasing your home's appraisal value
- Enjoying reliable, clean, free power for 25 to 30 years
- Helping to boost our economy by creating jobs and new solar companies.

Most solar electric systems last 30 years and pay for themselves in 4 to 5 years after tax credits and rebates. That means homeowners can enjoy free electricity for years. If you install batteries to back up your solar electric system, it will provide emergency power in areas with frequent storms, hurricanes, and other natural disasters.

Going solar adds value to your home. According to the Appraisal Journal, a solar electric system increases your home's value by \$20 for every \$1 in annual utility bill savings, which means a system almost pays for itself with the appraisal value increase in some cases.

Solar power reduces America's dependence on foreign oil and fossil fuels, making our nation more secure while reducing air pollution and greenhouse gases.

### TYPES OF SOLAR ELECTRIC SYSTEMS

A solar electric system is typically made up of solar panels, an inverter, optional batteries, a charge controller, wiring, and support structure. The three most common types of solar electric systems are grid-connected, grid-connected with battery backup, and off-grid.

#### Grid-Connected

In this system, the solar panels are connected to your local utility electrical grid to complement your normal power supply from your utility company. Grid-connected systems consist of:

- Solar panels
- An inverter to convert electricity produced by the system from direct current (DC) energy into alternating current (AC) energy
- A junction box that connects the solar panel wiring to the breaker panel on the home
- A power meter that displays how much power the home produces and uses
- A disconnect switch that, for safety reasons

#### Off-Grid or Grid-Connected with Battery Backup

Very similar to the grid-connected system, this system adds a "battery bank" to collect the power generated from the solar panels. Power stored in the batteries can be used during power outages. The battery bank collects power produced by the solar panels, sends it to the breaker box, and then into the house power system.

Off-grid systems. In off-grid systems, the solar electric system represents the home's main source of power. Batteries store unused solar energy for use at night. Generators, small wind systems, and other backup fuel sources are sometimes used as backup power when the solar power

stored in the batteries is not enough to meet household needs.

The components of this type of system consist of:

- Solar panels
- An inverter to convert solar electricity from DC energy into AC energy
- A battery bank for power storage
- A charge controller to prevent overcharging the battery
- A junction box that connects the solar panel wiring to the breaker panel on the home
- A power meter that displays the amount of power used, produced, and stored in the battery bank
- A disconnect switch

### POWER PRODUCED BY A SOLAR ELECTRIC SYSTEM

Solar panels are assigned a rating in watts based on the maximum power they can produce under ideal sun and temperature conditions. You can use this rated out-put to estimate the number of panels you'll need to meet some or all of your electricity needs. However, the exact amount of energy produced by a solar electric system also depends on roof orientation and tilt, as well as other factors such as shading, dust, panel conversion, and wire losses.

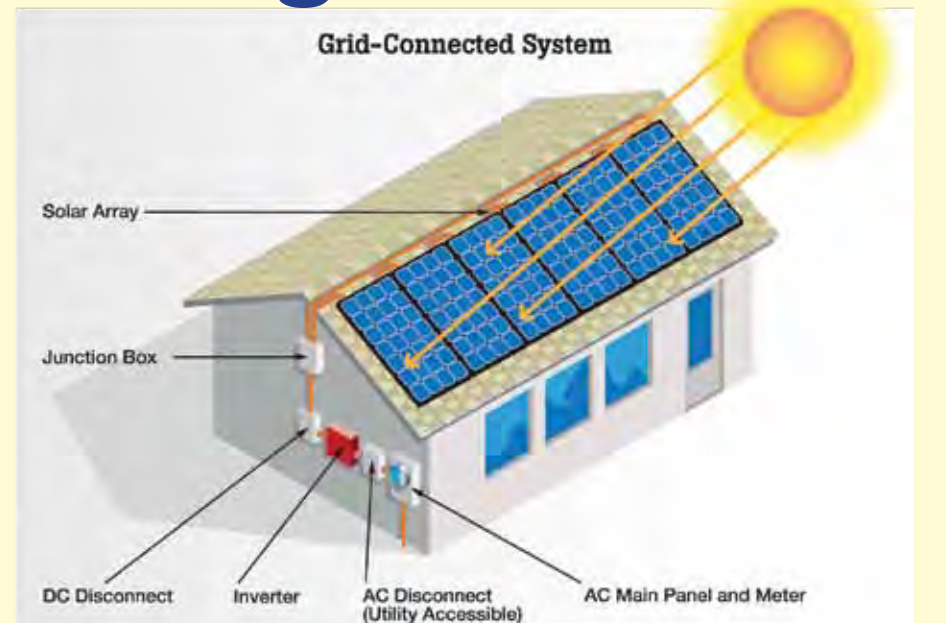
#### Example Savings and Property Value Increase for a Solar Electric System in the Northeast

Average monthly utility bill	\$100 per month
Bill after 34% efficiency savings	\$66 per month
Estimated system size required	4.48 kW
System cost (at \$9/\$4 per watt national average)	\$17,920
Estimated system cost after tax credits & rebates (NH)	Fed: 30% = \$5376 State of NH = \$3360
Total tax credits & rebates	\$8,736
Cost after credits	\$9,184
Estimated first year utility bill savings	\$726
Estimated increase in property value	\$15,840
Down payment for loan	\$918.40
Estimated monthly payment on system	\$68.64
(4.50% Annual Percentage Rate, 15 years, 90% of cost)	

### PURCHASING CONSIDERATIONS

Purchasing a solar electric system represents an investment with many benefits. Besides raising the property value of your home (\$20 for every \$1 in utility bill savings), a solar electric system provides savings on your monthly utility bill. As energy bills continue to rise, and in some states double, financing a solar electric system can give homeowners security in knowing their energy bills will remain virtually the same for years—it's the monthly payment on the system. Most systems pay for themselves within 5 years after rebates and tax credits, so homeowners enjoy free energy for years to come.

Example Savings and Property Value Increase for a Solar Electric System in the Northeast. ♡



### LOCATION TIP

*South-facing areas that receive no shading from other buildings or trees work best! Solar can be installed on the roof of a house or business, garage, porch, as a carport, in parking lots or yards, mounted on poles. Solar Power Works anywhere under the sun!*

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### Resources

- U.S. Department of Energy – Consumer Guide: <http://apps1.eere.energy.gov/consumer/>
- U.S. Department of Energy – PV Basics: [www.eere.energy.gov/solar/pv\\_basics.html](http://www.eere.energy.gov/solar/pv_basics.html)
- U.S. Department of Energy – PV for Consumers: [www.eere.energy.gov/solar/pv\\_consumers.html](http://www.eere.energy.gov/solar/pv_consumers.html)
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- Solar Electricity Basics: [www.fsec.ucf.edu](http://www.fsec.ucf.edu)
- National Renewable Energy Laboratory – Learning About Renewable Energy: [www.nrel.gov/learning/](http://www.nrel.gov/learning/)



# a SOLAR GARDEN IN PUTNEY, VERMONT

By George Harvey

The Putney Community Solar Array, being built in Putney, will be Vermont's first community-owned solar garden. It is a collaborative effort between SunFarm Community Solar, a Putney based solar organizer, the Clean Energy Collective, which handles financing, permitting, and legal matters, and Integrated Solar, a Brattleboro based firm tasked with array construction. The project will have a capacity of 147 kW, and includes 588 photovoltaic panels.

The Putney solar garden allows individuals, businesses, and non-profits to buy panels in the array and receive all the same benefits as those with individual systems. Those who find this implies too much upfront investment will be able to apply for financing through the Vermont State Employees' Credit Union. Ownership is available to those Vermont residents who had been customers of Green Mountain Power before the merger with CVPS. For those who are former CVPS customers, SunFarm and the Clean Energy collective have plans in the near future for another array that would allow panel ownership for those customers.

Nick Ziter, the founder of SunFarm Community Solar, pointed out to me one of the many advantages of ownership of panels in the solar garden. The solar garden is an independent LLC, with all funds to service the array held in that LLC, and set up to keep the array active



for 50 years. While people buying panels actually own them, just as they would own panels on their own property,

maintenance and insurance are provided by the funds held by the LLC.

The people buying the panels need


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not be property owners. This gives apartment dwellers a chance to own solar panels. Because the credit produced is not tied to a specific location, it gives people who are likely to move the same advantage. Many people live in places where there is not enough sunshine for solar, such as the north sides of mountains, but the community solar garden gives them a chance to own solar panels that are well sited. Those who own property do not have to consider how best to site panels it. Clearly, it gives many of us an opportunity we otherwise would not have.

The solar garden also provides financial and other advantages that people with their own arrays would miss. Since there are nearly six hundred panels being installed, they can be purchased and placed at low cost. This, coupled with optimal site placement, allows the returns to often be much better than they would be for people who site panels at their own homes. The tax credits and incentives available to solar are taken upfront, allowing those without a tax appetite to receive all the government benefits, without the need to wait for a tax return. The electricity generated is credited to the customer's electric bill.

The price of an installed panel is \$812.50, with the payback period expected to be 12 years. For more information on the Putney Solar Garden visit [www.VTSolarGardens.com](http://www.VTSolarGardens.com), email [info@VTSolarGardens.com](mailto:info@VTSolarGardens.com) or call (802) 536-4471. 



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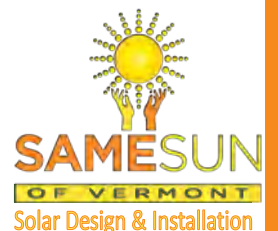
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# Pemi-Baker Community Health GOES SOLAR

**Caring for our families and our environment!**

Plymouth: Pemi-Baker Community Health (PBCH) located at Boulder Point in Plymouth, NH, is excited to announce they have completed the installation of two separate solar energy systems that will assist in heating their domestic water and therapy pool. Since 2009, PBCH has been working with the Plymouth Area Renewable Energy Initiative (PAREI) to design a solar system that would be suitable for their facility.

The first solar installation installed last summer, consists of two roof top evacuated tube solar thermal collectors (60 tubes) designed to pre-heat the water in a 119 gallon tank (located on the floor below) that feeds the primary electrically heated water tank. On a sunny day the heat from the solar collectors, circulated back and forth between the tank and the collectors by a pump, typically heats the solar tank to temperatures ranging between 100 to 140 degrees depending on the amount of hot water used by patrons during the day. Feeding the primary tank with solar heated water versus cold ground water, greatly reduces the amount of electricity needed to heat the primary tank.

The second installation completed recently consists of eight solar thermal collectors (240 tubes) which were in-

stalled on the ground outside the facility. The flexible stainless steel piping that carries the heat from these collectors was trenching underground and in to the building's mechanical room. Here the solar heated glycol (the liquid anti-freeze that's used to circulate the heat in a solar thermal collector in New England) runs through a heat exchanger that transfers the heat to the water in the facility's 18 X 36 foot therapy pool. The solar collectors will help heat the pool by producing 69.8 mBtus, saving the facility 750 gallons of propane a year.

"We are excited about using solar energy to help our facility meet its energy needs and budget," states Executive Director Chandra Engelbert. "As a facility that cares about the health of our area's residents, we are proud to do our part to replace fossil fuels with solar energy reducing harmful green house gas emissions and reducing air pollution."

Engelbert added, "Many people don't know that here at PBCH, we do so much

more than home care. We have four distinct programs: Home Health, Hospice, Rehab Therapies, and Aquatic & Fitness. And now we can say our water for showers and our pool water are heated in part by solar energy!"

"This solar project could not have been done without the hard work of the Plymouth Area Renewable Energy Initiative solar installation team and the financial incentives from the NH Electric Cooperative, State of NH Public Utilities Commission and Plymouth Better Buildings", said Engelbert. "I also want to thank everyone who donated to our Solar Fundraising Campaign. None of this would have happened without them!"

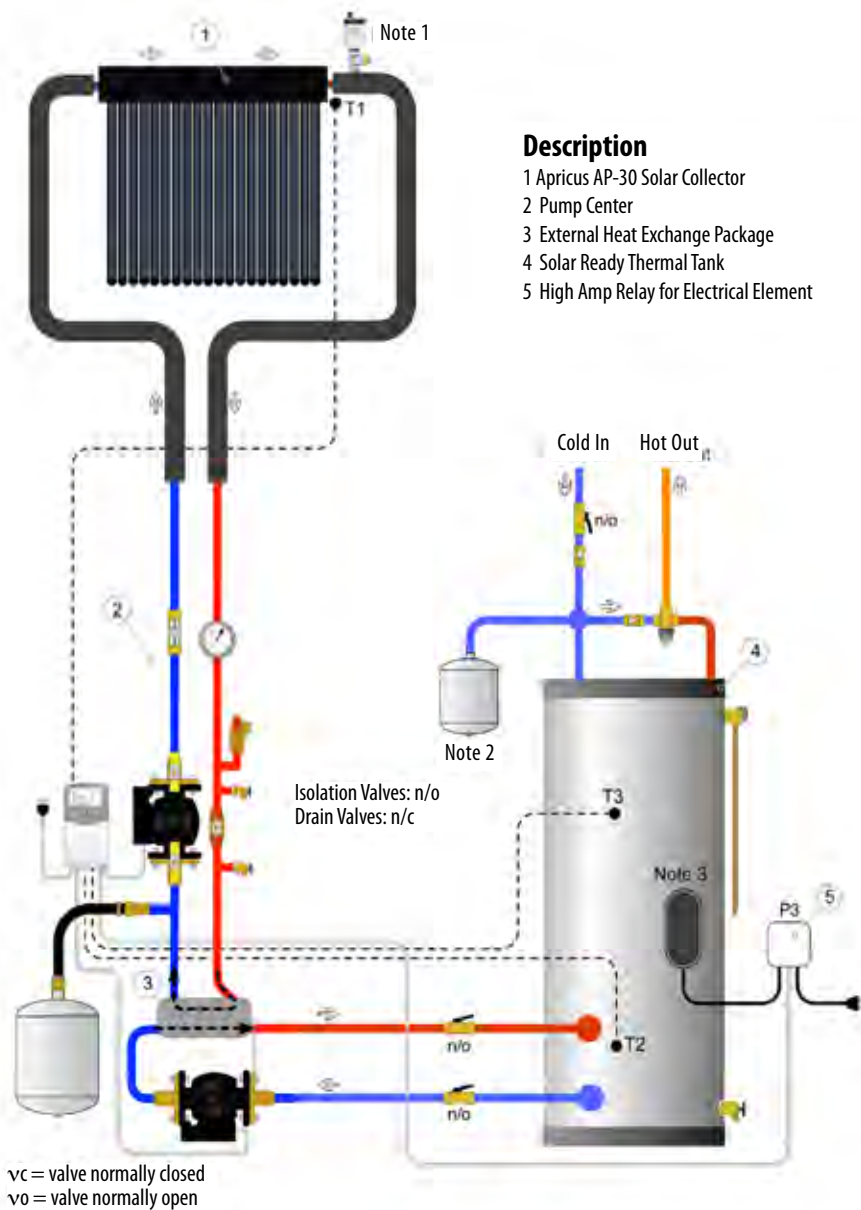
To learn more about the services at



Pemi Baker Community Health, visit the facility at 101 Boulder Point Road off Tenney Mountain Highway in Plymouth (www.pbhha.org) or call (603) 536-2232. Members of the community can use the solar heated therapeutic pool and fitness gym as drop-ins or members of the Pemi-Baker Aquatic & Fitness program. The pool and gym are open from 6am to 6pm M-F and Saturday 8am to Noon. To learn more about solar energy contact PAREI by visiting their office on 79 Highland Street Plymouth, NH or by calling (603) 536-5030 www.plymouthenergy.org

## Solar Thermal System with Heat Exchanger

### Solar System Symbols



#### Description

- 1 Apricus AP-30 Solar Collector
- 2 Pump Center
- 3 External Heat Exchange Package
- 4 Solar Ready Thermal Tank
- 5 High Amp Relay for Electrical Element





## WIND

# BLUE SPRUCE FARM'S NEW 100KW WIND TURBINE MAKES ENOUGH ENERGY TO POWER 25 HOMES!

The first farm in Vermont to put power from cow manure on the electric grid is now capturing energy from the wind. Green Mountain Power has installed a Vermont-built Northern Power 100 kilowatt wind turbine at Blue Spruce Farm in Bridport, Vermont.

"The Audet family led the way with Cow Power, so it was logical for us to approach them when we were looking for a partner to host a community-scale wind turbine" said Mary Powell, President and CEO of Green Mountain Power. "As far as we know, Blue Spruce is the only farm in the US that's producing renewable electricity from cow power and from wind power."

Blue Spruce Farm produces over 4 million gallons of milk each year, which is used to make locally produced Cabot Cheese.

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Cyan Magenta Yellow Black



Several guests at the open house chat at the access hatch of the Northern Power 100 kW wind turbine.



Students from Bridport Elementary School sing "Hold Onto Your Dreams" at the Open House celebrating the installation of the new Northern Power wind turbine at Blue Spruce Farm in Bridport, VT

kilowatts of electricity annually.

Marie Audet of Blue Spruce Farms said "Our family has been farming in Bridport since 1958. We are committed to practices that reduce costs, energy use and waste, with a focus on protecting the environment and improving the health and comfort of our cows. Harvesting the wind that blows across the fields for electricity fits naturally with what we do here."

The tower of the NPS100 wind turbine installed at Blue Spruce farm is 121 feet tall and can produce about 155,000kWh per year – enough to power 25 homes. It has a 20 year life span. The manufacturer is Northern Power Systems, a VT company with a factory in Barre.

Paul Dawson, Director, Americas, Sales, Marketing, Business Development of Northern Power Systems said, "The NPS100 wind turbine is ideal for a Vermont farm because of its smaller size, and excellent reliability. These turbines

have a long track record of reliable performance on four continents; they've proven themselves in the extreme winds and bitter cold of Alaska to the hurricanes of the Caribbean."

Other Northern Power 100 turbines in Vermont are at the Burke Mountain Ski Area, Bolton Valley Resort, Heritage Aviation at the Burlington Airport, and at Dynapower Corporation in South Burlington. This is the first located at a Vermont farm. Other farm-based wind turbines in Vermont are 10kW or smaller.

The turbine was erected by Aegis Wind, a general contractor based in Waitsfield, Vermont. Ground breaking was Feb 4th and the project took about a month to complete. Assistance was provided by the Clean Energy Development Fund. As part of the partnership with Green Mountain Power, Blue Spruce Farm will receive a portion of the power produced through net metering.

This is the second NPS100 wind turbine that Green Mountain Power has installed in a Vermont community. The first is at the Northlands Job Corps in Vergennes.

Other Green Mountain Power community scale renewable energy projects include solar arrays in Berlin, Montpelier, Rutland, Rutland Town, Shelburne, and Westminster, along with a dozen Vermont farms producing Cow Power.

"With recent upgrades to the grid, we're in a better position to serve our customers reliably with small scale projects distributed around our service territory" said Powell. "These community-based projects are a part of our vision for a low-carbon energy future."

Blue Spruce Farm, located at 1796 Route

22 A in Bridport, is holding a public open house at 10 AM on Friday, May 31 to celebrate the installation of the new turbine.



Audet Farm NPS100: The new Northern Power 100 kW wind turbine at Blue Spruce Farm

A brief program about the farm's energy work will be followed by the serving of light refreshments.

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

## REAL STRESS FROM WIND TURBINES *a Cautionary Tale from France*

By George Harvey

I have been confronted with many arguments against wind, and I have looked into the science relating to them. In every case, whether it was environmen-

tal, human health, economic, esthetic, or something else, the problem was not found to be true in the light of neutral studies, and the neutral studies I read were all from organizations that would not want

their reputations tarnished by bad work. I had concluded the whole body of data opposing wind was fraudulent or imaginary.

Now, I have to admit I finally found a case of stress caused by wind turbines. It seems much of the entire population of a village in southern France is suffering from difficulty making decisions, and the cause is definitely connected with wind turbines.

Arfons is a lovely little place, nestled in hills. It has a view of much more rugged, nearby mountains. There are quaint old buildings, separated by narrow streets. It looks like the sort of place a quiet person might want to go to for a vacation. But in 2010, the people decided to put up a wind farm with eleven turbines of two megawatts each. The turbines stand in a meadow near a ridgeline,

and can clearly be seen in the distance, from the village center.

When I read about Arfons, I realized that this case was different case from those I had previously looked into. The people at Arfons put up a wind farm that was far larger than anything they could use, even in a time of low wind production. The excess they generated had to be put on the grid, where it was sold. The result of this was that the village budget, which had been less than the equivalent of half a million dollars per year, suddenly swelled to nearly two million. There had to be a plan for the excess money, and no one really understood what that should be.

The mayor went to the villagers and asked how to spend their excess money, but got very mixed results. One suggestion he mentioned as an example was that the town buy a new telephone booth. It was a good idea, but did not even begin to deal with a problem of the magnitude the village had. No one really had any idea what to do with the millions that were rapidly accumulating, and that was beginning to cause stress.

I am told lottery winners in this country have sought each other out for help and advice. There is even a New York State Lottery Winners' Support Group. At least the people of Arfons have each other for support from neighbors they have long known. We hope they can get over their excess wealth and go on to living happily. ♡



Arfons' wind turbines have created a stressful situation -- too much from a good thing.



# PROTECT YOUR RENEWABLES INVESTMENT!

## Hickock & Boardman

By George Harvey

When I was asked to do an article on how insurance relates to renewable power and global warming, I prepared myself to write a very dull article. I should have known better. The vice president for Hickok & Boardman's insurance group, Bradway G. Widing, made some points that range from very interesting, to very important.



Bradway G. Widing, Vice President of Energy Practice, Hickok & Boardman, Inc.

Perhaps I should start by explaining that an insurance agent and an insurance broker. An agent is a representative for an insurance company, trying to sell a product to a customer. A broker represents the customer, trying to find the best product for the best price. Hickok & Boardman is one of the few companies around that can act as a broker for renewable

energy projects needing insurance. They do this for all manner of projects, for all types of customers.

Part of the problem with insurance in the era of global warming and renewable power is that very few insurance underwriters really understand either. Most smaller underwriters do not understand that they cannot base expectations for future climate disasters on past climate performance, and this can lead to failures at just the time people most desperately need support. For that reason, Bradway deals with such organizations as Lloyds of London to get the policies he needs for customers.

Insurance of investments in renewable power is not as straightforward as it sounds. It is necessary to go beyond covering the replacement cost of the panels in a solar array or turbines in a wind farm. Regardless of whether it is a small private setup or a large producer, when the power is shut down by some accident, the costs can go far beyond the physical damage. Loss of power implies that power

has to be purchased until the situation is rectified, or that the lack of power has to be compensated for. Materials, like food in a freezer, can be damaged or lost. Work may go undone, and pay lost.

There are other costs most people do not think of on their own. A good example of this is Renewable Energy Credits (RECs – see the sidebar). While many individuals with home power systems do not have reasons to get involved with them, they can quickly get important for larger systems, including those installed by business, cooperatives, and communities. Renewable power systems can be financed, to some extent, based on the RECs they can be expected to deliver. When a disaster happens, equipment may have to be replaced or repaired, and losses have to be made up for. That includes RECs that were promised, but cannot be delivered because the power promised is not being put on the grid. The inability to produce the REC is a loss, and insurance can be found against that loss – if you know where to look for it. ♡



## RECS

Staff article

A Renewable Energy Credit (REC) is a certificate of proof that a megawatt-hour of electricity has been generated by a renewable resource and made available on the power grid. RECs are issued under programs created by the states, and they are not precisely the same from one state to another. For example, some states allow RECs to be created by previously existing power generators, and others do not. In some places, there is a distinction depending on how the REC is created, so there is, for example, such a thing as a Solar REC (SREC).

There is a market for RECs, so the creator of the REC can sell it, creating an income beyond what the electricity is sold for on the grid. Owners of the REC can claim to have paid extra for renewable energy, because the renewable energy producer has been given extra income for it. This means REC owners can claim to have got their energy from renewable sources, even if they do not own those resources.

RECs are widely used and available. Various organizations publish information about their ownership of them, as an object of pride. The US EPA claims to get the highest percentage of its power from renewable energy, based on its support of the REC program. ♡

## THIS OLD HOUSE

Cont. from page 1

discovered drawbacks. Despite taking several steps to reduce energy costs, our electric bills still ran about \$100 a month. As years went by, electric rates continued to climb. How could we best address this problem, we asked ourselves. Three years ago, when the Concord Monitor reported that rebate money for home solar projects in NH was going unclaimed, we decided to look into solar hot-water makers and solar electricity generators. Before committing, we hunted for federal and state incentives available to homeowners installing renewable energy systems. We found that even our local electric co-op was eager to entice homeowners to install solar panels. The rebates and incentives available to us stacked up to more than 60% of the total cost for installing our home solar systems. We decided to go all in.

Similar incentives may currently be available for your home or business, but

be aware that agency funds are only replenished annually, and awards may stop abruptly mid-year if the funds are exhausted. You need to submit your plan early, or risk waiting until next year.

Our systems have now been running for two-and-a-half years, and here's their report card.

**Solar hot water** The solar hot-water collector on our roof collects heat from the sun, even when temperatures fall below zero. The heat is transferred into a preheat tank, so our oil furnace never has to heat cold water straight from the well, but in winter starts with 90-degree water. In the summer, the preheat tank is so hot (over 150F) the oil furnace never comes on. Our total oil consumption now has dropped to less than 400 gallons a year, or about half the amount previously used. The total installed cost of the system was about \$11,000. After rebates the cost to us was only \$6,600.

We believe this system saves us over \$1,000 a year in fuel oil, so we'll be ahead of the game in less than seven years.

In 20 years, the solar hot-water system will have saved us \$31,000! We're also happy that saving on the amount of fuel oil burned cuts down our contribution to air pollution and dependence on foreign oil. If you are thinking of getting into solar, think first about a solar hot water system. It is simpler technology (plumbing!) and I believe it gives the biggest "bang for the buck"! Solar electricity

To control our electric costs, we installed a 2-kilowatt solar photovoltaic array with twelve solar panels. Total cost was \$18,700 (excluding site work), but \$11,200 of this amount was paid through a 30% federal rebate, plus a 30% NH state incentive program. The system includes two electric meters. One meter records how much solar power has been generated - a bit more than 9,000 kWh in 30 months of operation. The other meter is the standard electric meter just like the one on your house, but ours turns backwards some of the time, as the unused electricity we generate flows back into the grid.

The result: To date, we have donated 870 kWh more electricity to the grid than we have consumed in our home. So aside from paying a flat \$25 monthly service fee, we haven't bought a cent of electricity since throwing the switch. We

estimate that in twenty years, this system will generate \$14,000 of electricity!

### The bottom line

Before we installed the solar systems, we were spending roughly \$1,200 a year to heat water and another \$1,200 a year for electricity. The solar hot-water heater cost us \$6,600, and will have paid for itself in its sixth year. The solar electric system cost about \$7,500, and will have paid for itself in the eighth year. This is a long time to wait to get out of the red, but the long-term benefits seem worth it to us. As the costs of fuel and electricity rise, solar energy systems will insulate us from those costs in our golden years. When talking about solar energy, "free" has more than one meaning!

Ken Wells teaches physics at the St. Mark's School in Southborough, Massachusetts. On breaks from school, he and his wife Lee make their home in East Andover, New Hampshire. ♡



Ken and Lee Wells with their beloved friend happily in front of their 2-kilowatt solar photovoltaic array in Andover, NH

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# FEDERAL

## Federal Investment Tax Credit

The federal investment tax credit (ITC) for most technologies, including solar, wind, heat pumps, and fuel cells, is 30% of expenditures. For commercial geothermal generating systems, microturbines, and combined heat and power the ITC is 10% of expenditures.

## USDA Rural Development Program

USDA Rural Development Program - Rural Energy for America (REAP)  
Finance the purchase of renewable energy systems, and make energy improvements; energy audits. Funding is awarded on a competitive basis; grant funding cannot exceed 25% of eligible project costs and combined loan guarantees and grants cannot exceed 75% of eligible project costs.  
Applicants include Feasibility studies/regular REAPs: agricultural producers and rural small businesses. Energy audits and renewable energy development assistance: local governments, tribes, land grant colleges, rural electric coops, public power entities. Grant must be used for Construction or improvements, purchase and installation of equipment, energy audits, permit fees, professional service fees, business plans, and/or feasibility studies. Find more at [www.rurdev.usda.gov/NH-VTHome.html](http://www.rurdev.usda.gov/NH-VTHome.html) or call 802-828-6080 in VT or 603-223-6035 in NH

### Biorefinery Assistance Program

As the call for increased production of homegrown, renewable forms of fuels has grown, so has the need to develop and produce them. USDA Rural Development offers opportunities to producers to development such fuels through the Biorefinery Assistance Program. The program provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries.  
The Biorefinery Assistance Program was established to assist in the development of new and emerging technologies for the development of advanced biofuels and aims to accomplish the following:

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

For More information go to [www.rurdev.usda.gov/BCP\\_Biorefinery](http://www.rurdev.usda.gov/BCP_Biorefinery)

# REGIONAL

## New England Grassroots Environmental Fund

Modest grants are available for community-based environmental work in CT,MA,RI,NH,VT,ME

- Must be volunteer driven or have up to 2 full time paid staff or equiv.
- have an annual budget up to \$100,000
- “Seed” grants of \$250-\$1,000 and “Grow” grants of \$1,000-\$3,500

• Go to [www.grassrootsfund.org/grants/](http://www.grassrootsfund.org/grants/) or call 802-223-4622 for more info.

# VERMONT

## EFFICIENCY VERMONT

### Lighting (must be ENERGY STAR)

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

### Home Efficiency Improvements

- improvements: air sealing, insulation and heating system upgrades - up to \$2,000 in incentives - using participating\* contractors Additional \$500 Savings until Aug. 31! (see p. 25)

### Appliances (must be ENERGY STAR)

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

### Heating/Cooling

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

### Residential New Construction

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

### Other Opportunities To Save

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

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

## Clean Energy Development Fund

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

### Solar Incentives – based on rated capacity of system

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

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

- -PV and ShW efficiency Adder - adder is calculated separately and added to standard incentive subject to customer caps (eligibility requirements apply, contact RERC)
- residential = \$0.15/Watt for PV; \$0.55/100Btu/day for ShW. Capped at a cumulative \$350 per customer.
- commercial/industrial/special customer = \$0.10/W; \$0.50/100Btu/day up to a cumulative \$450 per customer

### Wind Incentives

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

### Micro-Hydro

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

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

*All incentives are subject to availability and may change.*

Visit [www.rerc-vt.org](http://www.rerc-vt.org) or call (877)888-7372

## VT TAX CREDITS

Vermont offers an investment tax credit for installations of renewable energy equipment on business properties. The credit is equal to 24% of the “Vermont property portion” of the federal business energy tax credit from 2011 to 2016. For solar, small wind, and fuel cells this constitutes a 7.2% state-level credit for systems and for geothermal electric, microturbines, and combined heat and power systems, this constitutes a 2.4% state-level tax credit. Any unused tax credit may not be carried forward.

# NEW HAMPSHIRE

## Renewable Energy Incentives Offered Through the NH Public Utilities Commission Commercial Solar Rebate Program

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

Rebates for solar electric/thermal projects 100kW (or thermal equivalent) or less

- Solar PV = \$0.80/Watt D/C up to \$50,000
- Solar thermal = \$0.07(or\$0.12 for systems of 15 collectors or fewer) per thousand-Btu per year, up to \$50,000

Contact [jack.ruderman@puc.nh.gov](mailto:jack.ruderman@puc.nh.gov)

### Residential Solar PV Rebate Program

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

Contact [jon.osgood@puc.nh.gov](mailto:jon.osgood@puc.nh.gov)

## Residential Solar Water Heating Rebate Program

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

Contact [barbara.bernstein@puc.nh.gov](mailto:barbara.bernstein@puc.nh.gov)

### Wood Pellet Boiler or Furnace

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

Contact [barbara.bernstein@puc.nh.gov](mailto:barbara.bernstein@puc.nh.gov)  
[www.puc.nh.gov](http://www.puc.nh.gov) – Sustainable Energy or tel. 603-271-2431 for more information and current program status

## Local Incentives

Some towns provide property tax exemptions for renewables – visit [www.bit.ly/NHtownRenewablesTaxBreaks](http://www.bit.ly/NHtownRenewablesTaxBreaks)

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

## NH Utility Energy Efficiency Incentives Residential Programs

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

## www.nhsaves.com NH Home Performance with ENERGY STAR

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



## nhsaves Lighting and Efficiency Catalog

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

Offered at discounted pricing for NH electric utility customers, and fulfilled by EFL. Visit [catalog.nhsaves.com/](http://catalog.nhsaves.com/) for an online version of the catalog.

## Other NH Electric Utility Programs

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

Visit [www.nhsaves.com/resource/](http://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/](http://www.nhsaves.com/) for information about NH business incentives for electricity efficiency.

## NH Weatherization Assistance Income-Eligible Programs

Home Energy Assistance and NH community action Weatherization Assistance Program. Financial assistance paying fuel bills, and free weatherization improvements for qualified applicants. Funding from U.S. Dept. of Energy, NH utilities and Greenhouse Gas Emissions Reduction Fund (RGFI).

Visit [www.nh.gov/oep/programs/weatherization/index.htm](http://www.nh.gov/oep/programs/weatherization/index.htm) for application criteria, FAQs and local program contacts

## MASSACHUSETTS

## Commonwealth Solar Hot Water (SHW) Programs

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

- Residential Rebate: \$25/per collector X the SRCC thermal performance rating of the collectors (pls refer to KBTU/panel/day for Category C, Mildly Cloudy climates)
- Metrics for typical SHW system for 2-4 people, 2-panel roof-mounted plus 80 gal solar tank: materials/installation costs = \$10,000, MA CEC rebate = \$1100, MA State Tax Credit (use only once) = \$1000, Federal Tax Credit (30% system cost) = \$3000, Net Cost = \$4900

Visit [www.masscec.com/index.cfm/page/Commonwealth-Solar-Hot-Water/cdid/1176/pid/11159#shwresources](http://www.masscec.com/index.cfm/page/Commonwealth-Solar-Hot-Water/cdid/1176/pid/11159#shwresources)

## MassSave Heat Loan SHW

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

## Efficiency

After conducting a free residential Energy Audit, residential customers are eligible for up to \$25,000, commercial loan up to \$100k at 0% interest heat loan with terms up to 7 years to cover the following energy efficiency improvements: attic-wall-basement insulation, high efficiency heating systems, high efficiency domestic

hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows

Available only to utility customers of Western Mass Electric, National Grid, Berkshire Gas, Nstar, Unitil and Cape Light Compact Visit [www.masssave.com/residential/heating-and-cooling/offers/heat-loan-program](http://www.masssave.com/residential/heating-and-cooling/offers/heat-loan-program) Please call 866-527-7283 to schedule a free home energy assessment.

## Commonwealth Solar PV Programs

[www.masscec.com](http://www.masscec.com)

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

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

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

The rebate is available to the system owner, which may or may not be the host customer. In the case where the system owner is a third-party owner serving a residential host customer, the project is treated as a commercial project (and eligible for the commercial rebate amounts only). Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Resources (DOER) SREC program. Note: appropriate, approved tracking must be utilized in order to qualify to sell SRECs. MassCEC reserves the right to conduct post-installation inspections of PV projects prior to approval for payments.

MA State Income tax credit for residential solar hot water or pv systems are eligible for a one time 15% off system cost, capped at \$1000 max tax credit. • No sales tax on solar hw or pv systems.

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



Leah Wittenberg [www.leahwittenberg.com](http://www.leahwittenberg.com)

# THE 2013 LEGISLATIVE LETDOWN ON CLEAN ENERGY AND CLIMATE ACTION

This year's failure to advance meaningful energy and climate change legislation, despite promising talk early in the session from legislative leadership and the administration, was deeply disappointing.

At the start of the session, Vermont had:

- A Governor and legislative leaders who said combatting climate change was a top priority.
- A roadmap from the state-appointed Thermal Efficiency Task Force to address one of the biggest energy-wasting, greenhouse gas emitting culprits in the state — our leaky homes and buildings.
- Seeming consensus that investing in energy efficiency is important to start saving Vermonters money, shaving energy needs and reducing the state's carbon emissions.

Unfortunately, very little happened. A bill that would have significantly ramped up the state's commitment to heating efficiency — H.520 — was stripped of pivotal provisions and, instead, passed with just a few pieces that take small steps toward an efficient, renewable energy future.

Ironically, H.520's tumultuous fate culminated at the same time that the world's atmospheric concentration of carbon dioxide topped 400 parts per million. Grim news, considering the world's leading climate scientists say that 350 ppm is the safe level of carbon in the atmosphere for planetary stability...

Here is a brief rundown of the 2013 big energy bills

## H.520 — Reducing Energy Costs and Greenhouse Gas Emissions

This bill strengthens the prioritization between weatherization and LIHEAP investments, allows municipalities and the state to adopt a 'stretch code' in residential building energy standards and calls for a study of cost-effective strategies to integrate plug-in and hybrid vehicles into the state fleet. Unfortunately, despite grandiose rhetoric from most about the cost and climate benefits of investing in heating efficiency, the bill passed without the essential ingredient to meet the state's goal of weatherizing 80,000 homes by 2020 — funding.

## S.30 — Siting Electric Generation Plants

Originally proposed as a three-year moratorium on large-scale wind, the Legislature stripped this bill down significantly. The final bill required the House and Senate Committees on Natural Resources and Energy to study the Energy Generation Siting Policy Commission's report released this spring and asks them to recommend potential 2014 legislative action on how to improve the process and results for siting electric generating facilities.

## H.395 — Establishes the Vermont Clean Energy Loan Fund

This bill was this year's big commitment to supporting clean energy initiatives, enabling the Vermont Economic Development Authority to allocate \$5 million to Vermont businesses and farms to finance efficiency, conservation or renewable energy projects that reduce greenhouse gas emissions. It also authorizes the state treasurer to create and capitalize a short-term credit facility to help Vermonters invest in energy efficiency projects.

## S.58 — Act 250 and Oil Pipelines

The Senate passed a bill to strengthen the state's hand in regulating an oil pipeline running through the Northeast Kingdom, should it be used to transport tar sands oil. The bill is now on hold in light of an April Act 250 decision-affirming jurisdiction over the pipeline.

Despite this year's legislative letdown on clean energy and climate action, there is increasing urgency. Help ensure Vermont policymakers champion and support essential clean, efficient, renewable energy solutions. Contact VNRC's Johanna Miller at [jmiller@vnrc.org](mailto:jmiller@vnrc.org) or 802-223-2328 ext. 112 and get involved.



# MASONRY HEATERS, INCREASING HEAT AND DECREASING POLLUTION

By George Harvey

There are many ways to burn wood for heat. Some are clean and some are not. Some are more efficient than others. Lazy open fires and old-style long-burning air-tight stoves are among the most polluting. At the other end of the spectrum are the nearly non-polluting and highly efficient rocket mass heaters and masonry stoves. Rocket mass heaters were discussed in an earlier edition of Green Energy Times. Now, it is time to examine masonry stoves.

The principle of the masonry stove is very much like that of the rocket mass heater – both have very hot fires supplied with abundant air focused on the fire, both have flue systems that go up and down on a path intended to extract as much heat as possible, and both use a thermal mass to store the heat from the fire.

Unlike the rocket mass heater, which was invented less than ten years ago, masonry heaters have been around for a very long time. In fact the history of the masonry heater goes back so far, it has been obscured completely. We know they existed 500 years ago, but if we assume they must have chimneys, then they must have appeared no earlier than the 12th century, which was when the chimney was invented. In that time, a lot of information about masonry heaters, and a lot of expertise in building them, has been developed.

There is another way masonry stoves are unlike the rocket mass heater. Rocket mass heaters typically use an oil drum to form a downdraft and radiate some

heat quickly, and a mass of clay to retain heat. By contrast, the masonry heater is a display of the skill of a mason, who works with stone, brick, and tiles to produce a product that is often a work of art. They differ from one to the next, as much as fine portraits do. And some of them are quite beautiful. One nice thing about masonry stoves is that they can be built to have a very nice fire burning behind a ceramic glass door, so it can be seen and enjoyed, just like the fire in a fireplace.

I talked with Royce Thompson, who runs Roywood Masonry Heaters in Newbury Vermont, to get some current information. Their masonry heaters are built around refractory cores, which are fabricated in their shop. Options can include all sorts of things, ranging from ovens for baking to heated benches.

The burn in masonry heaters is commonly 90% efficient, according to a government website. This is much better than even the best wood stoves. The masonry heaters burn so hot that no tar or creosote collects in the chimney. A cleanout can be done once each year, but it is often not required. The fly ash settles into the lower places in the flue, at the bottom ends of



Example of a Masonry Heater, Photo by Rienvr

the downdrafts, so nearly nothing but gas exits the chimney.

Royce tells me that he believes the amount of fuel needed to heat a house can be reduced by a third or more, though he never calculated it closely. Having done the math on the chemistry and physics of the stoves, I can more easily believe a reduction of 50% in the fuel is possible.

A masonry heater can be quite expensive, and can cost more than a complete new fossil fuel-based heating system. Nevertheless, they will normally long outlast other heating systems, require exceptionally little maintenance, are very efficient, and are very clean, having nearly no particulate emissions. When you also consider their great potential for beauty, when properly built, and you can see why I dream about having one myself. ♪

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# BASICS OF PASSIVE SOLAR DESIGN

By George Harvey

A passive solar building is heated and cooled by the sun, without any electricity, fuel, or even human activity involved in the process. It also must be comfortable, providing temperature control for both the living space and the hot water, year round.

The implications of passive solar design are that, in theory, you live with no heating bills, no cooling bills, no maintenance of a furnace or air conditioners, and nearly no hassles relating to heat. In practice, careful planning can bring you very close to that. A passive solar house costs more than one with fossil fuel heating, but the difference in cost is more than made up for in time. It is also far better for the environment.

The first thing a house needs to be solar heated is a way to capture the energy of the sun. There are many ways to do this. Most obviously, sunlight coming through windows can provide heat for the interior space. There are other things to consider, however, and they are not necessarily obvious.

For a passive solar building, the location, orientation, and the placement of windows all have to be considered carefully. This cannot be done properly without study and planning. Obviously, the intention is to have the sun heat in the winter. Not so obviously, placement of windows and other architectural considerations can eliminate solar gain on hot summer days, or even cool the house. This is not something that happens by accident. It requires thought, and there are many choices to be made.

For example, wide eaves, carefully designed, can shade windows in summer but allow light in during the winter. In addition, windows that admit winter sunlight for heat can be built to reflect much of the light of the summer sun, because the summer sun is higher in the sky, and the light coming from its sharper angle can reflect off windows.

It is not necessary to have the main living area heated directly. Solar heat but can be captured in an attachment to the house, such as a greenhouse or a shed built for the purpose. It is possible to have things even more remote, capturing heat in water or some other fluid in a separate building, and conducting the heat to the living space.

The heat that comes into the house is trapped in a thermal mass to balance temperatures between the middle of the day and the middle of the night. In a specially designed system, the heat of summer can be stored for winter. Thermal mass is usually done with stone. Some large stone masses in the house can be decorative. Special interior stone walls can hold heat for a long time. Another approach is to use a mass of crushed rock under basement floors. Water stores more heat than stone on the basis of volume, but extra care has to be taken with it because of the potential for leaking.

A person getting into passive solar should study thermosiphoning. Both air and water can be circulated due to the principle that hot air or water rises. This means that fans and pumps are not technically necessary. To be entirely passive, they really must be eliminated.



Passive solar house with turf roof in Findhorn, Scotland. Photo by W. L. Tarbert

Another case of a thermosiphon is the solar chimney. The chimney stands where the sun can make it hot. As the air in it is heated, it rises and draws cooler air from below. It can take air out of a warm house, bringing fresh air in from outside. This can be combined with a ground-based heat exchanger, which allows the cool earth to absorb the summer heat of outside air before it is drawn into the house, or warms incoming air to a degree in winter.

Of course, houses benefit from insulation, and more is usually better. Most of us are probably best advised to consult experts on insulation before making any decisions about it. Be warned that different experts have different opinions about insulating existing buildings. The actual construction of the glazing, and even the types of glass used, are also important.

You can surpass the standard. The sun can be used for cooking. It can even be used to drive an absorption refrigerator, the same type of refrigerator that is typically powered by propane. Nevertheless, cooking and refrigeration are not usually included in the definition of passive solar buildings.

## A NEW PERSPECTIVE ON FOREST BIOMASS

By George Harvey

Global warming is predicted to have dire effects on New England forests. A white paper from the Vermont Agency of Natural Resources, "Climate Change and Vermont's Forests," by Sandy Wilmot, published in May of 2011, in describing the species in Vermont's forests, states: "Northern hardwood trees are now able to survive at increasing elevations, due to moderating temperatures, outcompeting spruce and fir trees. Climate and pest risk model predictions identify spruce-fir forests as being vulnerable to increased warming. Only slightly less vulnerable are northern hardwood forests whose dominant species are sugar maple, yellow birch and American beech. These forests are expected to be nearly eliminated in Vermont, replaced by species that prefer the warmer drier conditions, such as oak and pine species."

That statement may be dire indeed, but it does not even address the problems of hemlocks and the wooly adelgid, or of ash species and the emerald ash borer. Things are bad, and it seems they can only get worse, for the near term.

I would like to consider some effects of global warming I have not seen addressed. One of these is that the changes such predictions foresee will produce large numbers of dead trees in our forests. These changes would probably make it important to remove large amounts of dead or dying wood from the forests. In our current Global Warming section, I take a look at the effects of global warming on road infrastructure, with a conclusion that there are likely to be shortages of fuel. Putting two and two together, we might easily conclude that the dead wood is likely to be burned.

Burning forest biomass can have very



Frank Knight Forest, Yarmouth, Maine. Photo by Dudesleeper.

destructive effects on air quality, but it need not. There are many ways to burn wood, and some of them are very clean. I would like to examine one of these, in particular. It is the manufacture of wood gas.

Wood gas is made by destructive distillation or partial combustion of wood or other biomass. The product is a mixture of combustible gasses that can be used for a variety of purposes, including generating electricity and the manufacture of synthetic fuels among others. Fly ash and creosote are both trapped, and both can be sold or used. The resulting gas is comparable in many ways to natural gas, and can be used to drive turbines and reciprocating internal combustion engines. The emissions are actually cleaner than those of natural gas, because they do not include such contaminants as radon.

Woodgas was used long before natural gas, even before the Civil War. The technology has been adapted to small engines. It was used during World War II to power hundreds of thousands of vehicles in Europe, each carrying its own gasifier.

Today, there are companies producing large reciprocating and turbine engines that can use synthetic gas. GE's Jenbacher division makes engines rated from 0.34 to 4.4 MW. Generating energy this way is not particularly expensive, compared to other energy sources. They cost from 60¢ to \$1 per watt, installed. At a higher price, they can be adapted for combined heat and power (CHP).

Running wood gas through a generator to produce electricity can have a very low carbon footprint, and nearly no toxic emissions, aside from carbon dioxide. It can also produce power at a lower cost to the consumer than conventional sources we now have. The initial investment, whether it is just to produce electricity or in a CHP situation, can be returned in only a few years. If the investment is local, the profits stay local. A bonus is that in a microgrid, the power supply can be more secure than current systems.

The question of global warming puts a new variable into this equation. If the predictions about Vermont forests are correct, we may have to remove huge amounts of wood from them during the course of this century, just as a matter of stewardship.

If we have a forest fuel windfall during a time of declining fossil fuel availability, it will be used. It can be used badly, inefficiently producing pollution, or it can be used well, efficiently and cleanly. We can choose to use it well, or we can ignore choosing and default to using it badly.



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# AN INTRO TO THERMAL BRIDGING IN BUILDINGS

By Chris West, Owner Eco Houses of Vermont, LLC and President Passive House Alliance of Vermont

With advances in building science many people have been hearing more and more about thermal bridging as it relates to buildings. One often is told about it during an energy audit of their home accompanied by flashy color infrared camera pictures. But what is a thermal bridge and what can it mean to the energy efficiency of a house or other building?

## What is a Thermal Bridge?

There are some very technical descriptions of what a thermal bridge is based on how many Btu's the building assembly loses per linear foot, but simply put a thermal bridge is any part of the construction that is thermally conductive and goes from a heated space to the outside.

What does thermally conductive mean? The thermal conductivity of a material is how well or poorly it allows heat to flow through it. Materials like metals and concrete have high thermal conductivities and things like fiberglass and Styrofoam have low thermal conductivities. Materials with low thermal conductivities are called insulators (thus fiberglass and Styrofoam are both insulation materials). Wood can be a thermal conductor too. To better understand how these work let's look at heat.

## How Heat Travels:

I recently gave a class to the students at Jericho Elementary School on Thermal Conductivity. One of the first things I asked them was, "How does heat travel?" Almost everyone, including the teachers said that "Heat rises." This is WRONG. Heat doesn't rise. Hot air rises. Heat travels from hot to cold regardless of the direction! Understanding this is very important to the discussion about thermal bridging in buildings.

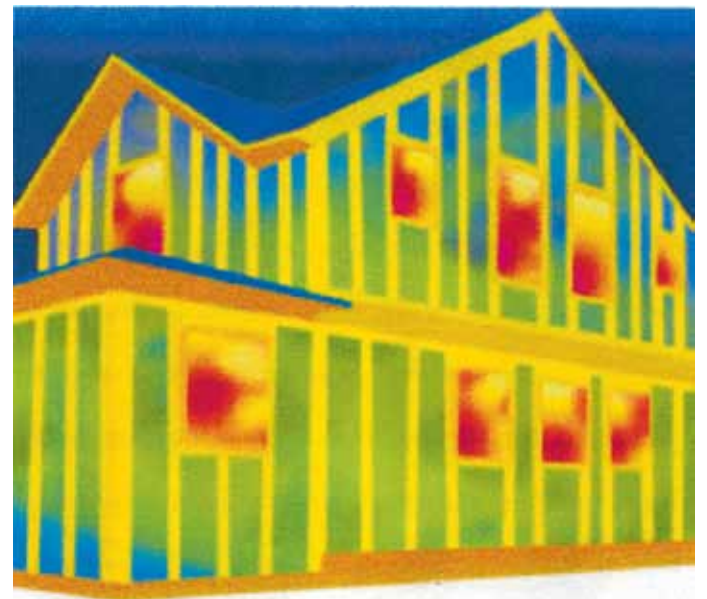
## How Heat Moves Out of Buildings:

In buildings during the heating season heat travels from the warm inside to the cold outside through our outside walls,

our windows, the floors that touch the ground and our ceilings/roofs. What these parts of our houses are made of decide how quickly heat escapes into the wilds of Vermont's Winter. Thermal bridging increases how some parts of our buildings, like walls, lose their heat.

Thermal bridges act like the fins on a lawn mower allowing excess heat to radiate off of the motor to keep it cool. On your house, extended eaves, attached decks and balconies act just like those fins on the lawn mower only the effect of heat loss is unintentional.


In this infrared picture blues and greens are low levels of heat loss. Yellows to reds and up to white are increasing levels of heat loss. The framing 2x4's that make up the wall are clear to see as yellow lines in the green of the walls. This shows that the thermal conductivity of the wood is higher than the insulation between them. Some may say the studs aren't that much of the area of the wall, but that isn't true. For a classic wall with 2x4's at 16" centers, approximately 12% of the area is studs. These studs form thermal bridges for that house. Each stud is connected to the drywall inside the house and directly connected to the sheathing (plywood or OSB) that form the outside of the house. The cavities of this wall have an R-value of 11.7 (if the insulation is properly installed). Include the wood from the studs and the wall actually has an R-value of 10.6. That seems like just a little bit but that 10% difference is the type of increase in efficiency people get when they upgrade to a high



efficiency boiler.

Another thermal bridge in a house are the ceiling joists. These are wooden beams that go on top of the upstairs wall forming the ceiling and hanging over the ceiling out of the house forming the eaves. These act like those fins on a mower, letting heat flow from inside the house to the cold outside world.

Thermal bridging becomes a bigger issue the more energy efficient your home is. Home that use lots of energy to heat won't see a big amount of savings from tackling thermal bridging. That house would benefit first from air sealing/weatherization and possibly more insulation in the attic, but if you are building a new, energy efficient home then analyzing your thermal bridging can make quite a difference in the energy used to heat and or cool it.

To identify what measures are best for your house contact a BPI certified energy auditor to come and do an audit on your house. They will then itemize and prioritize the best, cost effective remedies for your home. 

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# BUILDINGS FOR A FUTURE

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Cont. from page 1

insulation and energy efficiency were employed to reduce loads. Solar collection systems were integrated into the south roofs to produce hot water, space heat and electricity for the center.

Chris embraced the integrated approach for the solar system design and engineering. The aesthetics of the fully integrated approach achieved a far more pleasing result than individual panels mounted on racking over a finished roof. This approach was more practical, because the glass lasts a good deal longer than asphalt shingles. SDA prefers to make the solar component, whether PVs or thermal, fully integrated into the weather skin of the building. This helps to allay the concerns of people who feel solar collectors mounted on buildings are visual intrusions.

You can find out

more about the Tin Mountain Conservation Center and their educational mission of nature and the outdoors at: [www.tinmountain.org](http://www.tinmountain.org). They are they type of



The 'Great Space' interior at the Tin Mountain Conservation Center

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SDA provided design, engineering, code and utility compliance, contractor selection, construction oversight and full systems commissioning to ensure all systems were properly integrated. The fa-

cility makes more energy than it needs despite the harsh winter climate of the Mt. Washington Valley.

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# NHSaves - HOME PERFORMANCE WITH ENERGY STAR®

By Phil LaMoreaux

There are many wonderful benefits of living in New England. The unique character of the landscape and the architectural history provide for a charming landscape. One of the costs of this unique history is that many of us New Englanders are living in homes that are anywhere from 20 to 200 years old.

Unless you happen to live in a newer home that was built to Energy Star or similar high efficiency standards, there are probably many inexpensive, short term payback improvements that would improve your home's energy performance. The NH Home Performance with Energy Star® program is intended to do just this. The program is designed to provide you with one point of contact to analyze and improve the thermal performance of your home and to provide financial incentives for you to do this. Most of the measures included in the program are rebated

50% and some are rebated 100% by the sponsoring utilities using program funds. Additionally, several of the utilities that administer the program offer interest-free loans for qualified applicants to finance their portion of the weatherization cost. As a result of the incentives and loans, many households save as much on energy costs as they pay in financing costs to pay for the measures that are installed through the program.

There are several ways your home can qualify for the program. The simplest method is using the Home Heating Index calculator at the NHSaves web page. In order to apply using this tool, you will need your zip code, the heated square footage of your home and the amount of fuel used to heat your home for one year. If your home qualifies, you will need to submit records to document your heating fuel use for the previous two years. There are other criteria that can qualify a home as well. Any home with demonstrated use of electric heat, general high use of fossil fuels, or general high use of electricity can qualify as well.

Once your home qualifies for the program, your application will be assigned to one of the pre-qualified Building Performance Institute Certified Building Analysts. They will conduct an audit of your home to determine the current levels of insulation and air sealing. They will also provide you with a proposal to install the recommended cost effective measures to improve the performance of your home.

A significant portion of the audit is devoted strictly to evaluating and




Thermal Imaging reveals ice dam in a HPwES Audit.

monitoring heating and cooling equipment, lighting and appliances, and other health and safety systems that are affected by changes to the building's thermal performance. Your auditor will provide you with a summary of the systems that are inspected.

The NHSaves program is administered throughout the state of New Hampshire by the following electric and gas utilities: Public Service of New Hampshire, New Hampshire Electric Co-op, Unitil, and Liberty Utilities. For more informa-

tion about the Home Performance with Energy Star program, contact your local electric or gas utility company or visit the NHSaves website at [www.NHSaves.com](http://www.NHSaves.com). The program application can be found at [www.NHSaves.com/homeheating/](http://www.NHSaves.com/homeheating/).

Phil LaMoreaux is a Program Administrator in the Energy Solutions Department at New Hampshire Electric Coop. He manages the Home Performance with Energy Star and Home Energy Assistance programs. 

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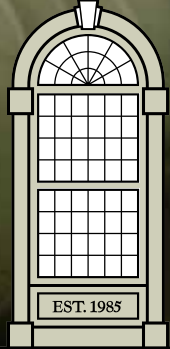
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# SEALING AIR LEAKS

Sources of Air Leaks in Your Home. Areas that leak air into and out of your home cost you a lot of money. The areas listed in the illustration are the most common sources of air leaks.

Air leaks can waste a lot of your energy dollars. One of the quickest energy-- and money-saving tasks you can do is caulk, seal, and weatherstrip all seams, cracks, and openings to the outside.

Tips for Sealing Air Leaks

- Test your home for air tightness. On a windy day, carefully hold a lit incense stick or a smoke pen next to your windows, doors, electrical boxes, plumbing fixtures, electrical outlets, ceiling fixtures, attic hatches, and other places where air may leak. If the smoke stream travels horizontally, you have located an air leak that may need caulking, sealing, or weatherstripping.



- Caulk and weatherstrip doors and windows that leak air.
- Caulk and seal air leaks where plumbing, ducting, or electrical wiring comes through walls, floors, ceilings, and soffits

- over cabinets.
- Install foam gaskets behind outlet and switch plates on walls.
- Inspect dirty spots in your insulation for air leaks and mold. Seal leaks with low-expansion spray foam made for this purpose and install house flashing if needed.
- Look for dirty spots on your ceiling paint and carpet, which may indicate air leaks at interior wall/ceiling joints and wall/floor joists, and caulk them.
- Cover single-pane windows with storm windows or replace them with more efficient double-pane low-emissivity windows. See the Windows section for more information.
- Use foam sealant on larger gaps around windows, baseboards, and other places where air may leak out.
- Cover your kitchen exhaust fan to stop air leaks when not in use.
- Check your dryer vent to be sure it is not blocked. This will save energy and may prevent a fire.
- Replace door bottoms and thresholds with ones that have pliable sealing

- gaskets.
  - Keep the fireplace flue damper tightly closed when not in use.
  - Seal air leaks around fireplace chimneys, furnaces, and gas-fired water heater vents with fire-resistant materials such as sheet metal or sheetrock and furnace cement caulk.
- Fireplace flues are made from metal, and over time repeated heating and cooling can cause the metal to warp or break, creating a channel for air loss. To seal your flue when not in use, consider an inflatable chimney balloon. Inflatable chimney balloons fit beneath your fireplace flue when not in use, are made from durable plastic, and can be removed easily and reused hundreds of times. If you forget to remove the balloon before making a fire, the balloon will automatically deflate within seconds of coming into contact with heat.
- Learn More at <http://energy.gov> about Insulation, Air Sealing Your Home, Air Sealing for New Home Construction, Detecting Air Leaks, Caulking, and Weatherstripping ...

## TRIPLE-GLAZING FOR THE MASSES? MAKING SENSE OF WINDOW OPTIONS

By Steve Cary

Does it make sense for homeowners to specify triple glazing when purchasing new windows and doors? The simple answer is...it depends. There are many factors to consider including: renovation or new construction (spending 25% more on triple glazing for replacement windows in a 1840 farmhouse may be debatable--more on that later); the cost of the window versus actual energy savings; is the manufacturer offering a significant gain in the energy performance (i.e. bang for the buck -- some triple glazing options offered by less sophisticated manufacturers give a relatively small energy improvement--so buyer beware, do your homework); how long has the manufacturer been offering this option (with triple glazing comes a host of engineering challenges--weight of the window increases 33% so the hardware and sash components need to be more robust etc., and yes those Canadians and Europeans have had a better way of making these windows for some time); what the actual cost is (affected by materials used in fabrication, options etc) and what the warranty is (glass warranties may vary by manufacturer when triple glazing is used).

The crux of the decision is performance improvement versus cost. Depending upon the manufacturer, a window will vary in cost due to its quality of workmanship, design and engineering, materials used, aesthetics and distribution network. In today's marketplace there are now

manufacturers of all price points that are offering triple glazing. This applies whether window-unit construction is of

Cont. on page 24

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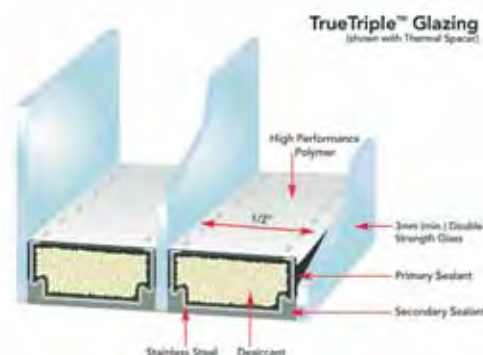


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# Charlie Hall: All-Electric Solar Home in Vermont

by Carol Levin

Five years ago, Charlie Hall made a deal with God. If HE gave Charlie fifteen more years, he would finish up his business on Earth, leading the way for the survival of future generations. Eighty-five-year-old Hall has 10 more years to finish his projects.

"Someone once said to me on a hot summer afternoon, 'Wouldn't it be nice if we could can this heat and use it next winter? I've been working with this idea for the past 38 years.' Charlie now uses the sun for all his household utilities and no longer has an oil, propane or electric bill. He uses the sun to support all of the energy he needs for his all-electric solar home.

In the early 1970s Charlie Hall, a 20-year Army veteran, went to Vermont Community College and received his A.S. degree. As part of his final college work, he designed a solar house that he planned to build on his parent's farm in Topsham, VT, where they settled in 1926. Hall built his solar trapezoid house in 1980, "so that



Charlie Hall's All-electric Solar Powered Home, W. Topsham, VT (above) Charlie explaining how it all comes together(right)

the house could capture the sun's rays from the time the sun arose in the morning until it set at night, wrapping a path around the house." He then scooped out a bowl on the land below the house, which sends back additional solar reflection onto the solar house from the snow in the wintertime and helps to heat the home, passively.

In 1985, he added his first photovoltaic (PV) solar electric system with the help of Richard Gottlieb of Sunnyside Solar. This small system was 250W using five 50W Arco Solar modules mounted on his roof, next to the domestic hot water solar panels. Later Charlie added a pole mount Zomeworks tracker with 2000W (2KW) Atlantis Solar PV modules. He now has nearly 10KW (10,000 watts) of PV power with three ground mount PV arrays rising on the hill behind his solar home. These power three Sunnyboy inverters. He added 3KW Canadian Solar PV panels in

2010 and almost-5KW Evergreen Solar PV panels in 2012, all of which grid-tied, and positioned on the hill behind the house so the back roof of the house adds extra solar reflection onto the solar panels,



increasing the power they produce from the sun.

During the day the electricity is used for electrical needs in his home or is sent to the power grid for credit. At night and during the short winter days, he draws the electricity he needs from the grid which was accumulated in the spring, summer and fall.

In this first in Vermont all-electric solar home, Hall uses the solar electricity for indoor lighting, TV, ham radio, water pumping, cooking, clothes washing and drying, refrigeration, domestic water heating, and for three freezers holding the produce he grows in his summer gardens.

His house-heating resources include passive solar heat captured by the design of the home, his newly developed solar furnace with a two tank -- two zone hydronic baseboard heating system heated by the PV electricity, and a wood stove

in the living room for backup heat on particularly cold days -- or when he wants to sit in front of the fire and think through his new inventions.

One small PV panel on the roof of the solar home charges a battery for the LED strips in each room, to provide light in case the line power goes out at night.

Locally Charlie Hall is known as the "Barrel Man" with his active recycling business of food-grade barrels which can be reused for composting, rain water harvesting, food and dry storage, bio-diesel storage, floats for boat docks, raised bed planting, and other creative uses. He is only open three days a week, to allow him time to work on his many other creative projects.

Charlie said to me as I was leaving "let me know if you come across any more ideas on how we can use the sun's energy." With all he's given us for ways to use the sun, added to all the ideas he adds to his list, we can certainly look forward to many more innovations Charlie will have for us during the next ten years!



Richard Gottlieb (L) with Charlie Hall (R) - old friends

Carol Levin is the wife of the late Richard Gottlieb. She lives in Guilford, VT. ♡



Pole mount Zomeworks tracker with 2000W (2KW) Atlantis Solar PV modules

## MAKING SENSE OF WINDOW OPTIONS

Cont. from page 23

PVC (vinyl), aluminum, wood, fiberglass and wood, or wood with cladding (which is commonly aluminum or vinyl). Triple glazing will typically cost 20% to as much as 50% more than double glazing. A good triple-glazed product will boast the U value by 30% or more. Using a "good" casement window from a company experienced with triple glazing for example, a double glazed window that reports an NRFC (whole window) U value of .30 will improve to a .21-.19 depending upon the type of Low-E coating. That 1840 farmhouse probably has a whole lot of other energy weak points-so spending extra dollars on triple glazing may not make sense, but if that same house goes through a through deep energy retrofit, a real good case can be made for triple glazing. When the budget allows it, new construction and additions should definitely consider triple glazing.

You may ask, 'what will I save when using triple glazing?' Because factors such as the house site (solar gain for example), lifestyle of occupants, design of the structure, etc., a straightforward answer can be gotten by engaging an energy specialist. Generally speaking, according to efficientwindows.org, a house in Boston that has its vinyl clad wood insulated-glass windows replaced with modern triple-glazed windows, a 12% savings in energy will be realized.

Other value-added attributes: while improving energy performance is the usual priority, triple glazing offers additional benefits such as comfort, condensation

resistance and sound transmission. Most New Englanders know the chilly feeling while sitting next to a poorly insulated window on a January evening. When an outdoor temperature is zero degrees, and inside temperature is 70F; the inside surface of a single pane glass will be 16F degrees! Compare that to triple glazing with an inside surface temperature of 63F (regular IG glass will be 45F). This warm surface also decreases the potential for condensation on your windows. Noise: triple glazing reduces sound transmission -- an added "quiet" benefit if you live near a highway for example.

Steve Cary, a self-professed "window geek," has been in the building material supply industry since 1979. He is partner in what he terms a full service "high performance" window and door business based in Vermont. Loewen Window Center, White River Junction, VT. 802-295-6555 [www.loewenvtnh.com](http://www.loewenvtnh.com)

• The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value.

### Argon

- Used in the airspace between the glass in place of normal air we breath
- Used in windows because it's heavier and less conductive than our atmosphere
- Naturally occurring (we are breathing it right now)

• Adds as much as 20% or more thermal efficiency to insulated glass

There will be more on this issue, written from another perspective, in a future edition of G.E.T. ♡

## 400 PARTS PER MILLION

Cont. from page 2

How can you help? What can you do? One of the most effective things you can do is to reduce your dependence on fossil fuels!

• Do everything you can to reduce the wasting of the fuels that heat your home: Seal and insulate your home and work place! Make these buildings as close to net-zero- energy buildings as possible. You will find that the cost to make these improvements will more than pay for themselves in many ways that will benefit both you and the reduction of carbon in out atmosphere.

• After building improvements are made, then it is time to add clean renewable energy to meet your energy needs. Or, commit to it all at the same time!

• Reduce your transportation needs. Carpool, even for errands in town or to work. Use public transportation, trains, buses, bicycles, walk - explore ways to consolidate trips and lessen your need to drive.

• Support community-generated electric power. This is very important. The changing weather patterns are predicted

to continue to happen more frequently, along with the devastation that they create. Continuing to rebuild roads, for example, is just not sustainable. There is a limit to how long funding will be available to re-build our roads and power lines. The preparation for this infrastructure that will assure that communities can meet their own energy needs should be in place ahead of time.

• Support community solar farms. Support community wind farms. (See sidebar for the data from the Georgia Mountain Wind farm). Support and encourage more solar and wind farms like we see sprouting up all over the northeast.

There's a lot that YOU can do to help to reduce the current CO2 levels of 400ppm. It is important that we each take it on ourselves to DO all we can to make the changes happen in our own lives. Where there is a will, there IS a way! Don't wait until it is too late!

Fighting global warming must be our number one priority--no environmental issue is more urgent!

Thank you for doing all YOU can... It is time to walk the talk!

~ Nancy Rae Mallory and all the staff at Green Energy Times. ♡

←350.org



# THE IMPACT OF THE GLOBAL ENERGY ECONOMY ... 8 LBS. OF AN EDUCATED SOLUTION

Book Review by N. R. Mallory

## ENERGY

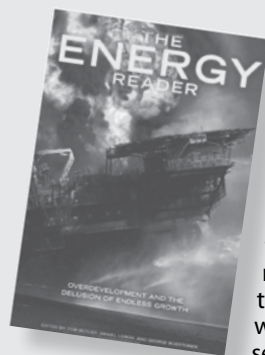
### OVERDEVELOPMENT AND THE DELUSION OF ENDLESS GROWTH

Edited by Tom Butler and George Wuerthner Introduction by Richard Heinberg, 278 pages, Post Carbon Institute | Watershed Media, Dec. 2012, \$50.00

"We have reached a point of crisis with regard to energy, where the contradictions inherent in our growth-based energy systems are becoming untenable, and where its deferred costs are coming due," writes Heinberg. "[T]he essential problem is not just that we are tapping the wrong energy sources (though we are), or that we are wasteful and inefficient (though we are), but that we are overpowered, and we are overpowering nature."

This is the best picture book I have ever seen! The book begins with 50 full-page illustrations that WILL get your attention. They barely need words. "The whole book is a photographic tour of the world of energy, illustrating the costs and trade-offs of constantly expanding efforts to fuel industrial processes, and that the huge pictures are not only justified but required," Heinberg explains. After an amazing exploration through the pictures – that by themselves impact your awareness of what our endless thirst has done to our planet, all in search of finding that cool tall thirst quencher – you might find yourself humbled and in tears. This book is very powerful. It really does weigh eight pounds.

The planet is in trouble. The human appetite and overconsumption not only for material goods, but also the energy to power everything we use, is out of control. The earth's CO2 levels are over 400ppm and rising. There is a crisis at hand that we



are striving to find the solutions for from all different angles, in all the wrong places. From mountain-top removal and major oil spills to renewables, we are feverishly searching for a bullet. Perhaps the solution is not to keep developing an endless supply of energy to meet our seemingly insatiable needs.

The author points out that there is no perfect energy, meaning by that term energy that has no consequences. Heinberg questions, "is all of this really necessary? Could we just use less?" Robert King, confirms a solution, "As a species, we must learn to live within the physical limitations of the biosphere. In the electric sector, this requires reversing the worldwide trend of ever-expanding electricity supply grids. "Capping the grid" is a crucial step toward reducing green-

house gas pollution and increasing the percentage of electricity generated by renewables." Serious conservation, energy efficiency and limited, decentralized, community-based power generation will be the new "business as usual" if we are to see a future.

In the afterward, Lisa Krall writes "In the final chapter of our use of fossil fuels we will commit ourselves to the messiest, dirtiest, most socially and economically disruptive transition we can possibly muster unless we are willing to change course....before the waning hours of the

IT'S TIME TO REMAKE THE ENERGY ECONOMY AS IF NATURE, PEOPLE AND THE FUTURE MATTERED.

fossil fuel economy alters our sense of place so irrevocably that we no longer see ourselves as Earthlings. ... It isn't all about us."

I highly recommend that you pick up this book. Energy: Overdevelopment and the Delusion of Endless Growth, should be in every library and educational institute and displayed so that it is readily available and visible. It should be on every coffee table, but not to just sit there -- to learn from and motivate the understanding we all need in order to take the action necessary to transition to a fossil-fuel-free society. The alternative is not acceptable as it could mean total destruction of human life on this planet.

Tom Butler is the editorial projects director for the Foundation for Deep Ecology and the president of the Northeast Wilderness Trust. A Vermont-based conservation activist and writer, his books include Wild Earth, Plundering Appalachia, and Wildlands Philanthropy.

George Wuerthner is a photographer, author, and an activist who has published more than thirty books on America's wild places. His books include Wildfire: A Century of Failed Forest Policy and Thrillcraft: The Environmental Consequences of Motorized Recreation. He lives in Helena, Montana.

Richard Heinberg is Senior Fellow at Post Carbon Institute in California and is a prominent "peak-oil" educator. He is a globally recognized energy expert. His most recent books are The End of Growth: Adapting to Our New Economic Reality, Powderdown: Options and Actions for a Post Carbon World, and The Party's Over: Oil, War and the Fate of Industrial Societies. ♪

# OUR FUTURE IN SUSTAINABLE CITIES

Book Review by Kika McArthur

## CARBON ZERO

### IMAGINING CITIES THAT CAN SAVE THE PLANET

By Alex Steffen, 147 pages, Open Design Studio, \$8.99

Carbon Zero is bold, innovative thinking about sustainable living in cities of the future.

"Alex's work has always been about seeking out and promoting pragmatic, empowering solutions to the world's most pressing environmental problems," Denis Hayes, Earth Day founder, has said. In the face of rising sea levels, nationwide droughts and dramatic coastal devastation along the eastern seaboard, the messages and strategies outlined in this book have never been more pressing or important.

It is so refreshing to read this roadmap of straightforward, optimistic but not pie-in-the-sky strategies for steering the ship of our cities toward carbon zero, or at least reaching towards that balance. This vision includes simple concepts that can be easily incorporated into the "urban boom," focusing on innovative design, planning, policy and products to equip the citizens



and create cities that "lead the way into a carbon zero future."

It touches my natural sense of optimism to read his conversational tone that makes it easy to tackle this complex discussion. Focusing the first two chapters, he is one of the first to realize that there will be greater requirements for "re-imagining" life in cities and that we are going to witness a renaissance in urban creativity, looking for new ideas and technologies. Now is the time for the creative minds to get into action and address the bigger issues with just this kind of discussion.

The biggest barriers to building a sustainable planet are political, not technological. Steffen offers an actionable task list of challenges, ideas, products and services to rethink our cities, and not only remove the barriers, but make the changes necessary to live sustainably in the future.

Not only does he focus his attention on the new urban world, he also discusses the concept of "smart suburbs," communi-

ties that can draw new growth, invite small scale redevelopment projects, and also create a more healthful lifestyle with more "walkable" compact communities. Not everyone wants to live in high density cities and the connection with nature can remain a priority for those who want to live outside the urban core.

New building technologies, new food growing and delivery systems, and new abilities in the workforce, applied to the growing urban scenario, can all be combined with simple and logical ideas to create a sustainable and liveable future.

I recommend this highly, and can't wait to read what he publishes next.

About the Author: Alex Steffen is a "designing optimist," with a passion for cutting through complex problems and diving right into solutions. Alex was Executive Editor of Worldchanging.com, one of the world's leading sustainability-related publications, with an archive of almost 12,000 articles and a large global audience. Now he spends his time working to understand the planetary future, and how the changes unfolding around us impact our lives and possibilities. He runs the foresight community, Planetary. Considered one of the world's leading voices on sustainability, social innovation and futurism, he is also an award-winning writer and acclaimed public speaker AlexSteffen.com on Twitter at @AlexSteffen ♪

# Solar Farms Are Sprouting Up All Over

Cont. from page 1

businesses, and even private individuals are putting in the projects. One person in Brattleboro has already independently installed a 40-kilowatt system, and has another 200-kilowatt system on the way.

Solar is springing up all over!

The SPEED program is an important part of solar development in Vermont. To qualify as SPEED resources, projects have to be both new and renewable. The program requires that 20% of the electric retail sales be generated by SPEED resources on January 1, 2017. After that, the amount increases by 4% of the total every third year, until January 1, 2032, when 55% of all retail sales should be from SPEED resources.

The purpose of the law is to provide the state with a secure power supply from renewable resources. When the law was passed, it was recognized that we cannot depend on a single technology, nor can we depend on a limited number of large, centralized power sources. The goal is to have a decentralized, distributed generating posture, based on a variety of technologies. The law provides for feed-in tariffs on the power generated, to provide incentives for installing new renewable power supplies.

The SPEED website ([www.vermontspeed.com](http://www.vermontspeed.com)) says the program has 58 projects currently either completed or in active development, including twenty small solar projects. The output of all projects currently underway will provide for over 73% of the goal for 2017. Not all of the programs are listed, however, and the Chester solar farm of our example is not yet among them. ♪

## Extra \$500 Incentive for Completed VT Weatherization Work

Efficiency Vermont announced that all Home Performance with ENERGY STAR jobs completed with reports submitted by August 31, 2013 will receive an additional \$500 incentive – on top of the \$100 discount on all energy audits done this year plus the \$2,000 incentive for improvements made to your home. More at: [efficiencyvermont.com/home-performance](http://efficiencyvermont.com/home-performance)

## VT Incentives for Air Source Heat Pumps!

Efficiency Vermont recently announced a new program offering up to \$750 to help homeowners buy an energy-efficient Air Source Heat Pump, which heat and cool homes at a fraction of the cost of conventional heating systems, operating in down to sub-zero temperatures. Details at [http://efficiencyvermont.com/for\\_my\\_home/ways-to-save-and-rebates/energy\\_improvements\\_for\\_your\\_home/Cold-climate-heat-pump/overview.aspx](http://efficiencyvermont.com/for_my_home/ways-to-save-and-rebates/energy_improvements_for_your_home/Cold-climate-heat-pump/overview.aspx)



# Product Review: Delta Breeze Fan/Light ...

Review by N. R. Mallery, May, 2013

Living in a 100% solar powered (off-grid) passive home, with a 3.8 kW system, automatically puts energy awareness is high on the list.



After 10 years of using a Nutone Energy Star Fan/Light in both bathrooms, I recently replaced the upstairs bathroom one with a new DeltaBreeze GreenBuilder LED fan/light. This is one more step with our transition away from the CFL's.

When it was first installed, I didn't even realize it was running -- from the downstairs of my house. When you first flip on the switch - you notice a quietly gradual increase of the speed until it levels off to a smooth soothing sound. This is their Built in soft start function that is designed to increase bearings life. Living off-grid, the

soft-start is familiar because we have also have a soft-start well-pump that is easy on the battery surge load when it comes on. This extra feature is definitely appreciated. Comparing this unit with the other Nutone that is downstairs, the fan is much quieter -- by quite a lot! "It is a much more pleasant sound," the installer remarked, "The motor is more dedicated to balance." He suggested we use it to suck the heat from the upstairs in the summer, because the fan is so much quieter and has the power to do it!


The quality of the whole unit is definitely higher than the Nutone. It is really amazing how bright and clear the light is and the difference. It is great to be able to just 'see' while in the shower! Well, it is an LED, after all. The one drawback is that it is too bright to look directly at the light. But, I am not sure that it is a drawback - who does that anyway?

In every situation where we have replaced CFL's with LED lightbulbs, the benefits of are like night and day - You can see. You can read. They use much less electricity. There are no mercury issues to deal with. The longevity alone makes the prices acceptable, but thankfully, they are already coming down. We are sold

## Delta BreezGreenBuilder Ventilation Fan/LED Light Combo - GBR80LED

Low noise ceiling mount ventilating fan rated for continuous running. Fan is ENERGY STAR® qualified, HVI, UL, and cUL certified, and can be used to comply with ASHRAE 62.2, CA Title 24, and CALGreen requirements.

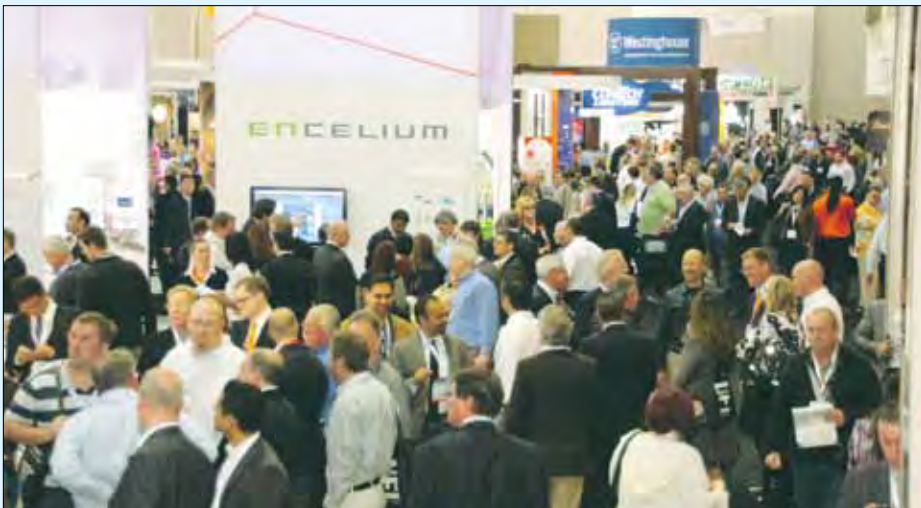
- 11-Watt LED lamp included (equivalent to a 60-Watt incandescent bulb)
- LED life is 30000 hours (compare w/ 10000-hr CFL life)
- Noise level at 0.8 sones
- 11.1 to 11.5 watt fan.
- Annual energy cost for 24/7 fan operation averages \$12.10
- ENERGY STAR® qualified with DC motor technology
- Built-in soft start function to increase bearings' life
- 3-year limited warranty

on LED's and are working to replace all of our lights a couple at a time. There is no turning back once you try them! [www.DeltaBreez.com](http://www.DeltaBreez.com) 

**ENERGY STAR Most Efficient is a designation recognizing and advancing the most efficient products among those that qualify for the ENERGY STAR label. ENERGY STAR Most Efficient products reduce greenhouse gas emissions by meeting rigorous energy efficiency performance levels set by the U.S. Environmental Protection Agency.**

**Approximately 2.5% of all residential bathroom ventilation fans in the market were recognized as ENERGY STAR Most Efficient products in 2013. Delta Breez was awarded this recognition for 14 models.**

## NEW EFFICIENCIES LEAD THE WAY AT LIGHT FAIR 2013



LIGHTFAIR® INTERNATIONAL 2013 photo courtesy of Lisa Bokovoy

by Rustom Meyer and Jon Meyer

Acceleration is the word for Light Fair 2013. Myriad technologies have been introduced this year, but the pedal-to-the-metal emphasis has been on LEDs: better efficiencies, lower costs, and rapidly expanding market share. Potential for energy savings is huge. The latest data from the EIA (Energy Information Administration) shows that the United States uses about 560 billion kWh of electricity for lighting each year. When (not if) LEDs replace most incandescent and fluorescent lighting, consumption will be reduced by at least half. That's a savings of 32,000 MW of continuous power, which means that we could in theory shut down

about 64 typical coal plants. And that's just with the LED efficiency of today!

The production of LEDs is proceeding a bit like computer chips - smaller, more efficient, and in multiple arrays. Combinations of four and even 16 dies in the same LED are now available to take the place of single-die LEDs. With some manufacturers like Philips, Panasonic, OSRAM, and Cree, these arrays of four dies cost about the same as a single die LED from last year. This rapid size and cost reduction is a major factor fueling steady, sustained growth of LED lighting, in the same way microchip growth drove the ubiquity of personal computers and smart phones. Seventy-eight percent of research

on lighting is now devoted to LEDs according to Light Fair speaker Mark Lien.

LED lighting is projected to grow by 40% in 2014, and LEDs will capture almost 10% of the lighting market by 2015 (again according to Lien). Customer energy savings, lower initial purchase costs, very long service life, and more versatility and color choices are driving growth. More companies are offering LEDs and the LED market is becoming more competitive as volume increases and prices come down.


New research reported at Light Fair suggests that lighting has a significant effect on human health. Excessive UV can cause some cancers and even blue light can disrupt sleep patterns, causing insomnia. Some blue light is OK in the morning, but excessive blue light can also cause macular degeneration. The new blue headlights offered on some automobiles may be harmful to eyes at night. At Cornell University, investigators discovered that soft light and soft music makes you eat less and enjoy more. It has also been found that overhead lighting is bad in bedrooms and is harmful to eyes when lying down.

A new Federal Trade Commission requirement was promoted at Light Fair which is the LED bulb equivalent of a Nutritional Facts food label. It describes products using five categories: light output (lumens), watts (power), efficacy (lumens per watt), correlated color temperature (warm or cool color), and color rendering index (how true colors are of illuminated objects). This is essential to letting consumers compare lighting products on an apples-to-apples basis.

New 'tunable' LED color lamps contain red, green and blue LEDs and you can control color balance and patterns with a mobile device from wherever you are. 'Tunables' have become a fashion, but at \$60 per bulb, they are still for the privileged. These could be especially exciting for boring building facades, but will they end up in the dustbin of history next to stereographic postcards and Xanadu disco lights?

One of the most unusual projects discussed at Light Fair is the New York City Lowline, presented by James Ramsey. He is working on transforming a 1.5-acre 100-year-old abandoned trolley station under the lower East Side into an underground park. In order to grow grass and trees underground with natural light, he has invented remote skylights; i.e. a system of parabolic mirrors and fiber optics. These capture and concentrate sunlight, channel it underground, and redistribute it. He has raised over \$155,000 from 3300 backers on Kickstarter for a proof-of-concept installation. If successful, this could give rise to a whole new breed of city 'greenspaces,' that can be crammed in existing neighborhoods anywhere they fit!

Light Fair International 2013 showcased a year of very solid progress: technology to save us energy, bring sunlight to dark spaces, and maybe even improve our health.

Sources:  
[http://www.ucsusa.org/clean\\_energy/coalvswind/c01.html](http://www.ucsusa.org/clean_energy/coalvswind/c01.html); <http://www.eia.gov/tools/faqs/faq.cfm?id=99&t=3>; <http://foodpsychology.cornell.edu/outreach/musiclight.html>  
Jon Meyer is CEO of Yeti Solar, LLC(TM) [www.yetisolar.com](http://www.yetisolar.com) 



owline View Renderings by Kibum Park, Raad Studios, NYC



owline View Renderings by Kibum Park, Raad Studios, NYC



# ENERGY INSIGHTS - DIGGING DEEPER

## GETTING OFF THE PROPANE GRID - STEP ONE: REDUCE YOUR USE

By Paul Scheckel

Last year I was feeling quite smug about having "too much" electricity. Sadly, harsh awakening is often on the heels of such smugness. We soon received a propane bill for over \$1,000. Most of that propane is used to heat water, some for cooking, and some for backup heat if we're out and can't load the wood stove. This presented a challenge that I could not resist: how to get off the propane "grid"? I knew that part of the answer was in reducing our water and energy use, part in harnessing excess summertime PV production, but perhaps another piece lay in producing my own renewable natural gas. For once, I would follow the advice I give others to "reduce your use, then produce!"

I've been a hands-on energy professional for over 20 years, living off-grid with my family with solar and wind for electricity and wood for heat. We have a backup (bio)diesel generator for those occasions when the sun doesn't shine and the wind doesn't blow. Recently we upgraded our power system so that nearly 100% of our electrical needs are met with renewables throughout cloudy northern New England winters.

We use 6 to 8 kilowatt-hours a day, with all electricity monitored at the circuit level through a Powerhouse Dynamics E-monitor. Our 4 kilowatt PV system keeps 50 kilowatt-hours of battery storage charged quite well when the sun shines, with wind as an added bonus when it's cloudy. Solar power generation is monitored through the Outback Power MX80 charge controller, and wind data is collected with an anemometer feeding an NRG systems data logger. Happily, when we compare annual power production graphs of both solar and wind, they are nearly inverted, with wind providing more power in the winter and sun taking over in the summer.

You can learn to make and use biogas in my recent book *The Homeowner's Energy Handbook*. It's quite an intriguing process, and while it's much simpler than I had thought, it does take some time and infrastructure to manage. I'll be delivering workshops on the topic of renewable natural gas at Vermont's Solarfest, as well as the NOFA conference in Amherst MA this summer. For now, I'd like to focus on going deep with water heating savings.

To increase water heating efficiency, the 10-year-old, 40 gallon, sealed-combustion water heater was replaced with a Navien NR180 on-demand, condensing water heater. On the conservation side, my plumber installed a drain water heat recovery (DWHR) unit from Swing Green. These heat exchangers extract heat from shower drain water and use it to preheat water entering the water heater. I was thrilled to feel firsthand the 20° temperature rise in the water circulating through the heat exchange coil. Now the cold water entering the water heater is 75°F instead of 55°F.

On the awareness and behavior front, we are trying to be acutely aware of how we use hot water. For example; how many times have you stood at the sink with the hot water tap open, waiting for the water to get hot, only to turn it off before it did get hot? One study showed that nearly 20% of the water that's heated in water heaters is never used because of this behavior.

A well-insulated, 40 gallon Marathon

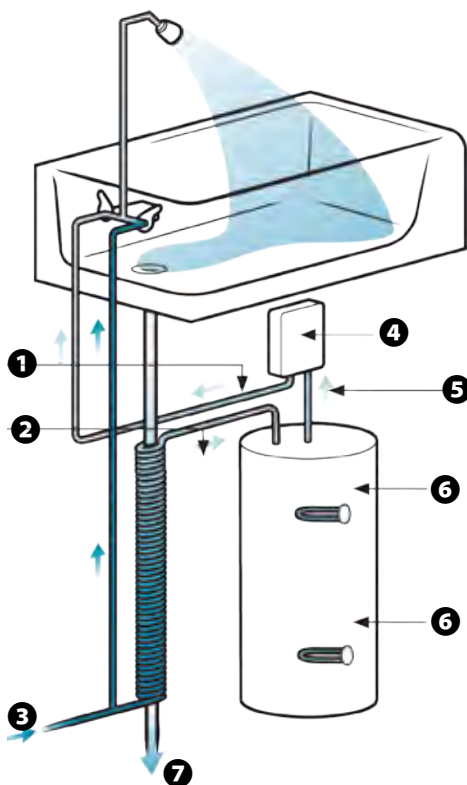


Illustration from *The Homeowner's Energy Handbook*  
© Paul Scheckel. Illustration © James Provost. Used with permission of Storey Publishing.

1. Hot water out to faucets, 2. Preheated cold water enters water heater, 3. Cold-water supply feeding water heater is preheated by drain water, 4. On-demand water heater heats water only if incoming water is not hot enough, 5. Pre-heated water from electric water heater, 6. Electric heating elements are used as dump load, diverting solar power to heat water when batteries are full, 7. Cooled drain

electric water heater serves as a dump load for excess solar electricity. Pre-heated water from the DWHR unit supplies this water heater, and if the water isn't hot enough it's further heated by the Navien. A gas meter and in-line water meter with pulse outputs, along with temperature sensors, are coupled to a WEL data logger. Using a web interface, I can see real-time and cumulative water, gas, and temperature data.

The result is that our propane consumption for water heating has dropped by over half, but that doesn't include the solar electric contribution. During summer months, the sun heats about half of our hot water. All told, the system cost about \$4,000 to install, and I anticipate about \$13,000 in savings over an expected 20 year life of the system. These numbers are great, but for me the instantaneous "feel good" factor of being more efficient is more important than long term cost savings.

Taking substantial steps towards meaningful energy savings can be costly and inconvenient in the short term, but the benefits are many and lasting. Choose the motivating metric that works for you; be it cost, comfort, or carbon. When it comes to energy savings, take it personally and take action!

Paul Scheckel is an energy efficiency and renewable energy consultant and author of *The Homeowner's Energy Handbook*. He is a partner at Shelter Analytics [www.shelteranalytics.com](http://www.shelteranalytics.com).

This is first in a new regular column by Paul Scheckel. Next issue look for "Getting Off the Propane Grid - Step Two: Produce -- making your own renewable natural gas."

Demand for solar in the USA is at an all time high. In the first quarter of 2012, developers installed 85% more solar panels compared to the first quarter of last year. Total U.S. installations may reach 3,300MW this year — putting the country on track to be the 4th largest solar market in the world.

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# KEENE STATE COLLEGE IS PRODUCING SOLAR POWER!

## Solar PV System brings TDS Center closer to a LEED Platinum Certification

By Dana Rubin

Keene State College is an exemplary campus for sustainability. For more than a decade, the southern New Hampshire school of 6,000+ students has been enriching campus life with a variety of environmental initiatives. From alternatively fueled vehicles populating the quads, energy efficient dormitories, to an integrated Environmental Studies program, Keene State has pioneered the greening of colleges.

In October 2012, Keene State unveiled the newest addition to the ever-evolving campus, the Technology, Design and Safety Center. The TDS Center is the school's first LEED Platinum building, featuring elements of passive design, fixtures to improve water conservation and state-of-the-art heating and cooling systems. According to Dr. Jay Kahn, Interim President, "...The TDS Center is a welcome addition... not only does it serve as a model for effective teaching, it is an outstanding example of our commitment to sustainability..."

A building of this caliber is not complete without the installation of a rooftop photovoltaic system, the cherry on top, if you will. As of June 10th, the TDS Center is producing solar energy! The Public Service

of New Hampshire (PSNH) has officially approved the interconnection and the College flipped the switch, electrifying the building with 15% of the electricity consumed throughout the building.

Keene State College is now the third largest producer of solar energy on the Public Service of New Hampshire (PSNH) system.


Solar Source, a division of the Melanson Company Inc., a business with over 80-years of experience in residential and commercial roofing, installed the 8,900 square foot system. This includes 532

Panasonic HIT 240W panels and 2 Fronius CL 60.0 WYE inverters across the building's RoofPoint Certified roofing system. The system has a rated capacity of 127.7KW, and it is projected that in the first year, the panels will produce about 142,800 kWh. The TDS Center building has the capability to be expanded to a total roof top solar capacity of about 316.8 kW. Additionally, there is preliminary conversation to increase the college's production of clean energy by installing panels on other rooftops and in campus parking lots.

We applaud the efforts of everyone involved. Readers, stay tuned for more



Keene State College's TDS Center with is producing power from the sun with their new 127.7kW solar system

updates; next issue we will be touching-base with Solar Source and PSNH to hear more about the building's initial energy savings. Plug into renewable energy! 

The top producer of solar power on the PSNH system is Manchester Intn'l Airport.

The 2nd is 'Favorite Foods', Somersworth, NH.

There are currently 719 customers throughout the PSNH service area that are generating all or a portion of their electricity via the sun.



From L to R: Rob Therrien, president of the Melanson Company and Pierre LeBlanc, president of Engleberth Construction and Jay Kahn, Keene State College Interim President. If you use this photo, please credit Keene State College.

# BONNYVALE ENVIRONMENTAL EDUCATION CENTER

## "BEAK" FINDS ITS WAY INTO MANY LIVES

By Dana Rubin

Visiting Windham County, Vermont, you're apt to hear people talking about "beak," and wonder what they are talking of. You'll soon learn they're talking about BEEC, an acronym for Bonnyvale Environmental Education Center. BEEC finds its way into many people's lives, and people love to recount the wonderful experiences they had there, so one does hear a lot of BEEC, BEEC, BEEC.

Twenty-some years ago BEEC was born from a vision of Paul Stockwell, a poet, scientist and teacher who owned a small farm on Bonnyvale Rd. His dream was to share the land with his community, while fostering environmental education and stewardship. In 1991, educators dedicated to Stockwell's dream moved onto the land, converted farm buildings to classrooms and offices, and created Bonnyvale Environmental Education Center.


Since 1991, BEEC has provided school programs, vacation camps and after-school programs for children of Windham. Countless people's lives have been enriched through public programs such as hikes, natural history walks, and talks on environmental issues. Citizen Science has become an important part of BEEC programming with our volunteer Salamander Brigades in the spring. No wonder people are talking about BEEC.

With the coming summer months, the BEEC staff is preparing for their summer camps, which run from the last week in June through the second week of August. Each week has a different theme chosen to enliven the learning experiences of a particular age group. Camp themes range from Nature Photo Explorers, to Cub Camp and Wee Naturalists, for the very young. Finding our Way focuses on orienteering skills, while our Magical World of Nature, opens the imaginative world of fairies and make believe. Roots and Shoots focuses

on adaptations and uses of plants, while

Adventures of Poppy explores the world of mice, porcupines and owls. We conclude our season with Wild Summer, where campers experience life on the wild side.

BEEC's Nature Explorers Camp is for the young nature lover. Our goal is to foster children's love of nature in a safe, supportive environment. Campers spend most of each day outdoors, in small groups, exploring the forests, meadow and waters of our 60 open acres. Non-competitive games, stories, art projects, music and a cooling ride down our gentle water slide add to the experience. Children return year after year, excited to visit special places such as Grandmother Tree and Frog Pond. They also return knowing that there is much fun to be had! Campers investigate the lives of their wild neighbors, learn naturalist skills, explore wildlife habitats, develop their sensory awareness skills, venture off-trail, and discover a sense of magic in the Great Outdoors!

For more information about our environmental center or to register for our summer camp, please visit our website at [www.beec.org](http://www.beec.org). 



Bonnyvale Educator leads an outdoor game at the center. Check out the BEEC website, [beec.org](http://beec.org), for 2013 summer programming



Students participate in Magical World of Nature, a week long camp that has students venturing through the local woodlands.

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# THE PROBLEM OF GLOBAL WARMING IN NEW ENGLAND



By George Harvey

What would you say to a solution that protects New England communities from some of the worst changes of global warming, reduces our costs, increases employment, allows us to live comfortably, and contributes to stopping and reversing global warming itself?

By focusing on how global warming affects road infrastructure, we can come to a valuable conclusion. Even if more distant help becomes unreliable, we can become able to depend on our own resources. The least distant resources are those of the community and the neighborhood, and I would advocate beginning work in those places. The very achievable goal is to provide resilience at the level of the community. If all our communities are resilient, so will our counties and states be, as well.

For individuals and families who live out in the wilderness, the plan for energy resilience seems clear. It is to prepare to live off-grid. Fortunately doing this can save money. Also fortunately, there are a lot of us who have already lived off-grid, and can guide those without experience.

We should realize that living off-grid can provide a pattern for cooperatives and municipal groups, to designing community-owned detachable microgrids, that can be taken off the main grid and continue to function.

Recent empirical data would seem to indicate that baseload power plants on a monolithic grid are only necessary where the grid is not "smart." It has long been accepted that a diverse, distributed power system can be more robust than one made up of huge, centralized power plants. Recent modeling research concludes that a grid dominated by intermittent power sources, with modest assistance from power storage facilities, can be very reliable, if the grid is operated intelligently. Intelligence can include ability for microgrids to be independent, as needed.

Energy cooperatives are catching on, producing and benefitting from renewable power, reducing both carbon emissions and costs. The reason is that they work. It costs less not to destroy the planet than it does to preserve it. You might say that saving the planet is a side-benefit of saving money by using renewable power.

The cooperative template can be extended to include schools and municipalities. Methane from municipal waste dumps is being trapped and used as

fuel. The same dumpsites are becoming solar farms. Community wind and hydro power are real possibilities. The results can include decreased costs, decreased pollution, and increased local employment.

A local energy supply can be made secure by going just a little bit further and combining the idea of community power with the ability to go off-grid. This requires only two steps, both of which are technically quite feasible.

First, a local power supply has to include the switching needed to be detached from the main power grid. Power substations are logical places for towns to put connecting ties between grids. Transformers might be places for neighborhoods. This may or may not be a bit more difficult than it sounds, as there may be ramifications both with laws and with power companies.

Second, community generating facilities must be local to the microgrid to provide power to the community when the main grid fails. Of course side benefit of each community having its own power supply is that the ownership and income stay local.

You might look at the electric supply in this way: The closer you are to the source of your power, the better off you are. The benefits of a change to local detachable microgrids include more dependable power, reduced costs, reduced emissions, and increased employment. We might use a new mantra, "Yes – In My Back Yard!"

For detachable microgrids to be most valuable, their diversity should be considered in planning. This means that each community should look at all of its resources, and plan to utilize as many as possible. It also means each community should understand what resources its neighbors have, and try to coordinate developing those that are least commonly found, if possible. By developing as many types of resources as possible, communities can avoid common-mode failures, making entire regions more resilient.

There is one thing I would like to mention, which is amplified in another article in G.E.T. It is that forestry biomass should not be overlooked. Global warming is expected to render whole groups of species of trees locally extinct. This means we will have to remove large quantities of dead wood from public forests over the next century. Since technology exists to burn wood with cleaner emissions than we get from natural gas, we are not doing ourselves any favors by ignoring wood as fuel. ♀

# A SOLUTION FOR GLOBAL WARMING IN NEW ENGLAND

By George Harvey

The more I read about climate change and sustainable technologies, the more confident I am that we can stop and reverse the problems before us. There is one provision in that view, which is that we have to act as soon as possible, and wisely.

Climatologists predict that storms in the U.S. Northeast will occur more frequently and with greater power than ever before. This is not a prediction for the distant future. The starting point is years ago, and the expectation is that things will get progressively worse until we have storms producing what we now call hundred-year floods every two to four years by midcentury, and every year or so, by the end of the century.

Ignoring all the other problems brought on by global warming, we can see an emerging problem that has already begun, and will become critical within only a few decades. We are still rebuilding from Irene. What if another Irene were to hit this summer? Freshly rebuilt roads and bridges would be destroyed again. Quite

possibly, we can come to a point when the damage done by one storm will not be cleaned up before the next storm hits.

A road does not have to be close to the flood line of a river to be vulnerable. It can be damaged if the bank gives way and the road is undermined, even if it is many feet higher than the flood line. Any road that runs along a river or stream is likely to be vulnerable. In addition, rivers sometimes change their paths, which can create a need for new bridges in places where none previously existed.

With this in mind, we can conclude that at some point they are likely to go unrepaired. With sufficient regular, widespread damage, FEMA will not have funding for even a small percentage of the national problems. With support from FEMA, the states are unlikely to take up the burden. At some point -- and I am guessing it will be before the year 2025 -- we will have to realize that it is a bad economy to repair some roads and bridges destroyed by storms. If so, sections of roads are likely to

Cont. on page 39

## TOO MUCH GREENHOUSE GAS! LATEST SCIENCE REVEALS ALARMING CONCENTRATIONS OF GREENHOUSE GASES

By Tricia Dinkel

Records are set and then they are broken. In many cases, breaking a record is celebrated—even commemorated through ceremony or accolade. Late last week, atop the Hawaiian volcano Mauna Loa a worldwide record was broken, and while news of the milestone spread fast and far there came no approbation, no celebration and no solace in the achievement.

On May 10, 2013, for the first time in human history, the daily average concentration of atmospheric carbon dioxide surpassed 400 parts per million, indicating the continued increase of fossil fuel burning despite mounting warnings and scientific evidence linking fossil fuel emissions, like CO<sup>2</sup> to global climate change.

Reports of the record-breaking CO<sup>2</sup> level were sobering to the scientific and environmental communities, as evidence tightly links the high concentrations of CO<sup>2</sup> and other greenhouse gases to rising global temperatures. The concern for global climate change has inspired efforts all over the world to reduce the burning of fossil fuels, from investing in renewable energy sources to fuel-efficient transportation to educational programs. But ominous measurements of atmospheric carbon dioxide admonish a gradual response to reversing climate change.

It is important to communicate the news, not to overdramatize the process of climate change but rather, to address and face the situation of escalating



global climate change: We need to do more — and we need to do it now. Some cynics would even argue we needed to do it yesterday. But there is always hope. We should reinvigorate the call to action to employ sustainable energy systems that do not contribute carbon dioxide and other harmful greenhouse gases and develop comprehensive energy efficiency programs.

What's important now is to take the information that science has imparted and let it inspire immediate action in our local communities. Take the time to learn about the organizations demonstrating positive action to abate global climate change and contribute to those efforts. Become involved in the community's call to action and strengthen these local movements by doing so.

The challenge now is to set a new record, to achieve worldwide action to tangibly reduce the burning of fossil fuels and transition to communities that are defined by environmentally sustainable standards and renewable energy sources. To achieve this feat, to succeed in unifying our communities to stop what we know to be harmful for the planet, and to start building systems that improve the quality of our natural world, would mark another first in human history and endow monumental benefits for generations to come.

Now, that's a record worth breaking. Tricia joined the Green Alliance Staff in May of 2012 as the Community and Member Manager [www.greenalliance.biz](http://www.greenalliance.biz). Born and raised in New Hampshire, she ventured out west to the University of Colorado where she earned her B.A. in Environmental Policy and Natural Resource Management and worked as a Field Naturalist. She is pursuing her M.A. in Environmental Education at University of New Hampshire. Tricia is often accompanied by her dog, Nixon, aptly named for his expertise in environmental policy and foreign affairs. ♀



## Amy Todisco — Green Living Now

### FIRST IN A SERIES: HOW TO GROW ORGANIC FOOD ALMOST ANYWHERE



It's true. I've grown organic food on a sunny New York City windowsill, a balcony in a seaside community in Massachusetts, in someone else's small

backyard in an urban jungle, and in much larger spaces, now fields, in Vermont. There is nothing quite like the satisfaction and the taste of picking something you've nurtured from a seed into a delectable, vitamin and mineral rich food. You just can't buy anything that good in the store.

Did you know that all supermarket produce is usually 3-7 days old (depending on the time of year and the store) before it even gets to the produce shelf? In the growing season, stores that buy from local farms will have fresher produce. Organic or conventional, it doesn't matter. Think about all of those lost nutrients.

There is an art to growing though. In my e-course in an e-book format, How To Easily Grow Organic Food Almost Anywhere, I mention the need to test your soil for missing nutrients (some things simply won't grow unless they have the right balance), use a Rainshow'r dechlorinator hose filter to get rid of chlorine in your water for the garden, and how to create your own nutrient rich compost, among other things.

Do you have the patience to start seeds or do you like the immediate satisfaction of planting seedlings? How about vertical gardening? It's become the popular thing in places where space is an issue. Is it okay to use conventional potting mixes? No. Not only is the potting mix sterilized, essentially killing all beneficial microorganisms (the good bacteria and fungi), but it contains nitrate salt or chemical urea fertilizers to feed the plant. In contrast, an organic potting mix is "alive" with microorganisms and organic matter that feed the soil, which feed the plants. And, the process of feeding the plants is a slower process as the nutrients are breaking down over time. It's not a "quick fix" feeding process like conventional agriculture and potting mixes.

And, what do you do if you don't even have a sunny windowsill but want to grow some nutritious based food? Consider growing sprouts. Why?

1. They are cheap to grow. Seeds can multiply 7-15 times their weight. At \$ 8-12/ lb. for organic sprouting seeds, you get one pound of fresh, locally grown, sprouted organic greens for under one dollar.

2. Power packed nutrition. Sprouts have the most concentrated nutrition at the sprout stage than at any other point in the plant's life.

3. Totally local and organic. No worries about synthetic, petroleum based pesticides or fertilizers. Relatively no carbon footprint. Your sprouts don't have to be trucked across the country to get to you.

There are so many reasons to grow your own food—especially now with the proliferation of genetically modified seeds, plants and pollen everywhere. Healthy food may become harder to find. Isn't it time to get growing so that you can provide for yourself and your family? Amy Todisco has a long history of community activism and education. She is an accomplished author on issues relating to health, sustainability, and organic gardening. She has co-authored a best-selling book, and has been featured on Vermont Public Television and numerous other media. We will be doing a review of her ebook, *How To Easily Grow Organic Food Almost Anywhere*, in an upcoming issue of *Green Energy Times*. You can learn more about her at [greenlivingnow.com](http://greenlivingnow.com).





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## SUSTAINABLE FOOD SYSTEMS

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A farmers' market is a physical retail market featuring foods sold directly by farmers to consumers. They typically consist of booths, tables or stands, outdoors or indoors, where farmers sell fruits, vegetables, meats, and sometimes prepared foods and beverages. Farmers' markets add value to communities as a benefit to both the farmer and the consumer. Supporting local saves energy, money, time, and the planet. Support your local Farmers Market!

#### VERMONT

**Bradford Farmer's Market.** Every Saturday 10-2. Open year round! Located on the front lawn of the Bradford Academy Building. Bradford, VT. Vendors include, veggies, meats, soaps, crafts, baked goods, lunch, events, jewelry, jams, pickles & more! 802-222-4495. Email: [hellobradfordfarmers@gmail.com](mailto:hellobradfordfarmers@gmail.com)

**Dorset, VT Farmers' Market.** May 12 - October 13th. Sundays. 10am-2pm. Rain or shine. HN Williams General Store, Rt.30 Dorset VT. (802) 353-3539. Email: [marketmanager@dorsetfarmersmarket.com](mailto:marketmanager@dorsetfarmersmarket.com)

**Jeffersonville, VT Farmers' and Artisan Market.** June 19-Oct. 2nd. Wednesdays 4:30-Dusk. Rain or Shine. Route 15 & 108S, behind the Cupboard Deli. Please access the market to park in the

adjacent field between the Cupboard Deli and Aubuchon Hardware. (802) 999-8486 Email: [debnervil@gmail.com](mailto:debnervil@gmail.com) or like us on Facebook.

**Jericho Farmers Market @ Mills Riverside Park.** June 6-Sept. 26. Rain or Shine. Thursdays (except July 4) 3:00-6:30 pm. Rte 15, between Jericho and Underhill, VT. (802)343-9778. Email: [JerichoFarmersMarket@gmail.com](mailto:JerichoFarmersMarket@gmail.com)

**Manchester, VT Farmers' Market.** May 30 - Oct. 10th. Thursdays, 3-6 pm (rain or shine). Adams park, Rt. 7A downtown Manchester Center. (802) 353-3539. Email: [mfmvt@yahoo.com](mailto:mfmvt@yahoo.com)

**Peacham, VT Farmers Market.** June 13 through Oct. 3rd. Thursdays 3 - 6 pm. Peacham Academy Green, 555 Bayley Hazen Rd., Peacham, VT (802) 592-3161. Email: [janealper@gmail.com](mailto:janealper@gmail.com)

#### NEW HAMPSHIRE

**The Farmers' Market of Keene, NH.** Offering a wide variety of locally produced farm fresh produce, dairy, meat, delicious baked goods, maple syrup, plants, unique crafts, and more! Located at Gilbo Ave. behind Margarita's restaurant. Open 9 am - 1 pm Tuesdays and Saturdays May-October. For more information: Email: [keene-farmersmarket@gmail.com](mailto:keene-farmersmarket@gmail.com), [www.facebook.com/keenefarmers](http://www.facebook.com/keenefarmers). <http://harvesttomarket.com/farmers-market/Keene-Farmers-Market-NH>

**Laconia, NH Farmers Market** located at City Hall parking lot, Beacon Street Extension, Laconia, NH is celebrating its 40th season; offering local farmers and producers, vegetables, fruits, unique gifts, baked goods, meats, seafood, bread, eggs, herbs, dog treats, honey, maple syrup, jams. Saturdays, June 15 thru September 28; 8:00 until noon. The market accepts EBT and credit cards. Call 603-267-5326. Visit [www.laconiafarmersmarket.com](http://www.laconiafarmersmarket.com).

**Newport NH Farmers' Market.** Located on the Town Common at intersection of Rt. 10 and Rt. 11 on N. Main St in historic down-

town Newport, NH. Organic produce, prepared foods, meats, eggs, cheese, crafts/art, and so much more. May 31-Oct. 11, Fridays, 3-6 pm. [www.NewportBuyLocal.com](http://www.NewportBuyLocal.com) (603) 865-9841. Email: [newportfarmersmarket@comcast.net](mailto:newportfarmersmarket@comcast.net)

**Peterborough, NH.** Fresh Chicks Outdoor Marketplace, every Monday 11-2, on the grounds of Monadnock Community Hospital. Produce, plants, dairy, lobster, meats & poultry, baked goods, ice cream, kettle corn, fairtrade coffee beans, artisan crafts, music, fun!

**Plymouth, NH Community Farmers' Market.** Located at 263 Highland Street, Plymouth, NH. Every Thursday from 3:00 to 6:00 PM (rain or shine). May 30 to Sept. 5. Variety of local foods, crafts and local specialty products. Local # 536-3823

**Tilton, NH Farmers' Market.** Every Friday 3 - 7pm, July 5 - Sept. 27, Over 30 Local Producers with fruits, vegetables, dairy, baked goods, seafood, body-care and prepared foods. Live music and family entertainment. Location: Tanger Outlet Center, 120 Laconia Rd, Tilton, NH, Exit 20 from I-93. [www.tiltonfarmersmarket.com](http://www.tiltonfarmersmarket.com).



Peacham, VT Farmer's Market Art by Mary Azarian

## Shop Our Area Co-ops

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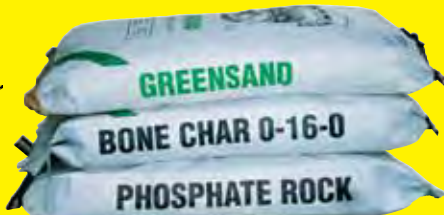
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# THE ROLE OF CO-OPS IN SUSTAINABLE FOOD SYSTEMS

THE CURRENT FOOD DISTRIBUTION ECONOMIC MODEL IS UNSUSTAINABLE!



City Market, Onion River Co-op is Burlington's only downtown grocery store.

By N.R.Mallery

As climate Change and torrential weather continue to devastate our planet, it is clear that working with local vs transporting our food from across the country or beyond is just not going to be reliable, let alone the cost that transportation adds to the CO2 levels in our atmosphere.

More and more it will be necessary to sustain our food needs locally. Food cooperatives play a noteworthy role in the organization and distribution of a network for what food supplies are available in individual communities that will need to sustain feeding us all.

As hurricane Irene and Sandy both demonstrated how quickly a community can be isolated, completely cut off from the rest of the world. It was weeks before some towns were reached after Irene devastated so much of Vermont. There were no roads in or out of whole towns. Transmission lines were all down ... We know this story all too well. This can and will happen again. Will your community be able to feed it's people? From local farms to your own backyard garden, we have the ability to grow grains -- even rice, fruit and nuts, meat, fish, etc. along with many other staples we rely on every day. This can all be achieved in our own communities. This should be addressed now to be able to meet our future needs in each individual community, so that should this

isolation happen, we are prepared and will be resilient.

This is how the role that food co-ops can help with the development of a sustainable food system. They are already networking and working and supporting our food system with what is available on a community level.

## What is a Cooperative?

A Cooperative is an autonomous association of people united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise.

Cooperatives are based on the values of self-help, self-responsibility, democracy, equality, equity and solidarity. In the tradition of their founders, Cooperative Members believe in the ethical values of honesty, openness, social responsibility and caring for others.

An excellent example of how a cooperative business works is found at City Market, Onion River Co-op, a community-owned food cooperative located in downtown Burlington, Vt. City Market is Burlington's only downtown grocery store, open 363 days per year from 7a.m. to 11p.m.

City Market provides a critical service to the residents of Burlington and the larger community by providing conventional,

Cont. on page 35

# CLIMATE CHANGE AND VERMONT'S FOOD SYSTEM

By Scott Sawyer

For many decades, scientists have warned that the consequences of anthropogenic climate change could be severe across all ecosystems and social systems in the years ahead. Two recent reports from the U.S. Department of Agriculture (USDA) and a draft report from the U.S. Global Change Research Program indicate detrimental effects from climate change on most crops, livestock, and agricultural production systems that will vary somewhat by region. Since most of the food consumed in Vermont is imported from somewhere else, we need to pay particular attention to the impacts of climate change on other parts of the world. Here are a few highlights from these reports:

- Rising temperatures and altered precipitation patterns will affect agricultural productivity. Crop sector impacts from weather are likely to be greatest in the Midwest, and these impacts will likely expand due to damage from crop pests. Decreased yields in the major corn, soybean, and wheat supplying region of the country will, of course, have ripple effects, including impacting the cost and availability of animal feed in Vermont—already the biggest production expense for dairy farmers—and the cost and availability of ingredients for marquee Vermont food processors like King Arthur Flour. Since the impacts of climate change are global, the availability of food products that we have grown accustomed to enjoying—and that Vermont companies use as key ingredients—will diminish. For example, cocoa production in Ghana and the Ivory Coast is expected to decline (which will impact Ben & Jerry's, Lake Champlain Chocolates, and other chocolatiers), as is coffee production (which will impact Green Mountain Coffee Roasters and other coffee companies). In the Northeast, most forest cover models show the composition of forest species changing from maple-beech-birch to oak and hickory by 2100. The implication of these changes is that the appearance, composition, and functioning of Vermont's working landscape—including maple syrup production—will be dramatically different in the years ahead.

- Livestock production systems are vulnerable to temperature stresses, rapidly changing weather conditions, and exposure to different diseases and parasites. Many Vermonters are interested in expanding livestock production to reach regional markets for grass-fed, pasture-raised meat. It is unclear how temperature stresses will impact the expansion of livestock production in Vermont, but the direct effects on livestock and livestock management systems may include lowered feed efficiency, reduced forage productivity, reduced reproduction rates, and higher costs associated with modifying

livestock housing to reduce thermal stress. The USDA also states that the negative effects of hotter summers will likely outweigh the benefits of warmer winters.

- Warming temperatures in the Northeast may mean more habitable environments for insects, invasive plant species, and other pests that may exacerbate current stresses on plants and animals; climate change will also alter pollinator life cycles, which will impact all types of crop and livestock production in Vermont.

- Ecosystem services (e.g., maintenance of soil and water quality, flood control) that food systems depend on may be damaged as a result of cumulative stresses.

- Increased incidences of extreme weather events will impact food production around the world. For example, Tropical Storm Irene—viewed as a harbinger of things to come—flooded 20,000 acres of farmland and impacted 463 Vermont producers when it struck in 2011.

Finally, under high emissions scenarios Vermont could experience conditions similar to the South—hotter temperatures and more humidity during the summer. Farmers and farm workers will be on the frontline of these changes—since they spend most of their days outside—and may experience more illnesses, injuries, and premature deaths due to extreme heat, allergy and respiratory symptoms related to increased plant and mold allergens, and increased exposure to infectious diseases.

Farmers, researchers, food manufacturers, technical assistance providers, health care providers, planners, state agency personnel, and many others should start planning now—not two years from now, not five years from now—to prepare for, mitigate against, and adapt to the challenges posed by climate change. As a practical matter, the Agroecology and Rural Livelihoods Group at the University of Vermont, Resilient Vermont, and the Climate Change Team at the Agency of Natural Resources, and others have started this process, but all stakeholders should start engaging in these conversations.

Scott Sawyer is the editor of the Farm to Plate Strategic Plan at the Vermont Sustainable Jobs Fund, a nonprofit organization created by the Vermont Legislature in 1995 to accelerate the development of Vermont's green economy. On the web at [www.vtfoodatlas.com](http://www.vtfoodatlas.com) and [www.vsjf.org](http://www.vsjf.org).

## References

USDA, *Climate Change and Agriculture in the United States: Effects and Adaptation*, USDA Technical Bulletin 1935, Washington, DC, 2012. Scott Malcolm et al., *Agricultural Adaptation to a Changing Climate: Economic and Environmental Implications Vary by U.S. Region*, Economic Research Report No. (ERR-136), July 2012. United States Global Change Research Program, *Global Climate Change Impacts in the United States*.

# FOOD IS MORE THAN A COMMODITY

Book review by George Harvey

## REBUILDING THE FOODSHED

by Philip Ackerman-Leist, 321 pages, Chelsea Green Publishing, \$19.95

Funny things happen as deadlines approach. Unexpected articles need to be written. Others I did not know of suddenly appear, needing to be edited. And so it came as no surprise that I was to do a book review. There were just two questions: Which book? and Where do I find it, since the copy for this assignment that Green Energy Times had was elsewhere?

I raced off to find, *Rebuilding the Foodshed*. It was not in the library yet -- this is a new book. I made a quick visit to Everyone's Books, here in Brattleboro, where I received some very kind help from Nancy Braus. She ran across the street to a display she had there, to find her only copy, and suddenly, it was in my hands. I opened it, looked inside, and felt my eyes drawn to a statement; "Food is energy. Food provides energy. Food requires energy. Food and energy are virtually synonymous." This was a book I now definitely wanted to review. More to the point, this was a book I wanted to read.

Philip Ackerman-Leist clearly set out to write about local foods, a subject on which he was both passionate and knowledgeable. Just as clearly, if he had simply dumped his knowledge and passion onto the pages, it could have been a fine book for localvores. But somehow, it turned aside



from the path. The author went on a journey of discovery that he made while writing it. The book tells that story, looking at everything from a different and new perspective.

The result is that this is not just about choosing what to grow or buy and eat, to reduce transportation costs and support the local community. It goes much, much farther. It is not just a book for a family, or even a community. It is a book for every community to have, and for all of us to consider.

It is about science, and it is about ethics. It both asks and answers questions about local economies and global warming, about healthy society, wealth and poverty. From its beginnings, dealing with local foods, the book traces the story of the author's quest, looking at global implications and local effects, and then returning to the community.

Ultimately, that is where the book will be used, at the level of groups of people who study it to apply its' understanding of how to deal with systems of food -- not only raising and distributing food, but dealing with it - not a commodity, but as a common trust.

I have one regret about *Rebuilding the Foodshed*. I did not have the time to do it justice as a reader. That is a defect I intend to remedy. This is a book I will read more than once.

Philip Ackerman-Leist is an Associate Professor of Environmental Studies and Director of the Farm and Food Project at Green Mountain College, here in Vermont.



A pair of Silver Sebright bantam hens at the Portsmouth, NH farmer's market, Stone Wall Farm (Nottingham, NH) always bring some chickens to see and oooh and ahhh over. Photo: Jennifer Dickert - Dover, NH



# SAVE THE BEES



Houston family tends to their new bees.

By Dana Rubin

Commercial agriculture has a direct impact on bee populations. Over the last 25 years, the honeybee population has decreased by nearly 50%. Bret Adey, owner of the country's largest bee farm in South Dakota, shared with The New York Times that his farm lost 42% of their pollinators this spring. "... By the time we came around to pollinate almonds, we had 55% bee loss."

Colony Collapse Disorder is caused by the continued use of neonicotinoids, an insecticide used on a variety of crops, from canola to corn. Agro-businesses claim that neonicotinoids are environmentally beneficial. However, when insecticides are applied to seedlings, toxic chemicals are released through the crops' roots, infecting the plants' nectar and pollen. Neonicotinoids are manufactured by large agro-companies such as Bayer and Syngenta, which ironically tag themselves as "The world's leading crop protection companies." Today, agro-companies manufacture neonicotinoids for more than 140 crops in over 120 countries.

Just last month, the EU banned the use of bee-harming neonicotinoids for at least two-years. Fifteen European countries have acknowledged that harming pollinators with pesticides is

unforgivable considering the harm to the health of the global food-system. Here in the United States, there has been an underwhelming amount of policy change. Bayer's neonicotinoid pesticide now covers more than 90% of the country's corn crop.

However, with great effort we can discourage and diminish the use of neonicotinoids, but undoubtedly, it will take time and perseverance to change the system. Outside of Washington, bee enthusiasts are taking the matter into their own hands. Backyard beekeeping, a growing hobby, spawns local bee populations and rewards apiarists with the sweetness of honey.

As an emerging beekeeper, there are numerous tools and resources. Once you get a beekeeper talking, they go on, and on, says Emily Hamm Diagle, a Brattleboro resident who has been beekeeping with her husband, Brian, for the last four years. Emily and Brian are members of the Monadnock Beekeepers Association, an organization that invites both beginner and experienced beekeepers to join for seminars and workshops. Check out upcoming beginner workshops on the website <http://www.monadnockbeekeepers.com/>

Tori Houston, a senior at UVM and resident of Waterbury, VT, just received her bee starter-kit. Complete with 400 bees, frames, supers and the Queen bee, of course, the Houston family is embarking on their first of many seasons. Tori's advice, "be patient, be curious and don't be afraid." For more information check out the Vermont Beekeepers Association at [www.vermontbeekeepers.org](http://www.vermontbeekeepers.org).

Buzz on.

Dana Rubin is a staff writer and account representative for Green Energy Times. She is Vermont-born and raised, with much education and experience in sustainability.

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## THE WORM BIN

By George Harvey

Worm bins provide an easy way to compost, and they provide great products. Worms grown can be fed to chickens and fish. The process produces solids (worm castings), and liquids (worm tea). They are both great fertilizer for the garden.

There should be very little or no smell from a good worm bin. The liquid that accumulates, called leachate, needs to be removed or drained from the bin, and the worms often climb out and fall on the floor, so it is probably not a hobby suited to the living room. Nevertheless, a properly maintained worm bin can actually be kept indoors.



Worms love G.E.T.

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# PLANTING FOR A CHANGING CLIMATE PART 2: ERRATIC WEATHER

Jonathan Teller-Elsberg

Part 1 (G.E.T., April 2013) dealt with predicted droughty summers and falls for the Northeast. According to current climate models, this is the likely condition for typical years going forward.

However, a key feature of climate change is an increase in the variability of weather. In other words, whatever the long-term averages and trends, there will be fewer "typical" years. In the context of gardens, two important issues besides drought are intense weather events (e.g., hurricanes) and frosts that occur when plants are unprepared.

If you live near a waterway, you can reduce flood damage to waterways and nearby land by establishing riparian

buffers. Aim for the widest buffer you can allow, up to 200 feet if possible. Choose a mix of plants from trees to grasses, being sure to include many with shallow rooting patterns. This may seem counterintuitive, but it is a dense web of near-surface roots that helps hold soil in place against floodwaters. Plant at high density, so that the mass of vegetation slows floodwaters passing through.

Riparian buffers provide other benefits as well, such as cleaner water and valuable wildlife habitat. The Connecticut River Joint Commissions has more information at <http://www.crjc.org/pubs/riparian-buffers/>.

As for ill-timed cold snaps, even hardy fruit trees and berry bushes are vulnerable to frost when they bud out in spring. Last year, for example, uncommonly warm

weather in March fooled many trees into coming out of dormancy. Then a (not really very) "late" frost zapped flower buds. For apple growers in New England, that translated into a 25 percent reduction in harvest compared to 2011.

There are two main strategies for protecting against late frosts. The first deals with locating plants. North-facing slopes and locations to the north of buildings—shaded in winter, sunny in summer—stay cool longer into spring. An evergreen hedge south of fruiting plants can create a similar seasonal-shade zone. This delays bud break, hopefully until the weather has made up its mind.

The second strategy is to choose plants that stay dormant longer by their nature. This applies both at the level of species (apples stay dormant longer than apricots), and cultivars within species (Cox's Orange Pippin apples bloom later than

Braeburn). A few fruits are strongly tolerant to frost, even in bloom. One such is the honeyberry, aka haskap, whose blossoms have been documented to withstand temperatures as low as 15°F. It's a native to northern Asia in the honeysuckle family and produces a berry looking like a cylindrical blueberry—and indeed, the berries taste remarkably like wild blueberries. (And it's not fussy about soil pH!)

The overarching theme of these adaptations is creation of microclimates. By altering the shape of the land or through strategic placement of plants, you can modify the experienced climate in a small area. Even when the world around your garden is out of whack, strategic interventions can keep your plants closer to their comfort zone.

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



The images show noon shade on level ground for northern VT and NH latitudes. When spaced correctly, a building or hedge south of fruit trees casts deep winter shade. At Spring equinox, the root zone is still in shade, keeping the trees dormant. By mid-May, as risk of "late" frost recedes, the tree receives full noontime sun. On Summer solstice, even the root zone is only lightly shaded. Images by Jonathan Teller-Elsberg, CC-BY-NC.





A sign along the roadside describes the Farm Fresh Fuel Project.

## FARM FRESH FUEL GROWING OUR OWN BIODIESEL

By Sarah Galbraith

A small revolution is happening in Grand Isle County, a declaration of fuel independence: In 2012, ten farmers and landowners tried their hand at growing sunflowers to have the oil made into biodiesel to fuel farm equipment or heat their homes.

Many farmers want to diversify their operation, control and lower fuel costs, and become more self-sufficient. Additionally, locally-grown renewable energy will support the agriculture economy. In Grand Isle County, growing their own biodiesel can save farmers more than \$2.00 per gallon, according to a new study released by the Vermont Sustainable Jobs Fund (See the report, "Vermont On-Farm Oilseed Enterprises: Production Capacity and Breakeven Economics," at <http://www.vsjf.org/project-details/21/bioenergy-resources>). Emerging feedstocks and new technology takes know-how, and the Vermont Bioenergy Initiative (VBI) at Vermont Sustainable Jobs Fund is taking steps to overcome barriers to energy self-sufficiency on the farm.

With funding from the U.S. Department of Energy, Borderview Farm staff and UVM Extension researchers guided the planting, tending, and harvesting of more than 60 acres of sunflowers in the 2012 growing season for the Grand Isle Farm Fresh Fuels Project in Grand Isle County. Each farmer planted two to ten acres of sunflowers, growing more than 30 tons of sunflower seeds. The seeds were pressed into 3,000 gallons of renewable, low-emission biodiesel and 26 tons of oilseed meal to feed livestock.

For the UVM researchers, coordinating the project, overcoming some of the logistical challenges, and shepherding a successful crop of sunflowers into the storage bin at Roger Rainville's farm was all part of the job. The lessons learned this year in Alburgh also contribute to a growing body of knowledge that is helping farmers in other regions put more acres under oilseed production and save money on their fuel bills.

VBI has been highlighting the connection between diversified agriculture and renewable energy production by showcasing the range of possibilities; from research and crop farming to feedstocks and fuel. VBI has developed a series of educational films documenting the people, feedstocks, and fuels, including those growing their own biodiesel. These biofuel videos draw the connection between diversified agriculture, sustainable systems and renewable energy production centered on oilseeds to biodiesel, grass as a heating fuel, and algae to biofuels and wastewater management. These videos can be viewed online at <http://www.youtube.com/user/VermontBioenergy>.

A new VBI website, due to be released in Summer 2013, will offer the educational videos, renewable energy resources, and project development ideas to be used in the classroom, the field, or in advocating for sustainable business ventures.

*Sarah Galbraith is a coordinator of the Vermont Bioenergy Initiative at Vermont Sustainable Jobs Fund, a non-profit organization created by the Vermont Legislature in 1995 to accelerate the development of Vermont's green economy.*

## TOUR DE TANKS AT BIGELOW BROOK FARM

By George Harvey

Three of us, editor Nancy Rae Mallery, another good friend, and I all went down to Connecticut in April to visit the Bigelow Brook Farm, as they participated in the Aquaponics Association's Tour de Tanks. Aquaponics combines raising aquatic animals with hydroponics. Simply put, waste from the aquatic animals is used to provide natural fertilizer for the plants, and the plants clean the water for the animals.

Bigelow Brook Farm's setup uses the elegant technology of aquaponics in a really beautiful setting that is clearly intended to be a memorably pleasant place to visit or work. The greenhouse is a geodesic dome, attached to a small, more conventional structure that provides support for solar panels and houses batteries and other equipment.

A thousand-gallon fish tank has a large number of large goldfish and koi. Though most aquaponics systems raise fish for food, these are really pets, and are decorative. In fact, if a fish gets sick, it is carefully nursed back to health in a separate hospital tank.

Water from the tank drains continually through a settling tank, into greenhouse growbeds filled with a very lightweight stone product called expanded shale. When the growbed fills with water, a very neat piece of plumbing called a bell siphon automatically empties it again, in a continuous cycle of filling and draining.

Roots of plants growing in the shale are flooded for some part of each hour, but also exposed to air. They never dry out, but they get enough air to keep them from drowning. When the growbeds empty, the water passes into a sump, from which it is



Young plants in an aquaponic growbed.

Photo: N. R. Mallery

pumped back into the fish tank.

The plants growing in the greenhouse range from lettuce, peas, tomatoes and peppers to such more unusual things as a banana tree. Their beautiful arrangement is enhanced by a brick floor and wide access aisles.

Electricity to power the operation comes from a grid-tied solar system with battery backup. Though it seldom happens, the grid can supply power, if necessary.

Heat is provided primarily by sunlight warming the greenhouse up, but in colder months, wood pellets are used to fuel a rocket mass heater. This system is novel, as it depends on pellets fed from a hopper, without moving parts. The riser of the rocket mass heater sits rather conventionally inside a drum, but the heat of the fire is caught and stored in water, rather than a solid. Ducts pass beneath the brick floor, which captures more heat, and the exhaust exiting the building leaves with nearly all heat removed, and practically no particulates at all. The system can run for

hours on a single load of fuel.

The folks at Bigelow Brook Farm have a few products that are rather unusual for a farm operation. They sell timers for aquaponics and other systems. They also provide technology consulting services for agriculture and lightweight industry. And they sell expanded shale for growbeds. When we left, we bought some expanded shale so we could try it out.

*Bigelow Brook Farm is operated by Rob Torcellini. Contact by email is [info@BigelowBrook.com](mailto:info@BigelowBrook.com), and by phone is 860-821-0005. The farm is at 35 Westford Road, Eastford, CT 06242, and can be visited by appointment.*



Growbeds in a flood and drain aquaponic system. Photo: N. R. Mallery

## THE WORM BIN

Cont. from page 32

During the warmer months, our worm bins are outside. When winter comes, and the worms would otherwise freeze, we have kept them either in the greenhouse, or in the basement, with a catchment to prevent the floor from getting messy. They do well in either place, but work rather sluggishly in the cold.

Worm bins can be made of wood or plastic. We use plastic totes. A bin has to be ventilated, because the worms need oxygen. The holes should be quite small, so insect predators cannot get in, cutting a larger hole and covering it with a plastic screen might be the best solution. Of course, there should be a lid. The bin may

have a drain so the leachate can be captured, and this requires keeping the bin elevated off the floor so a container can be placed below it; again, a screen might be advised, but take care to ensure it cannot be plugged up too easily; placing a small quantity of gravel between a screen and the drain works.

The bin should be started with a bed of little light soil or peat moss, some worm castings, some worms, and a little kitchen waste. Old copies of Green Energy Times may be used in the bed, because the ink and paper are specified as safe. Worms like different kinds of kitchen waste, including carbohydrates, fruits, and vegetables. They really like vegetable protein, but meat, fat, oil, and dairy products should be left out

of the mix because they are prone to rotting, causing smells and attracting insects and mice. They like reasonable amounts of coffee grounds and tea bags.

We use red wigglers. There are other species that can be used, but native earthworms are not a good choice, because they want to dig deeper than a worm bin would allow.

Some people are disturbed by the numbers of worms that escape. There is no need to feel bad about it; they probably breed faster than you would want anyway. A worm bin that has worms moving out of it in really large numbers might have problems, however, such as an anaerobic situation, which you can detect by an ammonia smell and treat by breaking up

the soil and mixing in materials that keep it loose. Another problem is accumulation of leachate, especially if the drain can get plugged.

The simplest way to harvest is to put fresh waste on one side of the bin and remove composted material from the other. Worms can be separated from castings by hand, but there are probably too many harvest strategies for a short article to do them justice. Worm tea can be made by steeping the castings in water.

There is an article in Wikipedia called Vermicompost that might be worth looking at ([wikipedia.org/wiki/Vermicompost](http://wikipedia.org/wiki/Vermicompost)). I think the material you get when you look for "vermiculture" or "worm bins" is not as useful, but you might try it.



RESOURCES

**Efficiency VT** This is a must go to site for immeasurable amounts of info. [www.efficiencyVT.com](http://www.efficiencyVT.com)

**SEIA/ Solar Energy Industries Association:** The SEIA Tax Manual to answer your solar related tax questions. [www.seia.org](http://www.seia.org)

**Dsireusa.com:** [www.dsireusa.com](http://www.dsireusa.com) Renewables & Efficiency. Find state, local, utility, & federal incentives for renewable energy & energy efficiency.

**IREC/ Interstate Renewable Energy Council:** RE educational info. [www.irecusa.org](http://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](http://www.nabcep.org)

**NESEA/ Northeast Sustainable Energy Assoc.:** [www.nesea.org](http://www.nesea.org)

**New Hampshire Sustainable Energy Assoc.** NHSEA Focused on N.E. US, for consumers & industry- RE & clean building info, events. [www.nhsea.org](http://www.nhsea.org)

**New York Solar Energy Industries Association/NYSEIA** [www.nyseia.org](http://www.nyseia.org)

**Clean Power Estimator:** [www.consumerenergycenter.org/renewables/estimator](http://www.consumerenergycenter.org/renewables/estimator)

**Find Solar:** [www.findsolar.com](http://www.findsolar.com)

**Energy Star Federal Tax Credits:** [www.energystar.gov/tax\\_credits](http://www.energystar.gov/tax_credits).

**Tax Incentives Assistance Project (TIAP):** [www.energytaxincentives.org](http://www.energytaxincentives.org)

**American Solar Energy Society (ASES):** [www.ases.org](http://www.ases.org)

**Energy Efficiency & Renewable Energy Clearinghouse (EREC):** [eetd.lbl.gov/newsletter/CBS\\_NL/nl6/Sources.html](http://eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html)

**Federal Energy Regulatory Commission (FERC):** [www.ferc.gov](http://www.ferc.gov)

**National Association of Energy Service Co. (NAESCO):** [www.naesco.org](http://www.naesco.org)

**National Renewable Energy Laboratory (NREL):** [www.nrel.gov](http://www.nrel.gov)

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

**NFRC** independent rating & labeling system for the windows, doors, skylights [www.nfrc.org/](http://www.nfrc.org/)

**NH Office of Energy and Planning:** [www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm](http://www.nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm)

**Energy Efficiency & R/E Clearinghouse (EREC):** [eetd.lbl.gov/newsletter/CBS\\_NL/nl6/Sources.html](http://eetd.lbl.gov/newsletter/CBS_NL/nl6/Sources.html)

**Federal Energy Regulatory Commission(FERC):** [www.ferc.gov](http://www.ferc.gov)

**Solar Living Source Book:** [www.realgoods.com](http://www.realgoods.com)

**Home Power Magazine:** [www.homepower.com](http://www.homepower.com)

**Solar Components:** [www.solar-components.com](http://www.solar-components.com)

**Backwoods Solar:** Specialty: solar, off-grid - [www.backwoodssolar.com](http://www.backwoodssolar.com)

**Solar Systems:** [NEsolar.com](http://NEsolar.com)

**National Solar Institute:** [www.nationalsolarinstitute.com](http://www.nationalsolarinstitute.com)

**NeighborWorks® Alliance of Vermont:** Low-cost energy loans - [www.vthomeownership.org](http://www.vthomeownership.org)

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

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

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

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

**SmartPower:** [www.smartpower.org](http://www.smartpower.org)

**Greywater Info:** [www.oasisdesign.net/greywater](http://www.oasisdesign.net/greywater)

**Weatherization, Energy Star & Refrigerator Guide:** [www.waptac.org](http://www.waptac.org)

**Buildings Energy Data Book:** [buildingsdatabook.eren.doe.gov](http://buildingsdatabook.eren.doe.gov)

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

**VPIRG:** understand the clean energy resources available to VT - [www.vpirg.org/cleanenergyguide](http://www.vpirg.org/cleanenergyguide)

**Track the Stimulus Money:** [www.recovery.gov/Pages/home.aspx](http://www.recovery.gov/Pages/home.aspx)

**Dept. Public Svc. (CEDF):** [publicservice.VT.gov/energy/ee\\_cleanenergyfund.html](http://publicservice.VT.gov/energy/ee_cleanenergyfund.html)

**Renewable Energy World:** [www.renewableenergyworld.com](http://www.renewableenergyworld.com)

**Renewable Energy VT:** [www.REVermont.org](http://www.REVermont.org)

**The Energy Grid:** [www.pvwatts.org](http://www.pvwatts.org)

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

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

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

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

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Guest Speakers:

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[www.biologicaldiversity.org](http://www.biologicaldiversity.org)  
**Bill Ryerson** of the Population Media Center, [www.populationmedia.com](http://www.populationmedia.com)

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By Larry Pleasant

# Ingredient of the Month

## INTEGRATING NATURAL BACK INTO THE LIVES OF MODERN PEOPLE

Now that we have overrun the planet, the true and important work of all developed lifestyle lovers is to integrate and interweave the natural world into our day-to-day human world. For far too long we have allowed multinational chemical companies to destroy our precious botanical endowment. The self-sustaining result of billions of years of evolution can be gone in one generation. In nature, every part is recycled forever. Humans, living comparatively short lives, go after quick riches while destroying everything that makes life worth living. By this I mean fresh clean air, pure water, green spaces and artistic integration of the botany.

We humans are often capricious and easily hypnotized by dazzling dreams of grandeur, power, wealth, and status. As always with such behavior, it is the gentle who suffer. We have allowed a handful of families to control most of the wealth and production of over 80% of the botanical, mineral, and sweat output of all the world (we can argue the figure, but you get the point). In return, some of us do really well; some of us do pretty well and a whole bunch of us get bupkis (leftovers). We also get to live in the time of a great die-off of the natural biology in favor of human domination. Continue on this track and our own collective demise will surely follow. Perhaps the 1% believe that their money will protect them from the ecological and economic realities of their actions. Or maybe they will wait until it is really bad, raise the alarm bells, and institute a carbon tax (to pay the interest on all that federal debt) that will finally bankrupt the middle class.

Wait! Can't we have great cell service and also tread lightly on our neighbors,

the trillions of organisms we encounter each day? And keep my job and cool toys? Of course we can! Am I crazy? Maybe, but check this out.

We have allowed something like 250,000 new substances, never before seen in nature, to be created and proliferated around the globe. There is no conceivable way to test every possible reaction these substances will have in real life situations. We are acting like we can actually get by on wishes, coverups, and slapping an occasion wrist. But cancer is now topping 65%. That's 65% folks! This means if there are two of you are in a room, one of you is statistically likely to get cancer. Cancer is mainly an environmental disease with some very slight portion from genetics - only about 6% according to one huge and expensive study.

One key way to turn the tide and stop being ecological ignoramuses is to enact THE PRECAUTIONARY PRINCIPAL. This means take 20 years to prove your new and novel thing is 100% safe. If it ain't safe, it surely doesn't belong in our production kit.

There is NO example of any new and novel substance being introduced that did not have UNINTENDED CONSEQUENCES. Unintended consequences are when, for example, your shampoo contains trace carcinogens. Or your pretty fruit slice has organophosphate chemical residues on it. Or off-gassing from that clear plastic water bottle starts turning adolescent men into metrosexual eunuchs. Then the plastic bottles are dumped in the ocean to turn into a toxic soup. WHOA! None of this is necessary. The system CAN be tweaked to disperse wealth by returning

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to progressive taxation - and by returning to common sense to run human affairs.

As they say in Central VT, "Common-sense...daamn uncommon!"

This has been The Soapman searching for common sense in an uncommon world. ♪

## THE ROLE OF CO-OPS IN SUSTAINABLE FOOD SYSTEMS

Cont. from page 31

organic and local products to over 4,000 customers that pass through their doors each day.

The Co-op is dedicated to supporting the local economy and strengthening the local food system. They work with thousands of Vermont vendors to feature a wide selection of local and Vermont-made products.

As with most Cooperatives, they are member-owned, so the profits generated by Co-op members are returned to members in profitable years.

### Where do we start?

Start by supporting and growing cooperative businesses!

Aside from food co-ops, cooperatives include all kinds of businesses: housing, consumer co-ops that sell products, printers, food warehouse workers, car repairers, bakers, coffee importers, land co-ops or agriculture based co-ops - that all exist to benefit the people that work, live, or shop in them.

Profits from cooperatives aren't siphoned off to a single outside owner, but reinvested in the community they came from, serving their own members economically, socially, and educationally. They are community-builders.

The Cooperative model is exactly what we need to lead us into a sustainable food system for our future. ♪

## AIR POLLUTION IS A MAJOR KILLER

By George Harvey

Just about the time the last issue of Green Energy Times went to press, the UN's World Health Organization (WHO) released some startling information. They said their old numbers on air pollution had been miscalculated and were wrong. They have come to understand that air pollution kills more people each year than AIDS and malaria combined.

Looking at the numbers, it becomes clear that air pollution is even worse than that sounds. AIDS and malaria are both major killers on their own, but combined they only kill about 38% of the number the WHO says are killed by air pollution. A current estimate is that about 67 million people die each year worldwide from all causes. That means air pollution is currently the underlying cause of more than 9% of all human deaths.

The earlier consensus on air pollution had been inaccurate because many deaths had been ascribed to such things as pneumonia, lung cancer, heart disease, and other things caused by air pollution, disregarding what the underlying cause was. That is why the new air pollution data counting these deaths represents a huge increase from earlier numbers.

Of course, these numbers only begin to address the environmental effects of burning fossil fuels. The World Wildlife Fed-

eration says

over half of all wildlife species will be destroyed during the 21st century, because of our addiction to fossil fuels. What they are talking about is not a few birds here and bats there. It is entire species being destroyed, half of all species, never to recover - extinction.

Many people are surprised by the new figures. Environmentalists are among those who are not. In the 1970s, a toxicologist told me he believed air pollution killed about 450,000 people in the US each year. His primary concern was petrochemicals, which, he said were nearly all carcinogenic, whether in the raw state, refined, or partly burned. Every smoking chimney from an improperly maintained oil burner, and every smoking vehicle, was cancer-causing. And so were unseen fumes of gasoline and oil.

The chemicals that are not particulates



are invisible, and so they are often taken entirely for granted. Nevertheless, they are far worse than the more obvious particulates in smoke from wood stoves. Smoke from wood fires settles out eventually as dust, but the non-particulate volatile hydrocarbons from petrochemicals are molecular, and will remain in the atmosphere until they decompose, which may take decades.

The fact that the WHO would identify burning fossil fuels as a major cause of death at just this point in history is interesting. This is happening just when the UN is getting progressively more upset about global warming. It is also happening just at the time the International Monetary Fund has pointed out the cost of government supports for fossil fuels, added to the medical and other costs of using them, come to \$1.9 trillion, worldwide, every year.

Perhaps it is the dawn of a new day, in which people are waking up to see the problem more clearly than they had in the past. Certainly, the voices calling attention to the problem have gone unheard too long, as world leaders were asleep at the wheel.

Fortunately, there are better solutions, ways to save ourselves and much of what we have. Green Energy Times is here to tell you about the solutions. ♪



# ECOTECH OFFERS GREEN SOLUTION TO ANT MANAGEMENT

By Jim Cavan

Chances are we've all had the experience: It's the first truly warm day of the year – late March, let's say – and you've just gotten back from an unseasonably balmy walk or some other activity outdoors. You come through the front door, take off your shoes, head to the kitchen to start preparing the night's dinner, and happen from the corner of your eye upon a trail of slowly moving black specks on the counter.

Carpenter ants. Dozens of them – and that's just in plain view. Here in New England, carpenter ant infestation constitutes one of the most common pest problems, affecting some tens of thousands of households in New Hampshire alone – causing millions of dollars of damage nationwide.

Enter Tom Pray, founder of the Eliot-based Ecotech Pest Control and a degreed entomologist with over 25 years of experience in the field. Settling on the trade as much for the science as sheer insect fascination, Pray launched Ecotech in 2000 with the aim of helping homeowner's beat back pest problems not through hard-hitting chemicals, but rather by managing the environment responsible for fostering that very infestation.

"People much prefer actual, scientifically-backed information over a sales pitch – it just makes them feel more comfortable with you as a business," says Pray. "My customers

have said that it's because of that information that they're empowered to do



more themselves to help the program I lay out with them. It's why we succeed."

Carpenter ants in particular offer a bounty of educational fodder, owing in part to the specie's uniquely intricate breeding habits. It also doesn't hurt that, according to Pray, they remain by far the most reported pest problem in the Seacoast region.

"Once the phone starts ringing, it's a

pretty steady stream of distressed people," notes Pray. "As soon as they get into your kitchen and start redecorating, it's pretty hard to ignore."

The infestation cycle begins with what's known as "swarmer season." Typically on the first real stretch of warm springtime days, a group of Carpenter ant queens – fresh off a winter of "fattening up," in Tom speak – will leave the nest to search out a males to mate with.

"Just about every nest in Northern New England will commence "swarming" within days of each other," says Pray. "When the nest is in or near a residence, the home or building becomes an ideal nesting site for the propagation of hundreds or even thousands, of carpenter ants. Sometimes their numbers can be so overwhelming, people find them both outside and inside the house – usually the kitchen."

Pray's account ends with a stern warning: Ants aren't just out for your food – they're more than capable of doing real damage to a home's structural integrity.

"Oh I can tell you some tales," Pray says. "I had one guy a number of years back who was going outside one morning to enjoy his cup of coffee, and when he stepped out on the deck it just gave way. Luckily it was only a few feet off the ground, but the ants had single-handedly detached the deck from the house."

Or the family whose sliding door came unhitched because of ant damage. Or the numerous homes whose owners don't realize the pests have eaten away the window framing until Tom – summoned by a typically non-panicked request for his services following a casual encounter somewhere else in the house entirely – investigates the property a little further.

But if the ant's propensity for propagation – to say nothing of its targeted destruction – amounts to a specie strength, it might also be its chief weakness: Carpenter colonies might include several nests scattered across multiple acres or property, but they behave essentially the same way. It's that very predictability that Pray exploits with his low-impact program.

"An ant's natural behavior is to forage in large areas, and that obviously includes



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outdoors," explains Tom. "So we'll do a walkthrough around the whole perimeter – inside and outside the house, to determine exactly what and where to treat in each environment. That process is unique to each customer."

Pray expects the first "swarm" – and the requisite distressed dispatches – any week now, commencing a six-month stretch of battle with the insect world. It might sound daunting, but Tom wouldn't have it any other way.

"It's always a challenge, and you have to remember that you're dealing with people's livelihoods," he says. "But it's all worth it when you solve the problem and give someone back that peace of mind and the realization that something they thought was out of their control really isn't at all – it's totally in their control."

*EcoTech Pest Control is a Business Partner of Green Alliance, a Portsmouth-based organization that seeks to connect green-minded consumers with the businesses doing their part to lessen their environmental impact.*

*Learn more about EcoTech at [www.ecotechpc.net](http://www.ecotechpc.net). For more information on Green Alliance, visit [www.greenalliance.biz](http://www.greenalliance.biz)*

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# HOW TO KEEP YOUR PARTY OUT OF THE LANDFILL

By Clare Innes

Throwing a shindig in your backyard? Counting on crowds at your next family, school, business, or town event? With just a little planning, you'll see how easy it is to keep mounds of bottles, cans, paper -- and even food -- from ending up in the landfill.

Clearly mark which type of item each recycling, composting, or trash bin is for. Ideally, create a sign with each type of item taped right on it: compost sign examples: a napkin, uncoated paper plate, and wooden coffee stirrer, for example, near the word "Compost" and, perhaps some images of food. Recycling sign examples: a plastic cup (upside-down to indicate "empty," or any other recyclable container you will be handing out. Trash sign examples: toothpicks with the little plastic frill on top and other non-obvious trash items.

Position the recycling, composting, and trash bins right next to each other. If you have a trash bin positioned all by itself, someone has a bottle or food scraps they wish to dispose of will likely be tempted to trash it rather than seek a recycling or composting bin. Use clear bags for recyclables so you can determine if there is too much trash contamination for the contents to be recycled.

Choose your refreshments and serving items based on the recyclability or 'compostability' of their containers. Reusable is best, of course, and a trip to one of many local reuse shops can yield a stack of serving items that you can keep for next time or donate back to the store or another charity so someone else can use them. VisitGreenMountainCompost.com for a great list of compostable serving items.

## Here's what can go in your recycling bin:

- Disposable plastic cups, bowls and plates of all sizes -- as long as they're scraped clean and empty.
- Anything normally allowed in your household recycling bin (cans, bottles, clean paper, cardboard, etc.)
- NO plastic utensils \* NO food or drink tagging along on the plates, or in bowls and cups
- NO paper plates, bowls or cups Here's what can go in the compost bin:
- Food waste of any kind, including meat, bones, cheese, etc.
- Paper napkins and uncoated paper products such as plates, bowls and white or brown paper table coverings.
- Certified compostable cups, wooden skewers and coffee stirrers, wooden or bamboo utensils. Look for this logo:
- NO "compostable" utensils unless they are wood or bamboo, regardless of certification. They just don't break down well enough.

Monitor the bins. If any are full, people may choose to use whichever has room, whether it's the correct bin or not, so delegate someone to swap out bins or bags as they become full. -- Talk it up! Hang posters, tell anyone helping with serving how to help people make the right disposal choice, or find other ways to let people know you're trying to keep as much as possible

If you have any questions about what can or can't go in which bin, or how to plan to keep valuable resources out of the landfill, check out the CSWD website at [cswd.net](http://cswd.net).

Clare Innes is the Marketing Coordinator, Chittenden Solid Waste District. E-mail: [info@cswd.net](mailto:info@cswd.net), Hotline: 872-8111.



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## SUMMER SALAD

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- 4 cups diced assorted melon
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- 4 Tbsp sugar
- 2 Tbsp mint chopped
- 1 Tbsp minced or grated ginger
- zest & juice of 1/2-one lemon

In a small bowl combine raspberries, sugar, ginger, mint, lemon juice & zest. Toss gently. Let sit for 20-30 minutes, then gently stir and mash raspberries with a fork. Toss dressing with prepared melon and serve.



# WINDCATCHERS ANCIENT PERSIAN A/C



By George Harvey

A windcatcher is a type of air conditioning used in ancient times. In places where the heat of the day was difficult to bear, people with the means to do it cooled their homes with windcatchers, just as many of us use air conditioning today. They did not need power, required very little attention, and were likely to last as long as the home did.

Windcatchers were rather common in ancient Persia, but were also used in other civilized areas. They existed in Egypt of the 16th century BC. They have modern applications, and because they

operate entirely passively, on sustainable lines, they are of special interest here.

The basic idea is that a draft is created in a purpose-built tower, either by a wind or by the heat of the sun. The tower need not be fancy or large, and is really just a sort of chimney, except there is no fire. The

draft pulls in air from a colder place, usually an underground tunnel with a remote opening. The earth cools the air as it passes through the tunnel.

In some windcatcher systems, the air is drawn along a subterranean canal, which also provides the home with water. Since the air being drawn in is very dry, there is a lot of evaporative cooling in the tunnel. In a carefully built system, temperatures of the water reservoir could approach freezing, and windcatchers provided not only A/C and cold water, but also refrigeration.

# PASSIVE COOLING OPTIONS

Green Energy Times Staff

Regardless of whether you want to heat or cool, the most important consideration is insulation. Without good insulation, the most efficient schemes become wasteful. Along with insulation, another consideration is having a thermal mass to absorb and store heat.

The next thing to consider is probably solar gain. Windows can be placed so they absorb heat in the winter, but reflect it in the summer because the summer sun hits the glass at a greater angle. Eaves can be built so the sun shines through windows in the winter, but they are shaded in the summer. Awnings can be used on most windows, and can be made of photovoltaic material to generate electricity. A cool roof can be made of reflective substances. Alternatively, in some cases roofs can be covered with plants to produce what is called green roves. Shade from trees is an obvious way to cut solar gain.

There are a number of ways to use geothermal cooling. One simple way is to have an underground tube heat exchanger



An "awning mount" evacuated tube solar hot water system.

that can pass heat from the air to the earth before it is drawn into a house. Such a cooling system can be operated using a solar chimney, which heats air in the sun, creating a draft, drawing the cooler air into a house. Another way to take advantage of geothermal cooling is to have part of the house below grade. Some people call such houses Hobbit houses.

Evaporative cooling was used in ancient times, and continues to be used today -- as water evaporates it cools off. Modern evaporative coolers are usually

operated electrically, but some types are passive except for the need to fill them with water. In some places plants chosen for their evaporative cooling properties have been planted near the house, especially vines that could grow across windows and along verandahs, both to provide shade and cool the air.

One way to reduce summer heat in a house is to cook outside. In the old days, the kitchen wood stove was moved to the porch for summer in many places. Today, solar ovens are easy.



# Green Tips

By Deborah DeMoulpied, Bona Fide Green Goods

## Let's Talk Dirty

Our society is obsessed with being clean, or at least not being dirty. We have gone from weekly bathing down to daily cleaning rituals. We have a different soap for different parts of the body and a cleaner for different things, sections, or household items. Cupboards often contain separate cleaners for the sink, counters, stainless steel, chrome, windows, mirrors, tile, tile grout, toilets, floors, carpets, walls, woodwork, and furniture. Not only do we want our body and things to be dirt-free, we especially don't want them to have germs on them. Yuck. Germs.

Not so fast. Why do the Amish have a significant lower rate of asthma? Germs. Why do Danish babies have fewer

allergies? Germs. Why do some children not develop eczema? Germs. And how is wine made? Germs.

Maybe some germs aren't so bad after all.

Germs – Microorganisms: including bacteria, fungi, viruses and other pathogens. The human body has 10 times more bacteria cells than human cells. The good bacteria outnumber the bad. But to be fair, bacteria can be bad...very, very bad.

The goal is to get rid of the germs, at least the bad ones. There are two ways to get rid of germs - remove them or kill them. Removing them is easy – and the safest. It's called old fashion washing and rinsing. Killing germs is easy too, but it comes at a cost – to you, society, and the environment. Killing germs requires chemicals (except for UV light application etc.) most notably in the form of pesticides. That's right - pesticides in your soap, toothpaste, cosmetics, clothes, cutting boards, cleaning solutions, socks, and even yoga mats.

Triclosan is the pesticide of choice, used since the 70's. It used to be only in hospitals (where it belongs) but found its way into consumer products. Triclosan is an endocrine disrupting chemical, causes adverse health issues in


humans and wildlife, and creates resistant bacteria. Triclosan persists in the environment. Canada has declared it an environmental toxin.

And the kicker? It does not have to be listed as an ingredient.

Both methods of getting rid of germs – either mechanical wash and rinse, or killing with pesticides, result in the same amount of reduced germs, up to 99%.

So how will you deal with dirt? (This is where you have the "it's a no-brainer" moment.) Wash (you or things) with simple, vegetable based soap that lists the ingredients so you can avoid synthetics, fragrance and other questionable additives. Wash for 2 to 3 minutes so the soap can encapsulate the germs. Rinsing well is the final phase of removing the dirt.

Who knows? Maybe being dirty will be the next health craze?

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

# DOES MICROWAVING VEGETABLES ZAP THEIR NUTRITIONAL VALUE?

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From the Ask Umbra column, published in Grist Magazine

It is a fact that cooking vegetables will lead to some amount of nutrient loss, no matter the method. This is why people are fans of raw food and its health benefits. But some vegetables do not lend themselves to this approach (raw rutabaga, yum!). So let's look at your options.

Three main factors affect nutrient loss during cooking: temperature, time, and — this is the big one — water. Nutrients tend to be both heat-intolerant and water-soluble. This means a vegetable cooked for a long time at a high temperature in a lot of water is going to lose more nutrients, so boiling is out. But a vegetable cooked for a short time at a lower temperature in little or no water is going to lose fewer

nutrients. And guess what appliance accomplishes that feat? Ye olde microwave.

Still, there are nuances to this nutritional equation. For instance, broccoli: back in 2003, a study from Spain showed that steaming broccoli in the microwave caused it to lose up to 97% of its antioxidants, which can help fight diseases, including cancer. When the broccoli was steamed on the stovetop, only 11% of those antioxidants snuck away. This led a lot of people to conclude (helped along by ever-eager headline-writers) that microwaving is inherently bad. Au contraire, mon sous chef: as critics pointed out, the study used more water in the microwave than necessary, skewing the results. The Food and Drug Administration says, "In fact, foods cooked in a microwave oven



Photo credit: Shutterstock

may keep more of their vitamins and minerals, because microwave ovens can cook more quickly and without adding water."

You see how water keeps coming up? It is the real player here. Steaming, for instance, is a fairly good option because the veggies have less contact with water. Even better, cook your veggies in a stew or soup, and you'll be able to slurp those escapee nutrients up. Stovetop stir-frying or sautéing is also a good choice, assuming you don't go crazy with the oil. Baking and roasting are yummy, but long exposures to heat will zap some of the nutrients — and use more energy.

Your microwave is rather energy-efficient. It can save as much as 80% of the energy used by an oven, and generally beats out stovetops too.

So my advice boils down to: keep eating your vegetables. Cook them however you and your family will enjoy them most. Buy local, buy organic when you can. Specifics on how to select, store, and prepare every

## Is the Radiation from Microwave Ovens Safe?

Some radiation is unsafe, but not all. The question of safety and radioactivity centers on whether the radiation is ionizing. Alpha and beta particles, neutrons, gamma rays and X-rays are ionizing, and unsafe. Sunlight includes ultraviolet light, which is ionizing, which is why exposure should be limited.

Visible light and infrared light are examples of safe, non-ionizing radiation. Radio waves and microwaves are also non-ionizing, and safe forms of radiation. This agrees with theory, and has been confirmed by a large number of studies. Cell phones also use microwaves for communication, but the ovens are regulated by law to allow none to escape. Cell phones account for much more human exposure and are another story entirely.

Our advice is, read the manual for safety advice and don't use if any seals are broken.

\* Cornell University, Environmental Health & Safety reports, "Of particular note, consumer grade microwave ovens are not included in our guide as they must meet stringent federal safety requirements."

## Energy Efficiency and Microwave Ovens

Microwave ovens use 600-1700 Watts, but cooking time is much shorter than it is with conventional ovens or range-tops, so your energy usage is less.

The Sierra Club's Green Homes recommends: "Zap small meals. If you have small to medium quantities of food, it's much more energy efficient to cook in a microwave than in a conventional or convection oven or on the stovetop." <http://www.sierraclub-greenhome.com>

## Energy Saving Tips:

- Make coffee in a coffee maker, and then keep it in a thermos. Reheat in a microwave oven to conserve energy.
- Between uses, keep oven unplugged or switched off with a power switch or built-in switch - the clock is a phantom load.

variety your heart desires: vegetable nutrition database (<http://www.fruitsandveg-giesmorematters.org/vegetable-nutrition-database>).

More Information: International Microwave Power Institute (804) 559-6667, email: [info@impi.org](mailto:info@impi.org), [www.impi.org](http://www.impi.org).

Source: <http://grist.org/author/ask-umbra> 

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## A FENG SHUI SUMMER

By Jessica Goldblatt Barber

Ya, yes, yippy!! Its Summer! Everything is green. Flowers are blooming. Gardens are growing. But on those rainy days what do you do? Clean. Try some basic Feng Shui principals while you are inside.

1. Look Under Your Bed. Our beds are tied closely to our personal energy, but we often forget to clean underneath them. It's time to reorganize and clear out be careful not to store old bills, documents, pictures other potential life cluttering items under bed clutter under the bed can symbolize blocks in your personal life and relationships.

2. De-Clutter Your Closet. As you pack up your winter clothing, give away items that have not been worn in a long time, be a little careful so you won't be sorry... like the time I gave away the polyester pants with the little green frogs all over them, thinking I would never wear them again, for some reason I kept the matching jacket (du). Do the same as you unpack your spring and summer closet. Keep in mind that if your closet is full you will have room for nothing new. This ap-

plies literally and metaphorically. If your closet is so full, you will have no space to accept new opportunities. There is no room to grow. So, recycle anything that you don't need.

3. Deep Clean the Refrigerator. It's a good idea to have a well-stocked refrigerator, but not too full and not too empty. With our spring cleaning considerations, it's an opportunity to deep clean and de-clutter. Empty out the refrigerator and remove anything expired, old and/or spoiled. When you clean the interior of the refrigerator, use natural such as baking soda to scrub and a mixture of vinegar, water and eucalyptus essential oil to wipe down and disinfect.

4. Open Up and Clean the Windows. Windows represent the eyes and mouths of the inhabitants of the home. Dirty and dusty windows can affect your ability to see and communicate with the world. Cleaning the glass as well as the frames and sills of your windows is definitely an essential checklist item. Instead of a toxic commercial glass cleaner, try a green option or make your own using 1 part vinegar and 1 part water.

5. Check Your Front Door. Walk outside to your front door, and take a good look at what you see. Make sure to clean your front door of any dirt and dust. The entry to your living space is something you see everyday as you come home, and it affects you and your mood. The influence of a clean and cared for entry will give your home and your visitors a sense of place and stability.

Jessica Goldblatt Barber is the owner of Interiors Green, The Home & Living Store, located on Main Street in Bethlehem NH, where you can be assured that she supports these principals when creating designs with these products and materials for clients. [www.interiorsgreen.com](http://www.interiorsgreen.com)

## A SOLUTION FOR GLOBAL WARMING IN NEW ENGLAND

Cont. from page 29

be abandoned.

As roads deteriorate, electric lines will be harder to maintain, because it will be harder to get vehicles and crews to damaged lines and transformers to repair them. This is additional to the problem that there will be more damage to the lines, more often. Where an outage lasting longer than a few hours is considered long, in many places, we might expect long outages to last days or longer. In places where they already can last a week, they might conceivably become permanent, by midcentury.

With unreliable roads, deliveries of goods will become more difficult and expensive. If our rail infrastructure can be maintained, it might well prove a great blessing, but from our current vantage point, we cannot have confidence this can always be done.

Deliveries, which are impossible in the immediate wake of storms, will require increasingly long periods, and that includes fuel for transportation. In addition, we will have to be able to deal with shortages of other fuel, food, and other goods coming from other parts of the country.

I am put in mind of a news story about a village in Serbia, during the wars there. The village went a long time without electric power, but a resourceful local repairman was able to get a tiny, but valuable, amount of electricity by building a run-of-the-river water wheel and using it to power a washing machine motor that had been turned into a generator. I am hoping it will not come to that here, but we cannot know. It could happen during the lifetimes of most of us.

I want to point out that this set of predictions is based on mainstream

science, and just uses that to answer the question, "what does that mean in terms of everyday life?" I also want to point out that the issues addressed here cover only the problems of transportation, and the resulting issues that can develop from increasing damage from storms. We will have many other problems, ranging from agricultural and medical to manufacturing and commercial.

But mostly, I want to point out that I am an optimist. I am firmly convinced we can, and will, address these issues. It should be much easier, if we start to address them now.



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