

8 YEARS! green energy times

Energy Independence, Energy Efficiency, Sustainable Living and MORE!

SUSTAINABLE SOLUTIONS FOR VT, NH, MA, NY and Beyond

www.greenenergytimes.org | 802.439.6675

WARNER, NEW HAMPSHIRE:

Groundbreaking News of a Community Design for a Community Microgrid

By George Harvey

Warner, New Hampshire, has not yet built its microgrid. It has not yet installed any of its hardware. In fact, it has not even identified where its first installations will go. Nevertheless, some people (including me) consider its story stunningly exciting.

To look at it, Warner it is not a place that a person might expect to stand out as an example of leading edge ingenuity. It seems too small and rural to answer that description. Its total population is about 2,835 people. Its buildings are spread out, and in the 2010 census, only 444 people lived in the town center.

Nevertheless, the town has a long history with renewable energy, and we have seen movements toward sustainable energy in the past. Green Energy Times published an article in the December 2012 edition, "Local Solar-Powered Bookstore Happily Shares with the Community" (<http://bit.ly/GET-solar-bookstore>). A second article, "Summer Fun



A gathering at the solar stage in downtown Warner, New Hampshire. Photo courtesy of Neil Nevins.

from the Sun," which appeared in June of 2015, is about a solar-powered outdoor stage (<http://bit.ly/GET-solar-stage>). Both of these stories related to activities of Neil Nevins, who runs MainStreet BookEnds of Warner.

Now the town has a pair of newer solar arrays. One was a 114-kilowatt (kW) array on Water District land, completed in 2016. The other was of 113.4kW, built at the transfer station in 2017. The earlier reported array at Main Street Bookends has grown to over 20kW, but other solar systems are also being installed by people who are using net metering to reduce both their electric bills and their carbon footprints. In fact, most of the major building permits being issued in Warner are for solar systems.

This brings us to the "microgrid." A community microgrid is an

Cont'd on p.20

Dartmouth-Hitchcock Medical Center (DHMC) in Lebanon, New Hampshire, has been doing some very impressive work on sustainability and reducing greenhouse gas emissions. The story of what they are doing can only be partly told, because the effort is ongoing. Nevertheless, it is an impressive undertaking to see.

The latest effort is a new solar array that was inaugurated in November at DHMC. Sitting on the roof of the Heater Road facility, the array consists of 378 Trina solar panels of 355 watts each, for a total capacity of a little over 134 kilowatts. It is expected to deliver about 10% of the electricity the building uses each year. It supplies power under a power purchase agreement with its builder, Norwich Technologies of White River Junction, Vermont, and DHMC did not have to capitalize it. As often happens with solar systems of this size, once the work was started, it was completed very quickly. The permitting process was concluded in October of this year, and the array was running in November.

That is just the latest effort. The list of DHMC's sustainability successes is long.

DARTMOUTH-HITCHCOCK MEDICAL CENTER IS A WINNER

By Thaddeus Rumple



A 134-kW rooftop solar array was inaugurated in November 2017 at the DHMC's Heater Road facility. The 378 solar panels will offset 10% of the electrical demand of the Heater Road DHMC building. Photo courtesy of Norwich Solar Technologies.

Zac Conaway, DHMC's manager of waste, recycling and training, explained that the efforts toward sustainability and pollution reduction started over two decades ago, in 1996, with the incinerator. Concerns had developed over incineration of waste, a process that did not just use energy, it also produced pollution.

Waste problems for medical facilities are not easy. The risk that waste can spread diseases is very real, and so it cannot be safely taken off to landfills. There is

always the worry that some pathogen will spread. So DHMC incinerated its waste. By 1996, however, the issue of air pollution was getting attention. Sterilizing waste in an autoclave was more expensive than incineration, and it still took quite a lot of energy, but it was much less polluting, and that was a public health issue.

With time, DHMC identified and acted on more issues. Leadership of other health care facilities began to take notice. So did the

Cont'd on p.8

THE COST OF DENIAL

When it happens in the Statehouse, we all suffer.

By George Harvey

Denial is a matter of asserting that something is different from what it actually is. It might be that most of us do it from time to time. Many people say, "I'm okay," as they shed a tear that says clearly they are not.

When denial is about something really important, it can be costly. There are many examples of that, but one story is particularly instructive on the subject of climate change. It is about Tim and Sally Canfield, who lived in Alstead, New Hampshire. They twice refused to evacuate their home as a flood threatened in October of 2005, asserting that they were in no danger. They stayed in their home, and within hours they had vanished. In fact, not only did they vanish, so did the entire home. Not even the foundation

remained, as everything was swept away in the flood.

The weather has been getting worse for years. This is clear from the cost of flood insurance. In 1978, premiums for flood insurance in this country totaled about \$82 million. Increases due to inflation, increased population, and increased value of real estate might have driven that up by a factor of five or six in the years leading to 2016. But the premiums did not go up by a factor of six; they went up by a factor of 43.

Please do not be fooled by the assertion that this was because of increased building in flood-prone areas. The Flood Insurance Reform Act of 2004 said that if a property gets claims of \$1,000 or more over a ten year period, it loses its federal

guarantees of insurance, and its premiums disappear. Unfortunately for the owner, so does most of the value of the property.

The steady increase in weather damage has happened in lock step with the increase in carbon dioxide in the atmosphere and the increases in temperature. The assertion of denialists that temperature increases

Cont'd on p.9

IN THIS ISSUE:

Power When the Grid Goes Down p.9

Financing Renewables in NH, VT p.19

Feature: NE Renewable Cities pp.21-22

Heating w/ Wood (Biomass) pp. 22-24

Burlington Addresses Climate p. 29

St. Albans Huge School Solar p. 32

*Many thanks
to the sponsors of
this edition of
Green Energy Times*



A SOLAR
POWERED
COMPANY

GREEN ENERGY TIMES (G.E.T.)

1749 Wright's Mountain Road • Bradford, VT 05033
t/f: 802.439.6675 • info@greenenergytimes.org
G.E.T.'s COMMUNICATIONS TEAM:
Publisher/Editor/Production Nancy Rae Mallery
General Factotum George Harvey
Copy Editor Ray Brewster
Coordinating Director Michelle Harrison

A huge special thank you to all of our contributing writers!
Charlotte Albright, Dr. Alan K. Betts, Randy Bryan, Kevin Carbonnier, Joanne Coons, David Fried, Annie Gilleo, Chris Gillespie, Paige Heverly, Roger Lohr, Laura Mistretta, Larry Plesent, Alex Popp, David Roberts, Lindsay Speer, Bob Tortorice, Rick Wackernagel, Barb and Greg Whitchurch.
Ad Design/LayoutNancy Rae Mallery, P.J. Fischer
Printing.....Valley News Lebanon, NH Using 100% Recycled Newsprint & Smudge-Free Environmentally Safe Inks*
Advertising Team:
..... Nancy Rae Mallery, Bradford, VT 802.439.6675
nancy@greenenergytimes.org
..... Michelle Harrison, Londonderry, NH 603.437.0167
michelle@greenenergytimes.org
..... Don Smallwood, So. Hero, VT 802.372.3309
don@greenenergytimes.org

Distribution: Larry Chase, Johnny Hinrichs, Hippo Distribution, Manchester, NH, Daniel Hoviss, George Lawton, Kika McArthur, Carl Michaels, Rosalyn Moore, our New York Team, Ray Nuttle, Jodi Owens, Lee Oxenham, Alan Phenix, Marty Philbrick, Larry Plesant, George Plumb, Ally Samuel, Jeff & Wenda Skelsie, Don Smallwood, Eric Stevens, Mona Sweat, David Van Houten, Jim VanValkenburg, Barb & Greg Whitchurch, and Julia Lloyd Wright.... Hopefully we have not forgotten to mention anyone. It is your help that paves the way to a sustainable future. Thank you all for your help, and for all you all do!
Let G.E.T. know what YOU are doing for our planet!
Please support our advertisers. They make G.E.T. happen!

ABOUT G.E.T.

Green Energy Times is produced by 100% solar power, off-grid with a 3.8 kW PV system. We live and know that Energy Independence is indeed possible - with clean, sustainable renewable energy along with reducing your needs. We walk the talk!
Our mission is to create Energy Awareness, Understanding and Independence - Socially Responsible Living.
Solar Power works! ... anywhere! under the sun!
G.E.T. is published bi-monthly, Feb.15, Apr. 15, Jun.15, Aug. 15, Oct. 15 & Dec.15, by NRM Advertising Company. It is free and available throughout 90% of VT & 80% of NH: the Upper Valley-St.J.down to Brattleboro,Windsor-Ludlow, Barre-Montpelier-Burlington, Stowe, Mooretown-Waitsfield, Morrisville, Hardwick, Danville, NEK, Grand Isle, Woodstock-Rutland-Bennington; NH: Woodsville-Hanover-W. Leb.-Plainfield, Enfield-Claremont, Keene-Concord-Plymouth-Laconia, Littleton, & towns in between, Greenfield Center, MA. New: Rye & Portsmouth, NH
If you would like to have G.E.T. available somewhere you have not seen it, let us know!
G.E.T. is also online at www.greenenergytimes.org.
We encourage you to patronize our advertisers. We strive to selectively include trust-worthy services & products. G.E.T. cannot be held responsible for advertising claims.
Please support our advertisers. Keep it Local!
To advertise in G.E.T. contact Account Executives listed above.
By advertising in Green Energy Times or sponsoring us, you not only help to create energy awareness, understanding and independence for a sustainable future, but also help to support our efforts to make it all happen! Please call one our Advertising Representatives today!

Editorial Policy: Green Energy Times works with a variety of writers and also publishes community submissions on various topics. We aim to publish content that is independently researched, unbiased and relevant to our audience. Submissions are subject to our guidelines. Publication is subject to our editorial judgment & schedule.
Subscriptions: \$30/yr. Online or with the form on this page.
Green Energy Times would like to thank everyone who has submitted articles or helped in any way to make this all a reality. We want to also thank our advertisers & ask that you support them. Say that you saw them in Green Energy Times. Now let's all G.E.T. moving ahead towards a clean, renewable future - one where our children & grandchildren will be able to breathe & grow, live & love on this beautiful planet where we live. Thank you for reading G.E.T. Please send your comments & suggestions to: info@greenenergytimes.org
Disclaimer: G.E.T. allows space to, but does not endorse, contributed content from professionals or vendors.
*G.E.T.'s Carbon Footprint Disclosure. Green Energy Times is printed on as high of a recycled content paper as one can get - locally. The printing process uses eco-friendly water-based inks. There are not any totally green printers in the area that we are aware of, so it would mean trucking them MUCH further to have G.E.T. published in a totally green manner, thus increasing carbon emissions, as a consequence. We chose to move from printing that used soy based inks because the soy is only used for the colors - not black, which is the most prominent color.... G.E.T.'s distribution emissions are also kept to a minimum, as well. With the wonderful help that we g.e.t. within many communities, it keeps our carbon footprint a bit lower. Hopefully our footprint is offset because we are 100% solar powered! Our Graphic designer, Amy Niebel, who owns and operates Double Plus Green, in Brookline is also Solar-powered. Because all of our employees work from home, our carbon footprint is kept to a minimum. We all grow and harvest organically and live as sustainably as possible. We DO walk our talk! Peace!

Organic Living, Homesteading
& Farm-to-Table Expo

SHARE - LEARN - CONNECT - GROW!

There's something for everyone at New England FarmCon!

February 17-18

Royal Plaza Trade Center
Marlborough, MA

New England FarmCon
Organic Living, Homesteading
& Farm-to-Table Expo

NeFarmcon.com

Letter to the Editor

Dear Editor:

I have been reading from many sources over many years about sustainability, renewables, etc. I want to tell you folks that Green Energy Times may be the best publication I have yet to come across in its genre. The specificity of your content and the focus on factual informative content is welcome. After all of these years of activism and self-education, I am in no need of editorial opining and lecturing on values formation. I love the economic analysis and updates on the relevant policies and industry developments impacting our biosphere. Our household looks forward to each edition for sure. All of you are to be commended.

- Dan Hughes, Brattleboro, VT (recently from Pittsburgh, PA)

HELP SUPPORT G.E.T.'S MISSION

Do you enjoy reading Green Energy Times?

We can use your support -- to invest in change for a future that we can all benefit from.

From recent powerful wind storms to more frequent flooding, warmer winters that will affect our maple industry, growing season and snow on our mountains, forest habitat, moose, deer and wildlife being affected by lyme disease or polluted waters ... it is clear that we need to do more. Help us g.e.t. this message across the region that we all live, work and enjoy. It is truly a gift in itself and a privilege to live here in the northeast.

Please make a gift of any amount you can afford -- to help support our work.*

When you support G.E.T., you are making a contribution to a sustainable future for you, your family, your neighbors, friends and all future generations. Thank you for supporting our work with whatever you think it is worth to keep G.E.T. going -- a gift that keeps on giving...

Send your gift contribution to:

Green Energy Times, 1749 Wrights Mountain Road, Bradford, VT 05033,
or donate directly now at www.greenenergytimes.org; or call in your donation to 802.439.6675 or 603.437.0167.

With your support we can continue to distribute Green Energy Times for free at locations near you. Thank you for a consideration to help support our efforts.

* Your donations are not tax deductible yet.

Green Energy News You May Have Missed

By George Harvey

At COP23, the Trump administration scheduled a presentation in which it was to tell the world that climate change can be stopped by the use of clean coal. The line of people wanting to get into the room where the presentation was to happen was about a kilometer long. The audience was made up almost entirely of protesters.

The entire island of Puerto Rico lost power as a result of Hurricane Maria. A \$300 million contract to repair the power grid went to a company in Montana with two employees, without going to a bidding process. The company belongs to a major contributor to the Trump campaign. The contract was widely challenged and eventually canceled.

Regulators in Nebraska have approved the route of the Keystone XL pipeline. They did this shortly after a leak in the Keystone pipeline resulted in the loss of 200,000 gallons of crude oil into the environment. Though the approval is a step toward construction and use of the Keystone XL pipeline, it is not yet a done deal.

Chinese electric vehicle manufacturer BYD is building a large plant in Canada to build buses for the North American market. They said their choice of Canada was based to a degree on lack of support from the US federal government.

Based on field results, China increased its forecasts of solar power additions for 2017 by 80%. China is out-pacing solar and wind installations of all countries of the rest of the world combined. The US is lagging behind in these areas. The US is also far behind China in electric vehicles. There are about 400 times as many electric buses in the Chinese city of Shenzhen as there are in the entire US.

Siemens had extensive layoffs of employees who make equipment for natural gas power production. The moves reflect a decline in natural gas use for generating electricity, as renewable energy takes its place. Siemens' layoffs were followed in a few weeks by more layoffs at GE, for the same reason. The renewable sector is creating jobs faster than they are being lost elsewhere, however.

Tesla's unveiling of the truck they call the Tesla Semi happened in November,

Cont'd on p.14

TABLE OF CONTENTS

NEWS & VIEWS ... 3

EXPANDING RENEWABLES IN VT3

TRANSPORTATION SECTION 4-6

CONVERSION TO HYBRID/PLUG-INS.....4

2018 MITSUBISHI OUTLANDER5

SOLAR FOR MILFORD, NH DEALERSHIP 6

ENERGY NEWS 7

ACEEE STATE ENERGY EFFIC. SCORECARD 7

RENEWABLE ENERGY GENERATION 8-15

R/E JOBS GROWING TWICE AS FAST IN USA 8

POWER WHEN THE GRID GOES DOWN 9

MONTPELIER IS FINALIST IN NATL COMP 10

FUNDING FOR COMMUNITY ENERGY IN NY 11

NH SOLAR SHARES OVER THE TOP12

ANDOVER, NH TOWN OFFICES GO SOLAR 13

U.S. RENEWABLES GROWING 14

SAVING ENERGY IS STILL CHEAPER15

WHAT THE END OF OIL LOOKS LIKE15

INCENTIVES 16-17

BUSINESS & FINANCIAL 18-19

HOME ENERGY PERFORMANCE DATA18

UV GREEN REAL ESTATE NETWORK18

FEATURE: RENEWABLE TOWNS & CITIES 20-21

WARNER, NH: NEW MICROGRID DESIGN1, 20

100% RENEWABLE CITIES: HERE & THERE 21

HEATING & COOLING 22-24

AFFORDABLE HEATING: WOOD BIOMASS22

MARVELOUS VT BUN BAKER 23

REV 5-YEAR ADVANCED HEATING PLAN 24

CLIMATE CHANGE NEWS 25

DR. BETTS: ROBBING OUR CHILDREN 25

VT CLIMATE RESEARCH 25

BUILDING & ENERGY EFFICIENCY 26-31

NEW METRIC FOR TRACKING NET-ZERO 26

WEATHERIZE UV CAMPAIGN..... 27

SWA: SUSTAINABLE SUPPLY CHAINS 28

BURLINGTON 2030 ADDRESSES CLIMATE 29

TORTORICE TIPS: TREAT SYMPTOMS 30

EFFICIENCY NEWS ITEMS31

NEW RECORD LEVELS OF CO2 / TESLA 31

SUSTAINABLE EDUCATION 32-33

DARTMOUTH'S CLEAN ENERGY TRANSITION ... 32

LARGEST SCHOOL SOLAR IN VT 32

1ST NET-ZERO COLLEGE (HAWAII) 33

RESOURCES, LISTINGS & CLASSIFIEDS 34

GUIDE TO ADVERTISERS..... 34

IT'S A GREEN LIFE AFTER ALL 35-39

INGREDIENT OF MONTH: INTENT 35

ELMORE ROOTS: HOW TO FLY 36

REDUCING HOLIDAY FOOD WASTE 37

SUSTAINABLE LOCAL SKI SLOPES 38-39

JOIN OUR G.E.T. TEAM

We have numerous positions open to help Green Energy Times g.e.t. our message out. We have positions available for help with many things such as:

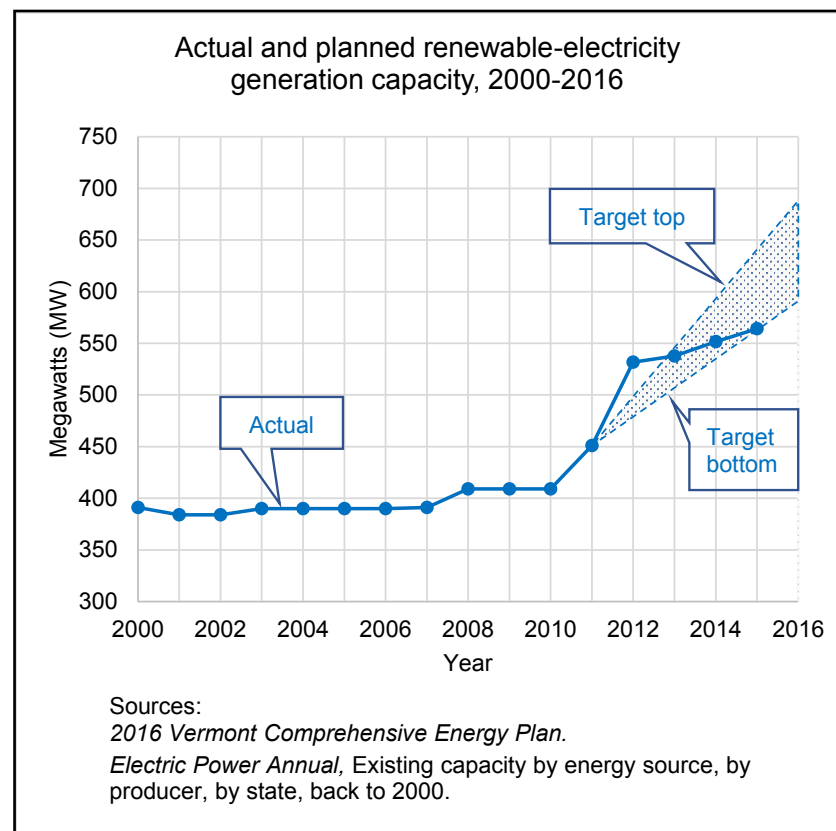
- Distribution • Ad Sales
- Writing Contributions

If you have some free time and a desire to help to make a difference, please let us know. Perfect for a retired person looking for something to do, part-time or as much time as you can give.

Help our mission to create a sustainable future for the planet. *Serious inquires only.* Reply to info@greenenergytimes.org or call 802.439.6675.

REMOVING BARRIERS TO EXPANDING RENEWABLE ENERGY GENERATION IN VERMONT

By Rick Wackernagel and Laura Mistretta



Since 2010, Vermont's renewable-electricity-generation capacity has grown much faster than previously. However, if it maintains the pace from 2012 onward, it will not stay in the target zone to reach Vermont's goal of getting 90% of its energy from renewable sources.

To avoid the worst effects of global warming, we need to transform our energy system, replacing fossil fuels used in producing electricity, heating and transportation with renewable energy. In 2011, Vermont made getting 90% of our energy from renewable sources a goal. This will require a substantial expansion of our electrical system. Our renewable-electricity-generation system has not been expanding fast enough to reach that goal, however.

In 2015, Vermont used about 5.5 billion kilowatt-hours (kWh) of electricity. About 2.5 billion kWh came from renewable sources - hydroelectric dams, wood, wind turbines, methane digesters and photovoltaic solar panels. We will need to replace the 3 billion kWh of fossil-derived electricity, and, to substitute electricity for fossil fuels used in heating and transportation, we would need to add another 8 billion kWh.

Vermont's Comprehensive Energy Plan plots three possible paths to 90% renewability in 2050. It requires expansion of our current 550 megawatts (MW) of in-state renewable generating capacity by 1,000 to 1,700 MW. To finish by 2050, we need to be adding 26 to 46 MW of generating capacity each year. In 2011 and 2012 we added about 120 MW. From 2013 to 2015, however, we averaged about 11 MW per year. This pace will not get us to our goal.

One of the barriers to expanding renewable generation capacity is local resistance, for example to wind projects in Swanton and solar projects in Bennington. The reasons for resistance vary and include aesthetics, health, tourism impacts, environmental impacts, and the relative influence of communities and developers in permitting processes. Many of these could be called dissatisfaction with the current distribution of costs

and benefits from producing renewable energy. Could we structure development of generation capacity, so host communities would capture more of the economic benefits - e.g., cheaper electricity and jobs? Could these communities have

more input into decisions, so new systems meet local goals, such as resilience in the face of extreme weather events? And how can we equitably share these benefits so that, regardless of income, property ownership or political access, all who call Vermont home stand to gain?

Act 174 already gives towns more voice in renewable-generation siting decisions. It should be allowed to continue. However, its impact on distribution of cost and benefit is limited. We need to address distribution directly. Creative minds will come up with many ways to improve the distribution. We offer four to start the conversation.

Deepen the engagement of communities by creating pathways for local ownership. Allowing partial local ownership has been an effective strategy in Germany and Denmark for accelerating expansion of renewable generation. Denmark now requires developers to allow local residents to provide 20% of the investment in large projects. Research shows this shared ownership has reduced local pushback.

Replace policies that restrict the ability of individuals and communities to benefit from renewable energy. Limits on the size of net-metered generation systems keep them at uneconomical sizes. Economies of scale in electricity generation are substantial. Allowing community members to be co-owners of utility-scale systems will reduce the cost of power for all Vermonters, as well as providing a better return on investment than they currently can receive. Community solar should refer to ownership structure, not size of generation system.

Think creatively about alternative ways to compensate host-community residents for the costs they bear. Different people will find different methods of compensa-

tion attractive. Having a menu of acceptable methods will allow negotiations to proceed more quickly. Power producers already make lease payments and pay property taxes. They also could make other payments to neighbors and communities. Residents of host communities could receive discounted prices for electricity or get credits on their bills. The prices or credits could depend on the kind and size of generation system, and the degree to which the community is self-sufficient in electricity.

Develop policies and incentives that benefit Vermont's most vulnerable. The Vermont Solar Market Pathways report found huge potential benefits for low-income households from community solar projects with interest rate buy downs or on-bill financing to reduce barriers to participation.

Institutional changes that allow more equitable distribution of costs and benefits of renewable energy will help open the bottleneck preventing us from producing the renewable energy we need.

Sources and live links to them are available in the web version at www.greenenergytimes.org.

Rick Wackernagel is a member of the Energy Committee of the Sierra Club Vermont Chapter.

Laura Mistretta is a member of Rights and Democracy VT, co-leading its Jobs, Justice, Climate campaign. ♻️

Community News Links For Your City or Town and You!

Carbon Free City Handbook

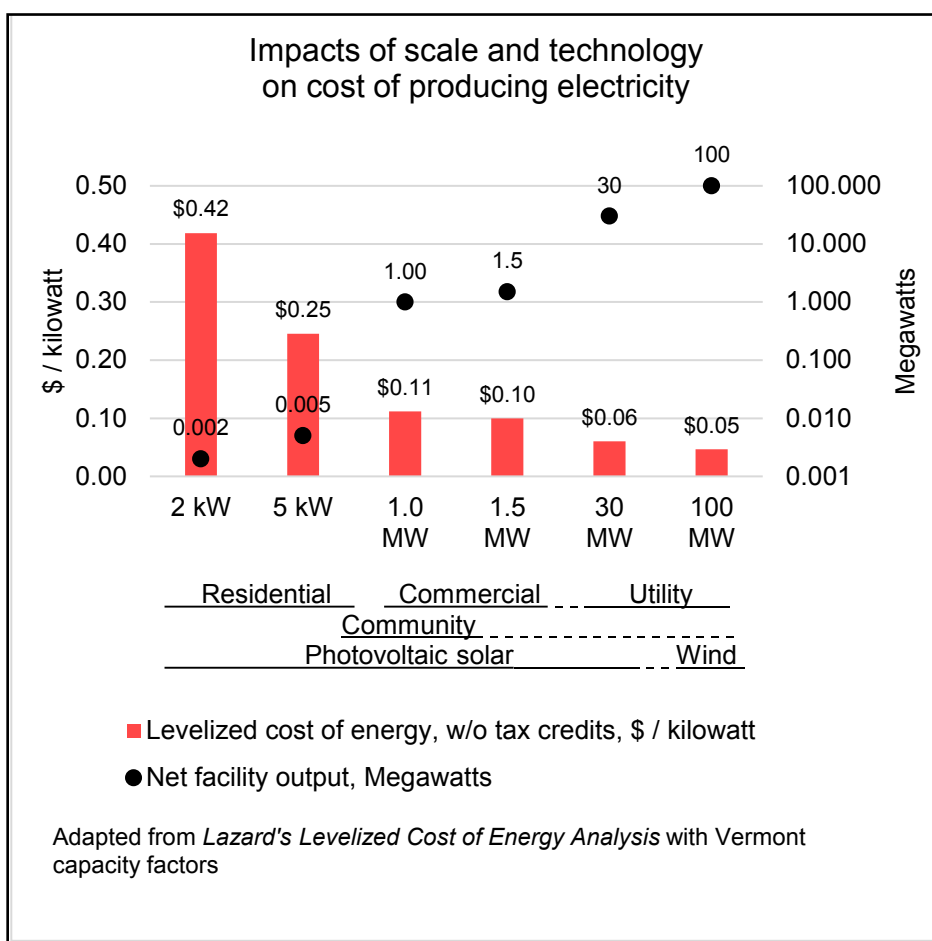
With Syria's recent announcement that it will join the Paris Agreement, every nation in the world is now part of this historic global effort. Even though the U.S. has declared its intent to withdraw at the national level, non-federal actors—including states and cities—have announced their intention to keep U.S. leadership strong on this topic. How can cities take action now? RMI recently released The Carbon-Free City Handbook, which includes 22 no-regrets, high-impact recommendations applicable to almost any city in the world and ready for implementation more or less immediately. Read more at <http://bit.ly/Carbon-Free-City-handbook>.

Energy Efficiency Self-Scoring Tool

The new and improved Local Energy Efficiency Self Scoring Tool provides cities of every size a resource to help them develop policy roadmaps to increase energy efficiency and reduce greenhouse gas emissions in the process. This tool is provided by the American Council for an Energy Efficient Economy (ACEEE). Learn more at <http://bit.ly/energy-self-scoring-tool>.

EPA Greenhouse Gas Calculator

The EPA has updated its greenhouse gas equivalencies calculator, a tool to help you communicate your emissions and energy goals and achievements. This online calculator helps you translate abstract energy and emissions data into concrete terms, such as annual emissions from cars, households, or power plants. <http://bit.ly/EPA-GHG-calc>.



Economies of scale in producing electricity are substantial. Cost per kilowatt hour goes down as the size of the generating system goes up. The cost with a 2-kW photovoltaic array in Vermont, 42 cents, is seven times larger than the 6-cent cost with a 30-MW, utility-scale array.

Established 1924
grappone
AUTOMOTIVE GROUP



One person. One price. One location.

available at the Drive Electric Vermont website: www.DriveElectricVT.com.

David Roberts is the Drive Electric Vermont coordinator. He has driven an all-electric Nissan LEAF for the past five years and says "if you have to drive, drive electric."

*Be prepared
for winter driving.*



2017 Mazda CX-5 AWD



2018 Toyota RAV-4 Hybrid AWD



2018 Honda CR-V AWD



2018 Hyundai Santa Fe Sport AWD



2018 Ford Escape 4WD

*Upfront pricing and negotiation free.
Experience a better car buying process.
No pressure, no haggling and commission free.*

514 - 594 Route 3A, Bow NH

800-528-8993

Conversion of Combustion Engines To Hybrid/Plug-ins



Yale University Shuttle courtesy of XL Hybrids.

By Randy Bryan

Just recently, major companies, cities, and countries have committed to 100% electric vehicles within a couple decades. However, there are more than 100M light-medium duty vehicles on U.S. roads and just 3% have any form of electric drive (2% hybrid, 1% plug-in), and those are all cars. How do we get from here to there? Fortunately, appealing electric cars are now being introduced and their sales will mushroom over the coming decade. But, almost no light-medium duty trucks are electrified. Yet, in some cases, electric drive may be better suited to the tasks assigned. Actually, electric drives may be better suited to trucks than cars.

What's the draw of an electric drivetrain for trucks? The answer is better reliability and lower operating costs. The fuel (electricity) is about half the cost of gasoline or diesel per mile, maintenance is maybe a third of the cost for combustion cars (only one moving part), and the electric motor doesn't pollute. And, there's better torque than diesel, especially at low speeds, and regenerative braking recoups some "fuel" when braking and saves on brake pad wear.

What's holding electric drive back? It's the batteries. Battery development and costs stagnated for a hundred years, but now lithium battery capabilities have been doubling every six to seven years and prices halving every four years. Today, the purchase price of an electric or hybrid vehicle is above the cost of an internal combustion vehicle, but the lower operating costs often enable the total cost of ownership (TCO) to be lower after a few years of use. This will improve over time, like computers did. So when does a fleet jump in and start using electric drive? Many have already done so.

One of the top electric drive companies in the country is right here in the Boston area, XL Hybrids. They provide partial electrification of trucks and have been quite successful at getting solutions that make sense into the fleet

market. Their primary product has been the addition of a hybrid electric drive (no plug) to the standard combustion truck. They add an electric motor to the drive-shaft, with battery, controller and sensors (cellular uplink for analytics) added in convenient places. They often save over 20% of operating costs.

XL Hybrids have versions for class 2 to 6 GM, Ford, and Isuzu trucks (pickups, cutaways, stripped, and more), and for the Chevy Express and Ford Transit vans. According to their CTO, Ed Lovelace, this simple bolt-on product "improves the performance of the truck and lowers its fuel consumption and maintenance cost." No changes are required for the driver or fleet mechanic. "The critical thing to look for is trucks that are driven enough for the lower operating costs to outweigh the purchase price." This turns out to be about 50 miles a day. And lots of fleet trucks do fit that profile. Mr. Lovelace adds, "XL Hybrid trucks have accumulated over 50 million miles in seven years of operations, generating savings for their fleet customers." And that makes them the largest company in their field. The secret of their success has been to focus on the customer and what products will save them money.

Looking to the future, XL Hybrids has also developed a plug-in hybrid product that adds a larger battery and plug to their existing product for more aggressive savings (and higher price). As battery prices drop and capabilities improve, the battery will become ever more central to fleet operations.

XL Hybrids is but one good example of many conversion companies offering credible products to fleets. There is something for every fleet manager to consider.

Randy Bryan has been an advocate for electric cars for 8 plus years. His company, ConVerdant Vehicles, has converted vehicles to plug-in hybrids, including his own Prius in 2008, and developed and sold inverters that turn a Prius into an emergency generator. He is one of the co-founders of Drive Electric NH. ♻️

THE OUTLANDER PLUG-IN HYBRID ARRIVES

And State Electric Car Sales

By David Roberts

The lack of affordable all-wheel drive and sport utility vehicle (SUV) models has challenged growth of the plug-in electric vehicle (PEV) market. This is especially true in New England and across northeastern states where snowy winter conditions and rural gravel roads present many new vehicle shoppers with a quandary – reduce their environmental footprint by going electric or choosing the type of vehicle they really need or can afford for their personal transportation.

The popularity of SUVs and light trucks continues to ramp up as they now sell at about double the rate of smaller passenger cars. Fortunately, we are now starting to see more options for all-wheel drive and higher clearance electric vehicles (EVs). At the upper end of the price scale Tesla, BMW, Volvo and Mercedes have offered all-wheel drive SUV EV models in both all-electric and plug-in hybrid (electric plus gasoline) guises for several years, albeit at prices well over \$50,000 in most cases.

Mitsubishi is joining the all-wheel drive EV market in December with the launch of their Outlander plug-in hybrid SUV in the United States. This second generation model will finally reach us after several years of Outlander PHEV availability in Japan and Europe,



Outlander PHEV. Courtesy photo: Mitsubishi

where it has been one of the top-selling models. Electric range is rated at 22 miles, and total range with a full tank of gasoline is 310 miles. The starting price will be just under \$35,000 before incentives – it is eligible for a federal tax credit of \$5,836. (NOTE: as of early December 2017, the fate of the federal EV tax credit is uncertain as the U.S. House version of the federal tax reform bill proposed elimination of this program at the end of 2017). Many states and electric utilities are offering additional incentives that will bring the cost lower still.

Like many other EVs, charging the Outlander PHEV is simple, with three different methods to choose from depending on your needs and available charging equipment. The vehicle can be charged with a standard 120V power outlet at home or elsewhere with the supplied charging

cable (full charge in less than eight hours), or with a 240V charging device at home or in many public locations (full charge in less than four hours). Unusual for a plug-in hybrid, the Outlander also comes standard with DC Fast Charging capability. Plugging in at a public CHAdeMO-plug-equipped DC Fast Charger, the vehicle will charge up to 80 percent in less than 30 minutes.


If you are looking for the flexibility of a plug-in hybrid and need higher ground clearance or all-wheel drive this is definitely an EV worth checking out and is an indication of what is coming to the EV market in the next few years as many other automakers are developing similarly priced all-wheel drive and SUV models.

State EV Sales Comparison

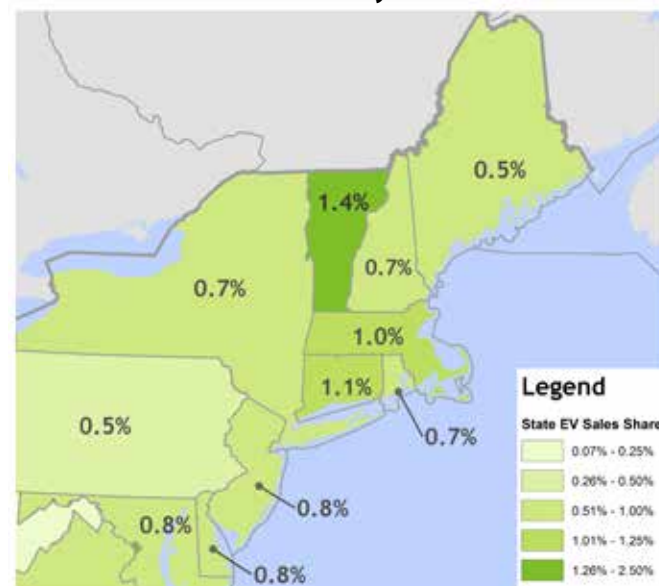
Wondering how your state is doing in getting more EVs on the road? The Auto Alliance, an industry trade group, has partnered with the Center for Sustainable Energy to create a dashboard of EV sales by state. The map shows the percent of new vehicle sales in northeastern states that were EVs over a 12 month

period from July 2016 to June 2017 using data from this dashboard.

Vermont was the northeast regional EV sales leader at 1.4% of overall vehicle sales. The region has a lot of work to catch up to west coast states like California, which won the overall national title with EVs representing 4.4% of overall sales. The arrival of new EV models and incentive programs paired with growing consumer awareness suggests these numbers will continue to improve over the next few years. <http://bit.ly/zev-dashboard>

David Roberts is the Drive Electric Vermont coordinator. He has driven an all-electric Nissan LEAF for the past five years and says, "If you have to drive, drive electric." 

State EV Sales Share – July 2016 to June 2017



A true PLUG IN HYBRID 4WD SUV

THE 2018 MITSUBISHI OUTLANDER PHEV

TOMORROW'S EFFICIENCY TODAY

The innovative Plug-in Hybrid EV system is remarkably eco efficient. Enjoy zero fuel consumption and zero CO2 emissions during all-electric driving as well as an incredibly quiet ride. Or enter a hybrid mode to travel even greater distances with low emissions and impressive fuel efficiency. You can even generate electricity as you drive, to enjoy vast stretches of wilderness with total confidence.



THERE'S MORE BEYOND DRIVING.

The world's first plug-in hybrid SUV drives like no other car on the planet. Twin electric motors and a highly efficient gasoline engine optimize performance according to how you want to drive. It's freedom. Smooth, quiet, cocooning comfort with abundant power to tackle off-road terrain with highly efficient purpose. Go beyond the boundaries of ordinary driving. There's more to enjoy and discover. Experience the many advantages of Mitsubishi Motors' innovative Plug-in Hybrid EV system with Twin Motor 4WD and S-AWC. You'll enjoy not only the solid stability of an advanced 4WD system, but also the dynamic driving performance and incredibly quiet ride that only separately mounted motors at the front and rear axles can bring. The OUTLANDER PHEV responds faithfully to every command to keep you in total control. Innovative Twin Motor 4WD teams with S-AWC to supply optimal torque and traction to each wheel, now with more responsive acceleration during EV driving. So you enjoy smooth, powerful acceleration and sure, stable handling in all road conditions.

Over \$28,000 less than the Porsche, Mercedes, BMW, and Volvo

Burlington Mitsubishi
802-865-4400
www.mitsubishivt.com



SMART COMMUTING IN NH & VT

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

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

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

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

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

IN NEW HAMPSHIRE

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

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

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

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

SCS TRANSPORTATION - Services for Sullivan County.. 603-542-9609. SCSHELPS.ORG

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

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

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

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

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

MID-STATE REGIONAL RIDE RESOURCE DIRECTORY - Services elknapp-Merrimack Counties, excluding Hooksett and the towns of Deering, Hillsborough and Windsor of Hillsborough County. 603.225.3295 x1201. midstatercc.org

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

NH RIDESHARE - Your Source for Transportation Alternatives. nh.gov/dot/programs/rideshare/

IN VERMONT

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

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

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

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

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

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

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

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

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

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

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

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

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

'Contemporary Automotive' Relocates To GROUNDBREAKING, SOLAR-POWERED FACILITY in Milford, New Hampshire

By Chris Gillespie

For the team at Contemporary Automotive in Milford, NH, relocating provided a chance to improve the dealership's visibility and accessibility as well as an opportunity to create a state-of-the-art, eco-friendly facility.

"Environmental stewardship is a responsibility shared by all of us here," said David Hammer of Contemporary Automotive. "From the start, an economically viable, environmentally conscious design was important to our planning."

Contemporary Automotive closed their original, thirty-three year-old Elm Street location on a Friday and opened their new 25,000 square-foot facility on Hammond Road (near the intersection of Routes 101 and 13) on the following Monday. Hammer says the move went well as a result of "advance planning, cooperation and the positivity of our entire dealership team."

Contemporary Automotive's new home on Hammond Road is an excellent example of how sustainability-minded design and green technology can come together to produce an operational workplace that delivers more by consuming less.

A key part of Contemporary Automotive's sustainability is the photovoltaic solar array situated on the building's rooftop. Installed by ReVision Energy, the system is a 135kW commercial solar electric system consisting of 450 Q Cells 300 Watt PV Modules. According to a press release from ReVision Energy, the solar array will generate approximately 149,700 kilowatt hours of clean energy each year and

will offset the majority of the dealership's electric load. As a result of this, Contemporary Automotive is expected to save upwards of \$400,000 on energy costs over the course of the solar array's life.

By switching to solar, Contemporary Automotive is offsetting 157,634 pounds of carbon pollution per year, which is equivalent to the emissions of 8,046 gallons of gas or 175,249 miles driven by passenger vehicles like the ones that are sold and serviced at the dealership. Carbon emissions are also reduced through the use of LED lighting, which is installed throughout the interior and exterior of the facility.

Contemporary Automotive's rooftop is not the only part of the building that has been optimized for energy capture—just as the solar arrays take care of electric needs, Contemporary Automotive's repair shop plays a role in providing heat for the entire facility.

Using two Reznor waste oil boilers, Contemporary Automotive will collect and store the used motor oil that is generated during day-to-day activities in the repair shop and then use the oil to generate heat, which is then dispersed as radiant heat throughout the facility. Together, the two Reznor boilers have a capacity of 1 million BTUH (British Thermal Units per Hour) and will cover roughly 70% of the facility's heating needs.

Once produced by the Reznor boilers, the heat is evenly distributed through Contemporary Automotive's showroom,

Cont'd on p.31



CONTEMPORARY
CHRYSLER • DODGE • JEEP • RAM • FIAT

NOW OPEN!!

**Brand new, state-of-the-art,
solar-powered, eco-friendly dealership.**

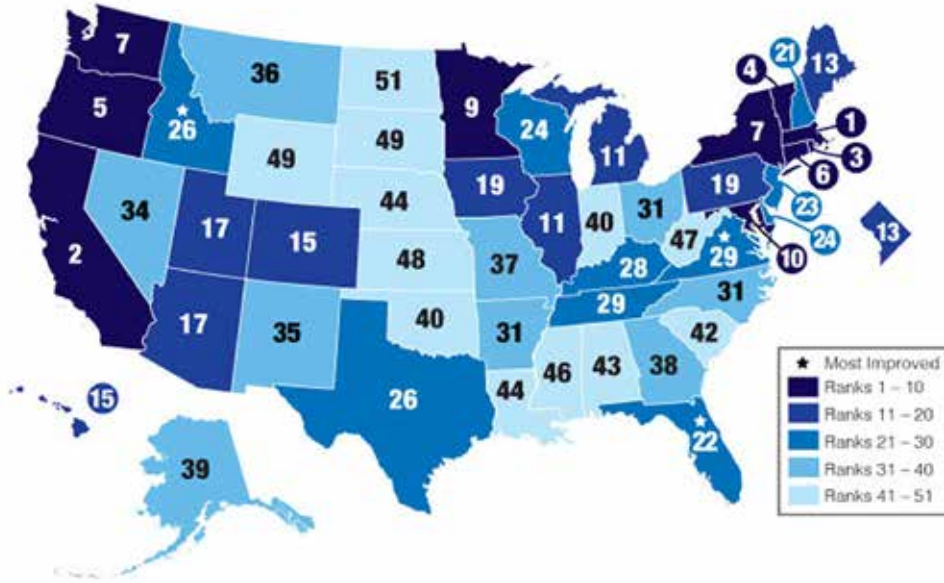
Your Destination for Chrysler Jeep, Dodge, Ram and FIAT in the Milford, Manchester, and Nashua Area!

www.contemporarycdj.com

Conveniently located at the intersection of
Route 101 and Route 13 in Milford, NH.

ACEEE INTRODUCES STATE ENERGY EFFICIENCY SCORECARD

ID, FL, VA THREE MOST-IMPROVED STATES, MA STILL NUMBER ONE



As more states struggle with extreme weather events, the 2017 State Energy Efficiency Scorecard gives state-level policymakers a road map for building stronger and more-resilient communities. This eleventh annual report from the American Council for an Energy-Efficient Economy (ACEEE), shows which states are doing the best on energy efficiency — a critical tool for withstanding and recovering from storms and economic shocks. To download the State Energy Efficiency Scorecard online, go to <http://aceee.org/state-policy/scorecard>.

Idaho, Florida, and Virginia are the three most-improved states in the newly released report. Massachusetts broke its 2016 tie with California by holding on to the No. 1 ranking, while the Golden State slipped to No. 2. As national leaders, Rhode Island, Vermont, and Oregon round out the top five in the ACEEE Scorecard. Idaho posted the most gains by far in 2017, surging past a number of mid-ranked states in ACEEE's comparative index of efficiency policies, best practices, and other metrics. Idaho advanced seven spots, from 33rd to 26th place. The balance of the 10 most-improved states are Virginia, Oklahoma, Florida, Utah, Nevada, Louisiana, Oregon, Washington, D.C., and Kentucky. While they show promise, all states can improve.

Storm-hit Florida and Texas rose in the rankings. Florida is among the top 10 most-improved states for energy efficiency. In late 2016 the state began its new Farm Renewable and Efficiency Demonstration (FRED) Program, which provides free energy evaluations to farmers and grant reimbursements for proposed efficiency measures. In addition, Florida is preparing to implement a stronger state building code with a major emphasis on energy efficiency. Both Florida (jumping three spots on the Scorecard to rank #22) and Texas (improving to #26) can continue to place greater emphasis on energy efficiency policy and implementation as they rebuild in the wake of the recent hurricanes.

"States hit by Hurricanes Harvey and Irma will need to rebuild, and energy efficiency can help them do so smartly, including improved building codes and promotion of Combined Heat and Power (CHP) systems," said Steven Nadel, executive director, ACEEE. "By pursuing energy efficiency policies, states can save residents and businesses billions in the long term. There is a lot of overall movement in

the 2017 Scorecard. Some states that have gone for years without much change have made incredible strides."

The 2017 State Energy Efficiency Scorecard

Charlie Baker, governor of Massachusetts, said: "As Massachusetts continues to make historic investments and progress in clean energy development, energy efficiency remains the most cost-effective method of reducing ratepayer costs and lowering greenhouse gas emissions. Massachusetts is proud to lead the nation in energy efficiency policies and programs, and over the last year, our administration has focused on increasing access for low- and moderate-income ratepayers, while investing in innovative peak demand reduction projects that will provide significant environmental and economic benefits to the Commonwealth."

Terry McAuliffe, governor of Virginia said: "I am encouraged that ACEEE continues to recognize the excellent work we are doing in the Commonwealth to advance energy efficiency through innovative programs such as the VASaves Green Communities Program and Energy Performance Contracting for public agencies. While we have made progress in these areas, there is still much to be done to grow utility-sponsored programs and encourage strategies like Combined Heat and Power. Energy efficiency is a win-win for Virginia's economy and our environment, and we must build on the momentum generated over the last four years."

Gina Raimondo, governor of Rhode Island, said: "From the nation's first offshore wind farm to the thousands of clean energy jobs we have created over the past few years, I'm proud that Rhode Island is leading the nation in the green economy. These programs help all of us — including residents, businesses, cities, towns and state government — to save money on our energy bills, reduce our carbon footprint and add to the 15,000 clean energy jobs in our economy. Rhode Island's third place ranking in this report, up from fourth last year, demonstrates that our investments in electric and natural gas energy efficiency programs are paying off."

Butch Otter, governor of Idaho, said: "Idaho is committed to using energy and all our precious resources in the most efficient way possible. The ACEEE report shows that we're making real progress in capturing cost-effective energy efficiency

cies, which helps reduce power bills for ratepayers and the need for more costly and less sustainable forms of energy generation.”

OTHER KEY FINDINGS:

1. California, Massachusetts, and New York continue to lead the way in energy-efficient transportation policies for the second consecutive year. California's requirements for reducing greenhouse gas (GHG) emissions have prompted several strategies for smart growth. Massachusetts promoted smart growth development in cities and municipalities through state-delivered financial incentives. New York, Oregon, Washington, and Vermont are among the few states in the nation to have a vehicle miles traveled (VMT) reduction target.

2. Rhode Island achieved a perfect 20-out-of-20 score in the utility programs category for the fourth year in a row, thanks again to its ambitious Three-Year Energy Efficiency Procurement Plan, which has helped to drive electric utility savings to levels approaching 3%, among the highest in the country. In December 2016, the Governor's Executive Climate Change Coordinating Council (EC4) issued the Greenhouse Gas Emissions Reduction Plan to help cut emissions 45% by 2035 under the Resilient Rhode Island Act.

3. Vermont and Oregon ranked fourth and fifth, respectively, both posting increases to their nation-leading levels of electricity savings and showing strong performances across nearly every policy area. In the top 10 again this year were Connecticut, New York, Washington, Minnesota, and Maryland. Each of these states has well-established efficiency programs and continues to push the boundaries by redefining the ways in which policies and regulations can enable energy savings.

4. Rhode Island, Massachusetts, and Vermont were the leading states in utility-sector energy efficiency programs and policies. These three states also topped this category in 2014, 2015, and 2016. With records of success, all three continued to raise the bar on cost-effective programs and policies.

5. California continued to lead in efficient buildings policies, with its latest building energy code updates taking effect in January 2017 and moving the state closer to its goal of achieving net-zero energy use for all new residential buildings by 2020 and commercial buildings by 2030. Other leaders include the District of Columbia, New York, and Washington, all of which have adopted the latest model codes and enforce mandatory building energy benchmarking and transparency policies for the commercial or residential building sector.


6. Multiple states in the lower tiers also showed progress. Louisiana moved up three spots to 44th, with savings continuing to increase as its utilities transition from the three-year “quick start” phase of their energy efficiency programs to the more comprehensive second phase. Mississippi, which also kicked off quick-start programs in 2014, held proceedings to guide the evolution to full-scale portfolios this year as well.

METHODOLOGY

The 2017 Scorecard assesses state policies and programs that improve energy efficiency in our homes, businesses, industries, and transportation systems. It examines the six policy areas in which states typically pursue energy efficiency: utility and public benefits programs and policies; transportation policies; building energy codes and compliance; Combined Heat and Power policies; state government-led energy efficiency initiatives; and appliance and equipment standards.

An update to the Scorecard report methodology in 2017 gives new consideration to state policies designed to improve energy efficiency programs that serve low-income customers. This new scoring metric arises from ACEEE research that shows low-income U.S. households spend three times as much on their household energy bills as a percentage of their income as other households.

Editor's Note: An electronic copy of the ACEEE 2017 State Energy Efficiency Scorecard report is available upon request. A streaming audio replay of the web-based news event is also available at <http://aceee.org/state-policy/scorecard>.

The American Council for an Energy-Efficient Economy (ACEEE) acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors. For more information contact Patrick Mitchell, (703) 276-3266 or pmitchell@hastingsgroup.com. 



- Established, Local, Small Business
- High-Quality Work
- Excellent Customer Service
- Design, Installation, and Support start to finish with our skilled, friendly crew
- Grid-tie and Off-grid systems



802-467-3500

www.solartechvt.com • info@solartechvt.com

Renewable Energy Leading the U.S. Employment Growth

By George Harvey



The U.S. Department of Energy recently released data for employment in energy fields for January, 2017. According to the data, solar generation has grown to employ the most people of all generating technologies, with 373,807 nationwide; wind power took second place at 101,738; and coal generation was third with 86,035, not including the miners themselves.

Other data from the Bureau of Labor statistics shows that jobs in major renewable energy technologies are projected to grow faster over the coming decade than for any other field. From 2015 to 2016, the number of wind technicians increased 96% and the number of solar installers shot up 105%.

The new jobs pay well. Wind technicians have a median pay of \$52,000 and solar installers of \$39,000. With the growth in these fields as fast as it is, this means that there are employees who have taken entry level jobs and are earning the median pay in less than a year. Going from finding that entry-level job as

a solar installer to earning \$39,000 per year takes less than one year for some people.

There are reasons that wind technicians are paid so well. The day's work often starts with a 30-story climb up the inside of a wind turbine mast on a ladder, carrying tools and supplies. Then the actual work might entail dangling 25 stories up from a rope, repairing the fiberglass on the tip of a wind turbine blade where it was struck by lightning. Fortunately for those of us who are bothered by heights, the wind industry has good jobs besides those for wind turbine technicians.

These data show employment in the renewable electricity sector growing at a large

multiple of jobs elsewhere in the economy. This is certainly true of a comparison with the average of all jobs, but wind technician and solar installer are regularly reported to be fastest growing job descriptions in the country. Again, doing a little math on the data above, we can see that over 190,000 jobs were added in the wind industry in one year. If we add the 86,035 workers in coal generating plants and about 52,000 coal miners we only come to 138,035 jobs in total.

The number of jobs mining coal and working in coal-burning power plants is not expected to grow. One coal mine did open this year, but the coal it will produce is of a grade used for making steel, not power production. No new coal-burning power plants have opened this year, and plants continue to close, despite efforts of the Trump administration to keep them going. Fortunately, we have better options.

Natural gas statistics are perplexing.

Though plants continue to be brought online, data from the Energy Information Administration clearly shows that amount of electricity generated from natural gas is declining. In the last year, every month showed a decline from the same month in the previous year. The average decline was over 10%. That means the capacity factors of the plants are being reduced significantly. If that trend continues, we might expect a number of jobs to be lost in the natural gas generating sector in the not too distant future.

Clearly, we have great options for a future with clean, renewable energy. ♻️



Above left: Wind technician on the job Photo: Energy.gov;
Above: installing solar panels. Photo: Oregon Department of Transportation.

DHMC IS A WINNER

Cont'd from p.1

Environmental Protection Agency, which singled out the hospital for an award.

In 2009, the hospital also began calculating its ecological footprint. Its reviews covered by-products, built-land, energy, food, transportation, waste, and water, as it searched for ways to be better for the environment and for patients.

Articles started to appear in magazines devoted to such things as hospital management. In its October, 2013 edition, Becker's Hospital Review named DHMC one of America's 50 greenest hospitals.

The acclaim was reiterated by the same publication in 2015. John Leigh, DHMC's Environmental Sustainability advisor, was quoted as saying, "This is reinforcement that D-H has been 'ahead of the curve' in realizing that human health and the health of our natural environment are fundamentally interconnected; that environ-

mental sustainability work is an important component of population health."

DHMC had by that time done extensive work in a variety of areas. A conversion in heating fuel from number 6 fuel oil to compressed natural gas had reduced a number of pollutants impressively. A new building had been designed and built to the LEED Silver standard. The food being served had been upgraded to include more fresh, organic, local produce. Care had been given in multiple areas to large reductions in waste. Patients were being offered bus service to reduce the amount of fossil fuels they burned getting to and from the hospital. Health and safety became major considerations for the products bought and used by the hospital, not just health products, but cleaning products, tools, and even carpets.

We might wonder how many people actually consider the green credentials of an operating room (OR). In May of 2015, Practice Greenhealth recognized DHMC

as the number one hospital in the United States for its OR team's work in reducing annual case-cart instrument kits, and awarded DHMC its national "Greening the OR" award.

The sustainability actions undertaken by DHMC have produced impressive reductions in costs in addition to safety and health benefits. The work of reducing the case-cart instrument kits not only cut them from the waste stream, it saved the hospital \$1.5 million. That is money that could be spent on better health care for everyone.

We asked Steve Cutter, the Director of Engineering Services at DHMC, whether he had seen any effects of the work on sustainability. He immediately spoke of his concerns about climate change, which can have profound effects on the environment, including on the health of people.

Cutter also spoke of sustainability goals for the future. "We have a long list of 'stretch goals' that have been approved

for 2020. These are goals that will take a lot of work."

DHMC seems to have done a lot of work already.

In the next issue of Green Energy Times, we will take a look at more of what DHMC is doing. One thing we will look into is the geothermal heating DHMC is beginning to use for buildings. We will also get into the list of goals. But there will certainly be more to talk about than those. ♻️



Dartmouth-Hitchcock Medical Center, CDC photo

EASTMAN ELECTRIC, LLC

- Residential - Commercial -



Scott Eastman, Master Electrician

• Insured & Licensed in VT & NH •

- 603-989-5941 -

romex103@yahoo.com 446787

A SOLAR
POWERED
COMPANY



Meara Solar

• INSTALLATIONS • SALES • SERVICE • DESIGN •



**Congratulations
Hanover, NH
100% Renewable!**

**Roof Mounts,
Ground Mounts
Trackers**

**GRID-TIE, OFF-GRID, GRID-TIE
BATTERY BACKUP SOLUTIONS**

802.522.2381

• Federal Tax Credits •

www.omearasolar.com • omearasolar@gmail.com

Serving Orange County, VT, Grafton County NH, & the surrounding areas

Power When the Grid Goes Down

By N.R. Mallory



Power lines downed by storms are an all-too-familiar sight lately. Wikimedia Commons.

If you have, or plan to have, a solar photovoltaic system, it is important that you address the question of what will happen when the grid fails. Without planning specifically for grid failure, most net-metered systems will not produce power when the grid is down.

The recent power outages in both Vermont and New Hampshire from high winds and heavy rains have reminded many of us of how vulnerable we are. Hurricane Irene showed us we do not have to live near the ocean to lose power. Numerous ice storms and blizzards have underscored that fact.

In my neighborhood of Bradford, Vermont, neighbors had to put in emergency generators to just keep their food cooled, to be able to use their heaters and cook, and run a few lights – and the generators filled the neighborhood with noise and pollution. Many did not have enough power from the generators to provide water to drink and flush toilets. Some families were prepared, but not all, for an outage that lasted for over four days. It was worse for some residents of Bath, New Hampshire, where the outage lasted another week and more.

Generators which burn fossil fuels certainly helped some people, but most people feel that living with noise and pollution can quickly get difficult. Generators also depend on fuel availability. In a bad storm, the roads could be cut off, making getting fuel difficult. If supply trucks cannot get through, no one has fuel.

In Houston, things are still not back to the old normal. Parts of Puerto Rico might have electric outages lasting over a year. This

year, there were four record-breaking hurricanes in eight weeks. We are moving into a new normal. Climate change is happening, and resulting storms will increasingly shut us down.

As we move into a time of increasingly bad storms, things are expected to be worse in the Northeast, according to researchers at the University of Massachusetts, Amherst. (See the Green Energy Times article of February, 2017, Climate Research News from UMass, <http://bit.ly/GET-Umass-research>).

Through the recent storm, the home office of Green Energy Times continued working on its battery-backed, off-grid solar system without pause. Neighbors with solar power and gasoline generators came by to get water for drinking and cooking, because their systems could not power their pumps.

For a person with solar power, a battery backup system does represent an additional cost, but it is not necessarily high. Checking available incentives, including those from power companies, may be very helpful. For example, Green Mountain Power offers a special program that makes it possible for customers to lease Tesla Powerwall batteries for only \$15 per month.

We would not suggest that people should rely entirely on solar power and batteries. A good solar system includes a generator for emergencies. But with solar power and batteries, emergencies come more rarely. I have one, and I run it periodically to make sure it is always ready. But I have also gone for periods lasting years without any power interruptions. ☺

THE COST OF DENIAL

Cont'd from p.1

plateaued in 1998, by the way, can clearly be seen to be a fraud by anyone who actually looks at the figures. 1998 smashed the previous record, but new records were set in 2005, 2010, 2014, 2015, and 2016. You would have to be wearing a blindfold to fail to see the pattern.

The cost of the damage has been increasing dramatically with increased violence in storms. Hurricane Harvey produced about 60% more economic damage than the previous record, set by Hurricane Katrina. Only two weeks later, Hurricane Irma set a record as the most powerful storm on record to have formed in the Atlantic, outside of the Gulf of Mexico and the Caribbean. Only two weeks later, Hurricane Maria came along, more powerful than either of those, and caused the longest extensive power outage in the history of the United States. Only two weeks after that, Hurricane Ophelia was the first major hurricane ever to have formed in the eastern Atlantic; it hit Ireland with 119 mph winds.

Denial comes in numerous forms. For climate change denial, one form says it is not happening. The Trump administration has mostly stopped doing that, and this may be in part because the decision on whether climate change is happening has already been made in federal courts.

Another form of climate denial says that it is not caused by human beings. For example, over a ten year period, aeronautical engineer Willie Soon published a series of papers in peer-reviewed journals of astrophysics saying that climate change was caused by the sun. These papers were reviewed primarily by astrophysicists, not by climate or weather scientists. They ignored the easier, long predicted explanation that climate change is caused by human beings.

Climate science has been around a long time. Climate change due to carbon dioxide emissions was first predicted in 1824 by Joseph Fourier. It was described quantitatively by Svante Arrhenius in 1896. The science behind it was developed over a thirty year period beginning in 1930 by Guy Stewart Callendar. By 1960, a scientific basis had been built.

The first president of the United States who was warned about the problem was Lyndon Johnson, who was given the information by scientists in 1966. While it was not public knowledge by that time, it was known to other scientists.

We have no way of knowing when they warned the board of Exxon about it, but the evidence we have seen in the press indicates that they hired their own scien-

tists to look into the matter sometime in the 1960s or 1970s. An article in Scientific American, "Exxon Knew about Climate Change Almost 40 Years Ago," appeared in December of 2015.

In June of 1988, Dr. James Hansen, the head of NASA's Goddard Institute for Space Studies, testified before Congress that climate change was already under way and threatening.

Since that time, there has been a lot of denial financed by the fossil fuel industry and the people who have invested in it.

A third type of denial says that global warming is real and that human beings may be causing it. It goes on, however, to say that this could be a good thing. And that, unfortunately, is what seems to be happening in the Vermont State House.

Vermont Governor Phil Scott recently told reporters that climate change could turn out to be an "economic boon" for his state. "Climate change is going to happen. It's happening," he said. He acknowledged that it would cause problems for other parts of the country, and for the world. "We're seeing wildfires in California," he said. "It makes Vermont look pretty good."

I guess that means that Phil Scott puts no value on the famous Vermont ski industry,

Cont'd on p.20

SAXTONS RIVER SOLAR ELECTRIC



- Local, family-owned
- Design
- Installation
- Service for Residential & Commercial
- Elite Installer of Fujitsu Heat Pumps

We will answer your call, meet your budget and build your project.

Prioritizing Life Cycle Environmental Costs, EU and USA Components

802-869-2588 *Serving Southern VT and NH*
802-490-0640

saxtonsriversolar.com
srsolar@comcast.net



Renewable energy does not mean continuous energy. Therefore, you must have dependable, reliable batteries...

Rolls, the World's Best.

- Unsurpassed cycling
- Industry's largest liquid reserve
- 10 & 15 year average life span*
- 7 & 10 year warranties*

* 4000 Series - 7 yr warranty / 5000 Series - 10 yr warranty

Authorized **Rolls** Battery Dealer
www.raestoragebattery.com



MANY NEW MODELS AVAILABLE

Phone 860.828.6007 Fax 860.828.4540 POB 8005 Berlin, CT 06037

"A Trusted Partner for ALL Your Renewable Energy Options."

Home Heating and Solar




Sales • Service • Installation

79 Emerald St., Keene, NH 03431
603.358.3444
www.greenenergyoptions.com

MONTPELIER IS FINALIST IN NATIONAL COMPETITION



Georgetown University Energy Prize recognizes top-performing communities for increasing energy efficiency, reducing municipal and household energy budgets

WASHINGTON, D.C. – Montpelier, Vermont, is among 10 cities and counties that have advanced to the final round of the Georgetown University Energy Prize (GUEP), a national competition to rethink the way America's small- to medium-sized towns, cities, and counties use energy. Montpelier has already saved almost 60 billion BTUs of energy, and reduced carbon emissions by 1,685 metric tons.

On November 21, 2017, the Energy Prize announced the 10 communities who have advanced to the final round of the competition. Montpelier is among the highest performing communities in the nationwide, multi-year competition based on total energy savings per household. In December, a panel of judges representing academia and industry will evaluate each community's approach to innovative, replicable, scalable energy efficiency programs and will select a winning community based

"Our goal is to become the first state capital to produce or offset all of its energy needs from renewable energy sources by 2030."

on a combination of energy performance scores and the advancement of new best practices over the course of the two-year energy-saving period. The final stage of the Energy Prize will be led by Uwe Brandes, faculty director of the master's program in Urban and Regional Planning at Georgetown.

"Montpelier is at the forefront of a nationwide competition to bring together communities with a shared goal of reducing energy consumption," said Energy Prize executive director Uwe Brandes. "Our ten finalists have achieved impressive energy savings and reduced municipal and household energy budgets. They serve as models for other communities across our country and have offered innovative energy-saving strategies that can be replicated and scaled."

"Despite being one of the smallest communities to participate in the Georgetown University Energy Prize, Montpelier

has shown that a small city can have a big impact and lead the way towards net zero energy for rural communities across the country," said Kate Stephenson of the Montpelier Energy Advisory Committee. "Looking back at what we have accomplished over the past few years, it's impressive."

She noted that the city has connected over 20 buildings to district heat, installed one megawatt of municipal PV solar, drafted a new city energy plan, held a design competition for the downtown, audited the city's municipal building stock, launched a revolving loan fund for energy projects, and engaged thousands of residents and business owners with outreach. Stephenson added, "Montpelier is on a path to net zero by 2030, and being named a finalist for the GUEP is great recognition for the work we've done."

Montpelier's Mayor John Hollar said, "This is an important recognition of the progress the city has made towards becoming Net-Zero Montpelier. It also is an acknowledgement of the city's commitment to meet this goal."

community have supported Montpelier's efficiency effort, understanding it's good for the environment and good for the economy.

Since 2014, 50 cities and counties across the U.S. have worked to reduce their energy consumption. At the end of 2016, these communities had collectively saved 11.5 trillion BTUs of energy, reducing their carbon emissions by an estimated 2.76 million metric tons—the equivalent of taking one car off the road for every 30 minutes of the competition—and saving nearly \$100 million from municipal and household energy budgets.

- To reduce their energy consumption, the communities:
- implemented bold new local policies on energy transparency, energy savings, and clean energy technology;
- conducted deep "data-mining" of their energy use and community infrastructure;
- focused on increasing energy efficiency in neighborhoods with high energy use in all income brackets;



Net Zero Montpelier team members gather at the Log Rd 500-kW array in Montpelier, that was completed in 2017. Photo: John Snell.

"Montpelier's strong record on energy efficiency and a move to renewables proves that small communities can be national leaders on this front," said Montpelier City Manager William Fraser. Fraser said residents, city councils and the business

- created novel financing mechanisms to enable their residents to invest in new energy upgrades; and
- used radically new and different approaches to support behavior change, including gamification and the latest methods in social

Cont'd on p.19

Free Fuel Delivered Daily.

Call today for a free site assessment & estimate.
802-728-3600

Local Team.

Deep Experience.

Vermont Values.

Off-grid and grid-tied systems for:
Camps • Homes • Farms
Communities • Businesses



**CATAMOUNT
SOLAR**
Endorsed by the Sun

Vermont's Employee-Owned Solar Company info@catamountsolar.com

**A Vermont Contractor With 45 Years of
Providing Quality Solutions to Customers**



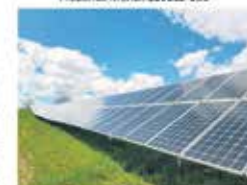
**Building
Vermont's
Energy
Future Now!**



PV Installation
Professional

Frederick Merick 110112-100

Nationally Ranked Solar Power World Top 100 Installer



Residential | Commercial | Industrial | Solar, Energy Storage & EV Charging

802-658-3378 | Solar@peckelectric.com | www.PeckSolar.com | S. Burlington, VT

Funding Available for NY Communities To Implement Clean Energy Programs

By Joanne Coons

NYSERDA's (New York State Energy Research and Development Authority) Clean Energy Communities Program (CEC) offers a local opportunity to engage in energy savings, cost savings, create jobs and improve the environment. The program is clear to follow, offers motivating technical assistance and a handsome prize awaits the community at the end of the path which also keeps you on goal.

Local governments across NY State can apply. They need to complete four out of 10 "high impact actions," and along the way they will be assisted by a Regional Clean Energy Communities coordinator that works closely with their regions to offer guidance in the form of helping to prioritize clean energy goals, access templates for legislation and other documents and basically hold the community's hand and promptly answer any questions they



may have. Documentation is surprisingly fast and easy to fill out unlike other programs and grants.

The ten high impact action steps are:

1. Benchmarking - Adopt a policy to report the energy use of buildings.
2. Clean Energy Upgrades - Achieve 10% reduction in greenhouse gas emissions from buildings.
3. LED Street Lights - Convert streetlights to energy efficient LED technology.
4. Clean Fleets - Install electric vehicle charging stations or deploy alternative fuel vehicles.

5. Solarize - Undertake a local solarize campaign to increase the number of solar rooftops.

6. Unified Solar Permit - Streamline the approvals process for solar.

7. Energy Code Enforcement Training - Train compliance officers in energy code best practices.

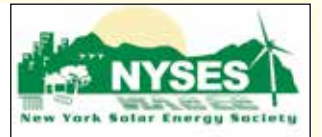
8. Climate Smart Communities Certification - Get certified by the NY State Department of Environmental Conservation.

9. Community Choice Aggregation - Put energy supply choices in your community's hands.

10. Energize New York Finance - Offer energy upgrade financing to businesses and non-profits.

Step one is for the community to sign up online, at which time they will be put in touch with their friendly, knowledgeable and helpful CEC coordinator. NY State is divided into ten regions, each having an expert coordinator. Communities are designated as either small, under 40,000 population, or large, over 40,000. There are 281 participating communities, 119 communities are designated which means they successfully did four out of 10 action steps. There have been 761 actions completed which indicate that many of

Bringing
G.E.T.
to NY!
nyses.org



the participating communities are well on their way to being designated. The prizes for designation are divided into blocks 1 and 2 and also large and small communities. Prizes range from \$250,000 to \$50,000 of grant money that is available according to what size community and which block (round) you are participating in. The prize is actually an opportunity to apply for the allocated grant money with a clean energy project idea for up to that amount. This must be done within three months of designation. The CEC coordinator from your region will hold your hand through this process to ensure success.

Mohawk Valley and North Country are the two regions that have the most remaining award money available.

This program is refreshing, easy, and a no-nonsense government benefit that is good for the community by reducing carbon and allows the community to be more fiduciary responsible.

Joanne Coons is an adjunct professor at Hudson Valley Community College, TEC-SMART facility teaching PV Theory and Design. She organizes Capital Region NYSES (New York Solar Energy Society) monthly meetings and is a member of the Town of Clifton Park GREEN Committee. ☕

Ten Action Steps for Sustainability

By Joanne Coons

Judith Enck, former Environmental Protection Agency (EPA) Regional Director under President Obama, gave the keynote address at the 2017 Renewable Energy and Sustainable Living Fair on Saturday, October 28, 2017 in Rensselaer, NY. With over 500 people in attendance, the presentation was a breath of fresh air which proved a motivational and informative call to action.

Judith Enck suggested ten action steps to take to promote sustainability:

1. Call Senator and House Members – ask them to pass the next supplemental budget item allocating money for renewables.
2. Ask congress not to cut the EPA budget.
3. Ask institutions to divest from fossil fuels.
4. Write thank you notes to organizations that support litigation (including Earth Justice, Sierra Club, the Natural Resources Defense Council, The Center for Biological Diversity, Greenpeace, The Alaska Wilderness League, and The Wilderness Society).
5. Support local media (no matter how small a donation, it all helps, vote with your dollar!)
6. Write well-written letters to the editor.
7. Use social media, especially Twitter.
8. Run for office.
9. Make sure your pension divests from fossils fuels.
10. Watch Fox News (to understand where opposition is coming from, so you can disarm it).

The event was one-stop shopping for information and products from more than fifty different organizations as vendors tabling and presenting workshops. Topics ranged from solar energy to composting and sustainable living. They included solar installations on your home, community solar, purchasing electricity through a re-



Judith Enck gives the keynote address at the Renewable Energy and Sustainable Living Fair in Rensselaer, NY on October 28, 2017. Photo John Ciovacco of Aztec Geothermal, LLC.

newable energy supplier, and a Google offshoot that makes geothermal heating and cooling installations more affordable. There was information on green and zero energy building techniques, heat pumps, Tesla's wall-mounted storage battery, replacement windows, energy-efficient products, and how to invest your money in sustainable businesses.

In addition there were thirty non-profit organizations with information about bicycling options in New York's Capital District, how to sign up for a NYSERDA energy audit, how your town can become a "Climate Smart Community," the best ways to compost, environmental justice, lobbying for a carbon tax, biomass heating, the power of Community Choice Aggregation, making healthy soil, recycling, raising and saving bees, HVCC's Clean Energy Management Program, Green Energy Times, and local climate advocacy organizations.

Joanne Coons is an adjunct professor at Hudson Valley Community College, TEC-SMART facility teaching PV Theory and Design. She organizes Capital Region NYSES (New York Solar Energy Society) monthly meetings and is a member of the Town of Clifton Park GREEN Committee. ☕

Keep Your Solar Installations Tax-Free in NY

WARNING TO NY SOLAR USERS: CHECK YOUR SOLAR TAX STATUS

It has come to our attention that some town boards in New York State have voted to eliminate the tax exemption from RP 487, or may not have submitted your form RP 487 to the state authorities.

This could have the effect of discouraging solar installations and can also discourage people and businesses from moving to such an area.

If you currently have a solar energy system, call to make sure your town isn't about to change their law. You can submit a NY Tax Exemption Form RP 487 to get grandfathered into the tax exemption of your system. Form RP 487 is filed with the local property assessor.

If you are about to buy a solar energy system, call your tax assessor to check the solar tax status.

Opting out is another option. Some municipalities and school districts have opted out and will include the value of the solar in their property tax assessment without the exemption. For a list by county of communities and school districts that have opted out go to <http://bit.ly/NY-opted-out-list>. ☕

HARVESTING THE SUN SINCE 2008

REVOLUTION SOLAR

HARVEST THE SUN!!!
CALL US FOR A FREE SITE ANALYSIS

RESIDENTIAL, COMMERCIAL + FARMS
YOUR LOCAL INSTALLER
NABCEP CERTIFIED
INCENTIVES AVAILABLE

607-441-0367
24 S. Main St. Milford, NY

REVOLUTIONSOLAR.NY.COM

NH Solar Shares Over the Top

PLYMOUTH, NH – A matching grant of \$10,000 from the New Hampshire Electric Co-op Foundation will allow NH Solar Shares to break ground on its first solar photovoltaic (PV) array that will share renewable energy with low-income families.

The inaugural Solar Shares array will be built in Plymouth, NH on land donated by The Common Man Family of Restaurants, to the right of the Frosty Scoops ice cream stand on North Main Street. It will consist of three or four pole-mounted solar arrays serving as shade for the customers as well as a solar picnic pavilion.

The Plymouth Area Renewable Energy Initiative (PAREI) has partnered with New Hampshire Electric Cooperative (NHEC) to create NH Solar Shares, which aims to build small-scale solar arrays in one commu-



nity at a time using local volunteers, donations and charitable foundation grants.

The majority of the PV electricity will be credited directly to the electric bills of low-income families living in the region of the solar PV array. When the first array is built, NH Solar Shares will be recommended to families through established social service organizations and programs where income verification has already taken place. Solar Shares will be a voluntary program to which families will apply individually. In addition to wanting a portion of their power to be offset by solar energy, these families must also possess an interest in taking part in an energy education program.

Under the leadership of PAREI Co-Director Sandra Jones, NH Solar

Cont'd on p.35

**PLYMOUTH AREA
Renewable Energy
INITIATIVE**

Providing services that help communities and families plan for their energy future

79 Highland Street, PO Box 753
Plymouth, NH 03264
603-536-5030
www.plymouthenergy.org
www.nhsolarshares.org

ALBERT DUCHARME

**NABCEP
certified**

Solar Thermal,
Electric, Whole
house heat

Ecological
Design & green
building

**SNOW
DRAGON
SOLAR**

DESIGNER

Consultations
Installations
Full Design
&
Green Building
Construction
Packages

albert@snowdragonsolar.com 603-630-3003

Solar Electric (PV)

Why Pay For Electric?

Milhouse Enterprises

603-300-2943

SEIA
Solar Energy Industries Association®

solar edge
Authorized Installer

Schneider Electric
Authorized Installer

Enphase
Preferred Installer

SolarWorld
Authorized Installer

❖ Grid-Tied Systems
❖ Battery Backup Options
❖ Self-Install Kits
❖ Complete Off-Grid Solutions
❖ Residential & Commercial

✦ Best Warranty & Service in NH since 2006 ✦
✦ Call us Today for a Free Estimate! ✦

MADE IN U.S.A.

energy emporium

Your Renewable Energy Resource Center

Design, Installation and Service

30% federal tax credit - ask us about rebates

Visit our zero energy resource showroom

Solar Hot Water • Solar Electric • Solar Heating

603-632-1263
www.energyemp.com

Solar Electric and Hot Water Combination

Solar Electric Ground Array

Happy Holidays

the **MELANSON** company, inc.
SINCE 1932

Download the Sun - Clean, Reliable Solar Energy

Reduce Your Carbon Emissions

Choose the company with over 15 years of solar experience and over 80 years of roofing experience.

SOLAR SOURCE

Commercial & Residential Solar Specialists

the Melanson co, inc.
www.SolarSourceNE.com ~ 603-352-4232

www.kwmanagement.com

KW MANAGEMENT Inc.

55 Lake Street
Nashua, NH 03060
(603) 598 - 0181

Renewable Energy Systems

Commercial, Municipal & Utility

Design & Installation

Geothermal Heat Pumps

Energy Systems

Over 20 Years Experience

In Photovoltaics & Energy Conservation

Andover Town Offices Move Toward Net Zero

By George Harvey

Andover, New Hampshire, a town of almost 2,400 people, has a long commitment to conservation. It has been thirty years since an ordinance was brought before the town meeting to make recycling mandatory. It passed unanimously.

Readers of Green Energy Times may recognize Andover as the home of Proctor Academy, which was featured in "Proctor Academy Continues to Blaze Sustainable Path," (<http://bit.ly/GET-Proctor-Continues>). That article, which appeared in December of 2016, described the school's dining hall, which has net-zero energy usage.

Recently, people of the town started to consider energy use in a building shared by the town offices and the library. It was built in 1885 and expanded in 2001. In 2011, it was given an energy audit funded with a grant through the New Hampshire Local Audit Exchange Program and with assistance from the Jordan Institute.

In 2014, a volunteer committee, the Andover Energy Group (AEG), had led a successful solarize program in the town as part of Solarize Kearsarge. It was natural for the AEG to turn its attention to the audit's recommendations. With leadership from Randall Costa, and the support of the town's select board, the AEG created a four phase plan to make the building as close to net-zero for energy as feasible.

The first step would be insulation and air sealing. For the second, all lights would be replaced with LEDs. The third step was to install air-source heat pumps. Finally, the building would get a solar array for electricity.



Andover town office building. Photo by Larry Chase.

The first two steps were implemented rather easily. The New Hampshire Electric Cooperative (NHEC) helped with incentives, reducing the cost for both to \$5,600. This could be covered by the building's capital improvements fund, and work began in the fall of 2016. The insulation and sealing work was performed by Shakes to Shingles based in Concord, NH, and the LED replacement was completed by EcoElectric LLC from Plymouth, NH.

NHEC also helped with incentives that kept the cost of two air-source heat pumps and five distribution units

to slightly less than \$10,000, for which EcoElectric made the lowest bid. This expenditure, however, had to go before the town meeting.

After conducting diligence on a solar system, the AEG worked through a power purchase agreement (PPA) for a roof-mounted system covering the building's projected needs with ReVision Energy. The PPA would reduce the town's electric bills immediately and required minimal capital outlay, and the town would be able to buy the system after six years. But this system also had to be put before the

town meeting.

The AEG produced a presentation for the town showing that running heat pumps was much less expensive than heating with fossil fuels and would improve the building's working environment. With a solar array with a PPA from ReVision, even greater cost cutting was possible.

The Andover town offices and library would retain one link to the fossil fuel age. It would retain its oil-fired heating system as a backup for the coldest times of winter and to maintain heat during power outages. This approach would shorten the payback period on the heat pumps, while still bringing the building very close to net-zero.

At the town meeting in March, Andover's voters voted strongly to adopt the AEG plan. The whole plan was executed by October, just about a year from the time the project started.

The solar installation is worth describing. It has 68 panels for a total capacity of 20.4 kilowatts, and is conservatively expected to save the town over \$50,000 over its first 25 years of service. Because of the layout of the roof, 40 panels face south; the rest of the panels face east or west but will get sunlight for the best part of the day.

"We are thrilled that the project is complete and already protecting the town from fuel cost swings and improving the quality of the town offices' environment. But just as importantly," Costa said, "we are excited that every member of the community can participate in and join us in learning from this project – the town offices belong to everyone, and everyone can now see in real time and in their own lives how energy and carbon savings can really work!" ☀

TAKE ADVANTAGE OF THE 30% FEDERAL TAX CREDIT



Spring will be here before you know it. Now is a good time to get on our 2018 Installation Schedule!

SOLAR
PHOTOVOLTAIC
DESIGN • INSTALLATION

Buy Solar locally, from a family owned and operated business since 1991!

Frase
ELECTRIC
Sundwich, NH
284-6618
FREE ESTIMATES

Kim Frase - NH Lic #4146
789 Whittier Highway | South Tamworth, NH
284-6618 | c: 387-0873
kim@fraseelectric.com

For More Information
284-6618 • www.fraseelectric.com



A smarter way to heat and cool
POWERED BY SOLAR

Use solar to heat and cool your home!
REVISIONENERGY.COM // 866.700.6065



U.S. RENEWABLE ELECTRICITY GROWS 14.7% AS FOSSIL FUELS AND NUCLEAR FALL

U.S. Renewable Electricity Grows 14.7% as Fossil Fuels and Nuclear Fall

For first three-quarters of 2017, Energy Information Administration's (EIA) data show:

- Renewable electrical production up 14.7%
- Biomass, geothermal, hydro, solar, and wind energy all increase
- Coal, natural gas, oil, nuclear power all decrease
- Renewables provide 17.8% of total U.S. generation as solar reaches 2% and wind is 6%

According to the latest issue of the U.S. EIA "Electric Power Monthly" report (with data through September 30, 2017), U.S. electrical generation from renewable energy sources (i.e., biomass, geothermal, hydropower, solar - including distributed solar, wind) rose by 14.69% during the first three-quarters of 2017 compared to the same period in 2016.

Simultaneously, electrical generation by fossil fuels and nuclear power combined declined by 5.41%. Nuclear power and coal both dropped by 1.5%, natural gas (including "other" gas) was down by 10.7%, and oil (i.e., petroleum liquids and petroleum coke) plunged by 17.1%.

For the year to date, electrical generation by utility-scale solar (i.e., solar thermal and photovoltaic) plus small-scale solar photovoltaic rose by 43.2% and is now providing almost 2% of total electrical generation. For perspective, solar has

more than doubled its generation since 2014. It has surpassed biomass and is now providing nearly four times the combined electrical output of oil and other petroleum-based sources.

All other renewable energy sources showed positive growth as well: electrical output from hydropower grew 15.0%, wind by 11.5%, geothermal by 2.9%, and biomass by 1.6%. Together, electrical generation by non-hydro renewables is now nearly 10%. Wind alone is nearly 6%.

Overall, renewables accounted for 17.78% of domestic electrical generation during the first nine months of this year - up from 15.13% a year ago. Meanwhile, nuclear provided 19.57% and fossil fuels 62.50% (i.e., gas-31.94%, coal- 30.05%, oil-0.51%); the balance (0.16%) was from pumped hydro and other sources.

"It's no wonder congressional tax writers are seeking to undermine renewable sources while the White House contemplates tariffs to put the brakes on solar's growth," said Ken Bossong, Executive Director of the SUN DAY Campaign. "The dirty energy sources they favor are rapidly losing ground and costly subsidies for fossil fuels and nuclear power are their only option for survival."

EIA released its most recent "Electric Power Monthly" report on December 1st. The full report may be found at: <https://www.eia.gov/electricity/monthly>. The most relevant data cited in this advisory may be found in, or is derived from <http://bit.ly/EIA-monthly-table>.

Distributed Wind Energy Zoning and Permitting:

A Toolkit for Local Governments

The Clean Energy States Alliance (CESA), a national nonprofit coalition of public agencies and organizations working together to advance clean energy, has published a free toolkit to help local governments and planning agencies facilitate the efficient and appropriate development of distributed wind in their communities.

Learn more and download the free toolkit at:

<http://bit.ly/Distr-Wind-Toolkit>.

More about CESA is at: <http://bit.ly/Clean-Energy-Sts-Alliance>

The SUN DAY Campaign is a non-profit research and educational organization founded in 1992 to aggressively promote sustainable energy technologies as cost-effective alternatives to nuclear power and fossil fuels. ♻️

Green Energy News You May Have Missed

Cont'd from p.2

several weeks after it was originally scheduled, so the company could put efforts into helping Puerto Rico recover from hurricanes. During the show, Elon Musk abruptly stepped off of the stage, and a new Tesla Roadster drove on, making it a double unveiling.

A number of airplane manufacturers are working on electric aircraft. Airbus, Siemens, and Rolls-Royce, are now collaborating on the development of a hybrid electric aircraft engine, the companies jointly announced. They plan to have a demonstration aircraft ready to be witnessed publicly in 2020, after they have concluded tests.

When fires hit the vineyards in northern California, one vineyard was notably spared. It had to be abandoned by its workers, as the fire neared. But it had a solar-powered micro-grid, which the workers were able to continue running over the internet via satellite. It powered irrigation pumps, which provided trees and vines with water, so they could resist burning.

Puerto Rico suffered devastation from Hurricanes Irma and Maria, and the federal government recovery efforts were barely underway when it was ended by leadership in Washington. A number of private organizations have taken the lead in those efforts, including Tesla and German battery maker Sonnen.

Tesla fulfilled a promise by Elon Musk to build a 100-megawatt, 129-megawatt hour battery in South Australia in 100 days. The new battery will help with grid stability. The battery is the largest in the world. It has nearly twice the combined storage capacity of all grid batteries installed in the United States in 2015, the year with the greatest amount of US battery installations.

Tesla's battery in South Australia may be big, and it may have been put in quickly, but Hyundai announced that it was putting in a battery 50% larger and would have it built faster. Hyundai's battery is being installed near the coast of South Korea in Ulsan.

A research report from the Imperial College in London examined the possibility of powering the trains in the United Kingdom with solar photovoltaics. It concluded that all the trains in the UK could get all their power from photovoltaics sited along the tracks and at substations.

Devastating wildfires fueled by climate change are "the new normal," California Governor Jerry Brown said. He continued, "We're facing a new reality in this state," and said they could happen "every year or every few years." He made the comments after surveying damage from a 180-square mile fire in Ventura County, north of Los Angeles. The fire has grown to be bigger than the city of New York.

A study published in the journal Nature has warned that the worst-case predictions regarding the effects of global warming are the most likely to be true. It said that if emissions follow a commonly used business-as-usual scenario, there is a 93% chance that global warming will exceed 4°C by the end of this century. That is double the increase allowed under the Paris Climate Agreement.

Omaha Saving \$ by Switching From Nukes to Wind

By George Harvey



Fort Calhoun, Omaha, Nebraska during a flood in 2011 (US Army Corps of Engineers photo)

On August 26, 2016, the Omaha Public Power District (OPPD) announced that it would close the Fort Calhoun nuclear power plant, which had a rated output of 476 megawatts (MW). It had been in operation since 1973, and its original 40-year license had been extended for another 20 years.

The reason OPPD decided to close the plant was a matter of simple economics. It was not making money and keeping it open would require an increase of 2.5% in electric bills for ratepayers. OPPD decided there were better alternatives and notified the Nuclear Regulatory Commission that the

plant would cease operations on Oct. 24th.

Electric demand has fallen in many parts of the country because of efficiencies. For this reason, it was not necessary to replace the full 476 MW of the Fort Calhoun plant. OPPD indicated that it was interested in replacing the nuclear plant, which had a considerably lower carbon footprint than natural gas, with 400 MW of renewable power. Since the plant is in a state with great wind resources, the utility was interested in contracting for a power purchase agreement (PPA) for wind power.

It did not take very long for OPPD to

negotiate a PPA. It announced in mid-December that it had contracted for 400 MW of wind power from the Grande Prairie Wind project, which is owned by BHE Renewables, a unit of Warren Buffett's Berkshire Hathaway Energy. The project is on 76,800 acres in Holt County, Nebraska, and has 200 Vestas turbines.

There are a couple of observations that should be made about these proceedings. Possibly the most important is that nuclear power, which had so long been considered one of the least expensive ways to produce electricity, has been replaced with wind power, which many people still seem to think is too expensive. Current data indicates that both ideas are quite wrong.

Perhaps the most quoted current source for comparing electricity prices is Lazard's Levelized Cost of Energy Analysis, Version 10.0, which compares costs, including regular subsidies and incentives (<http://bit.ly/Lazard-LCOE-10>). According to Lazard, the levelized cost of wind power is \$32 to \$62 per megawatt hour (MWh), and the cost of nuclear power ranges from \$97 to \$136 per MWh. Even with backup power and purchases to cover power not delivered during calm times, wind power is very much less expensive than nuclear.

The second observation we might make is that nuclear power, which is baseload electricity, is being replaced by wind power, which is variable. The short explanation of this is that the replacement is easier than many people might realize. It happens that baseload power requires backup regularly, just as intermittent and variable sources do. The idea that we cannot go without baseload generation is itself a sort of myth. ♻️



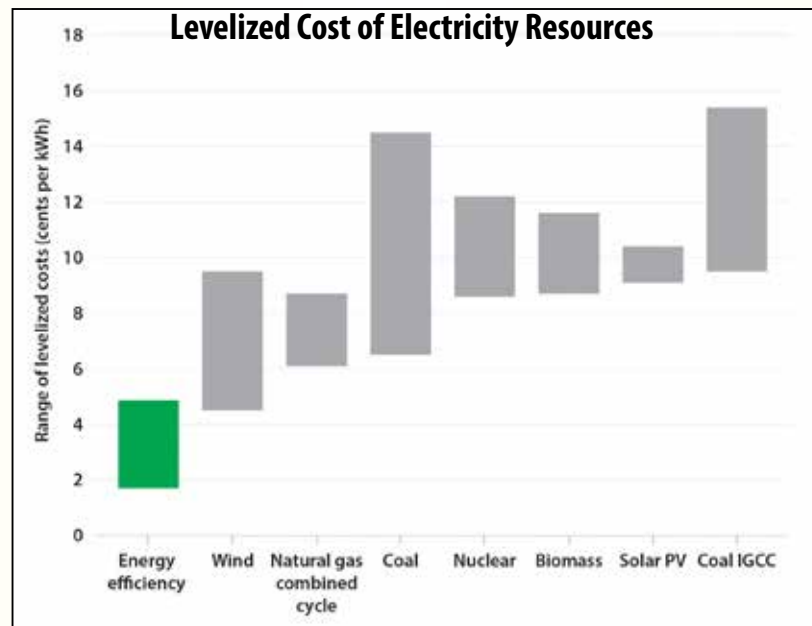
ACEEE Report: New data, same results SAVING ENERGY IS STILL CHEAPER THAN MAKING ENERGY

By Annie Gilleo, Senior Manager,
State Policy, ACEEE

Keeping the lights on for customers is every electric utility's top priority. To do so, utilities have choices. They can build power plants to convert fossil fuels to energy. They can capture renewable resources like solar and wind. And they can work with their customers to more efficiently use energy, meeting demand by saving energy rather than generating it.

ACEEE research has shown a dramatic growth in energy efficiency's role in the electric sector. We estimate that today it's the United States' third largest electricity resource - contributing more to our grid than nuclear power. But it's not just one of our most common resources, it's also typically the lowest-cost way to meet customers' energy needs. New data by Lazard on levelized costs of electricity supply resources released in November 2017 confirms that by helping customers install efficient appliances, insulate their homes and buildings, and refine operations and maintenance practices, utilities are still investing in the lowest-cost energy resource out there.

Energy efficiency investments aimed at reducing energy waste cost utilities two to five cents per kilowatt hour (an average of about three cents), while generating the same amount of electricity from sources such as fossil fuels can cost two to three times more.



*Notes: Energy efficiency data represent the results of this analysis for utility program costs (range of four-year averages for 2009-2012); supply costs are from Lazard 2013.

It isn't a surprising result that energy efficiency continues to stack up as the lowest-cost resource. Recent research from ACEEE found that even among utilities achieving the highest

levels of electricity savings from efficiency, the cost of saved energy has remained consistently low. Lawrence Berkeley National Laboratory (LBNL) has found similar results.

GOLD SUSTAINING SPONSOR



Investments in energy efficiency can have a big effect. In fact, the investments we've made in energy efficiency between 1990 and today have helped us to avoid building the equivalent of 313 large power plants and have delivered cumulative savings of nearly \$790 billion to customers across the country.

Energy efficiency has a host of other benefits, too. It's clean, readily available, and reliable. It can increase comfort in homes and offices, and spur economic development in cities and towns. Utilities that invest in energy efficiency do so because it makes financial sense for them, but the payoffs accrue to everyone.

For more on the cost of energy efficiency, see ACEEE research including The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs (<http://aceee.org/research-report/u1402>) and Big Savers: Experiences and Recent History of Program Administrators Achieving High Levels of Electric Savings (<http://aceee.org/research-report/u1601>).

About ACEEE: The American Council for an Energy-Efficient Economy acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors. For information about ACEEE and its programs, publications, and conferences, visit aceee.org.

What the End of Oil Looks Like

By Randy Bryan

I was driving around town a month ago (windows still open) with a noisy truck on one side and a motorcycle on the other. So my mind wandered again to thoughts of what our life will look like as electric vehicles proliferate and gas and diesel vehicles dwindle. It's a strange preoccupation, what with electric vehicles being just 1% of the cars on the road, and fuel vehicles being 99%. But, more progressive societies are making plans for this change, so the time seemed right to share my thoughts.

A perfect storm of trends is converging toward electric drive over the next five to ten years which will disrupt the transporta-

tion business in a big way. For instance:

The costs of 100 years of polluting cars and utilities are becoming ever more visible and expensive.

Battery prices are improving steadily (halving every four years).

Battery capabilities are improving too (doubling every six to seven years). Car range and charge times will improve.

Electric vehicles are more powerful (fun), and regenerative braking systems get some energy back (efficient).

Electric cars are easier to manufacture and need much less maintenance.

Tesla pre-sold 400,000 Model 3 electric

cars in a month (confirming market readiness).

Whole countries, states, corporations, cities are starting to mandate the restriction or end of combustion vehicles.

The major car makers are all rushing to introduce greater variety and volume of electric vehicles.

The result will be a booming market in electric vehicles over combustion vehicles. Though electric cars are more expensive now (federal tax credit helps), operating costs (e-fuel and maintenance) are much lower, so that the total cost of ownership breaks even in three to five years and favors electric drive thereafter. New electric vehicles will reach initial cost parity with combustion vehicles by 2025. Current 30

to 60 minute charge times will go to 15 to 30 minute charging, eventually to sub-15 minutes. The writing of big change is on the wall. According to modelint Morgan Stanley, annual plug-in electric vehicle (PEV) market growth of 30 to 50% is predicted during the coming decades, while overall vehicle sales stay static.

Effect on Car Industry: The disruptive speed of electric vehicle emergence has caught the car manufacturers off guard. Some started their R&D, sourcing, and market testing sooner, some delayed as much as possible. Some may have waited too long, like Volvo, Saab, Mazda and Mitsubishi who "partnered." Look for others (such as Fiat-Chrysler) to follow suit. R&D for engines will dwindle, all

Cont'd on p.36

Follow the Sun into the Future

allEarth SOLAR
PREMIER DEALER

GREENFIELD SOLAR STORE

2 Fiske Avenue
Greenfield, MA
413.772.3122
solarstoreofgreenfield.com

Quality and reliability you can count on
AllEarth Solar Trackers are American engineered and American made and come with a 10-year full-system warranty and a 25-year design life. A system that's effective and efficient every day — a system that you can count on well into the future.

Artist Christine Pellerin www.dunroaminfarm.com

BARRINGTON BREWERY & RESTAURANT

SOLAR BREWED BEER

Lunch and Dinner Daily
429 Stockbridge Road, Jenifer House Commons, Great Barrington, MA 01230
(413) 528-8282 • www.barringtonbrewery.net

FEDERAL

FEDERAL INVESTMENT TAX CREDIT

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

USDA RURAL DEVELOPMENT PROGRAM

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

Finance the purchase of renewable energy systems, and make energy improvements; energy audits. Funding is awarded on a competitive basis; grant funding cannot exceed 25% of eligible project costs and combined loan guarantees and grants cannot exceed 75% of eligible project costs.

Applicants include Feasibility studies/regular REAPs: agricultural producers and rural small businesses. Energy audits and renewable energy development assistance: local governments, tribes, land grant colleges, rural electric coops, public power entities. Grant must be used for Construction or improvements, purchase and installation of equipment, energy audits, permit fees, professional service fees, business plans, and/or feasibility studies. Find more at www.rurdev.usda.gov/NH-VTHome.html or call 802-828-6080 in VT or 603-223-6035 in NH

BIOREFINERY ASSISTANCE PROGRAM

USDA Rural Development offers opportunities to producers to develop biofuels through the Biorefinery Assistance Program. The program provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries.

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

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

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

REGIONAL

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

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

VERMONT

CLEAN ENERGY DEVELOPMENT FUND

The Small Scale RE Incentive Program, administered by Renewable Energy Resource Center (RERC), provides funds to help defray the costs of new solar thermal and advanced wood pellet heating systems. For more information: www.RERC-vt.org or call (877)888-7372

Solar Thermal Incentives – per rated capacity of system

- **Note that these incentives end on Dec. 1, 2017! Reservations by 12/1/17 have 6 mos. to be installed.**

- \$0.40 per kWh/year for residential and commercial customers
- \$0.80 per kWh/year for Special Category customers

***special customer category limited to municipalities, non-profit housing authorities, public schools., and non-profit hospitals and health care centers. All incentives are subject to availability and may change.*

Advanced Wood Heating

- Advanced wood pellet heating systems -- \$3000 per boiler/furnace
- Custom Rebate \$1.25/ft² of heated space, \$25,000 max (\$20,000 max for heating system and \$5,000 additional incentive if system includes thermal storage, \$10/kBtu thermal capacity).

- **Details at www.RERC-vt.org or call (877)888-7372**

VT TAX CREDITS

- Vermont offers an investment tax credit for installations of renewable energy equipment on business properties. The credit is equal to 24% of the "Vermont property portion" of the federal business energy tax credit from 2011 to 2016. For solar, small wind, and fuel cells this constitutes a 7.2% state-level credit for systems and for geothermal electric, microturbines, and combined heat and power systems, this constitutes a 2.4% state-level tax credit.

Tier III programs

- Additional incentive offers may be available through your local utility provider, contact your utility for more information.

EFFICIENCY VERMONT
Lighting (must be ENERGY STAR®)

- ENERGY STAR LEDs supported by Efficiency Vermont incentives available at Vermont retailers for as low as \$.95.

Home Efficiency Improvements

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

Appliances (must be ENERGY STAR)

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

Heating/Cooling

- LP/Oil boilers & furnaces - \$250 rebate*
- Select smart thermostats - up to \$150 mail-in rebate
- solar hot water - \$950 rebate post installation
- heat pump water heater - \$300-\$500 point of purchase discount
- central wood pellet boilers (excluding outside wood systems) - \$2,000

- circulator pumps - \$15-\$600 point of purchase discount
- cold climate heat pump \$600-\$800 point of purchase discount

Residential New Construction

- enroll in Residential New Construction Service – up to \$2,000 in incentives and free home energy rating and expert technical assistance throughout construction and eligible for ENERGY STAR label

- Washington Electric Coop and Vermont Gas Systems customers may also receive additional incentives (contact EV*)

Other Opportunities To Save

- Advanced Power Strips – coupons at register at participating retailers*
- Pool Pump – up to \$600 rebate on qualifying ENERGY STAR models
- Meter Loan – borrow "Watts Up" meter to measure the electric consumption of your appliances

- Commercial Refrigeration Evaporator Fan Motors - \$60-\$100 each w/ point of purchase discount

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

NEW HAMPSHIRE

Renewable Energy Incentives Offered Through the NH Public Utilities Commission

Commercial Solar Rebate Program

Category 1:

≤100 kW AC incentive levels for PV systems:

- \$0.70/watt (lower of AC and DC) for new solar electric facilities
- 0.65/watt (lower of AC and DC) for new solar electric facilities
- Expansions to existing solar systems are not eligible.

≤100 kW AC equivalent incentive levels for solar thermal systems:

- \$0.12/rated or modeled kBtu/year for new solar thermal facilities fifteen collectors in size or fewer;
- \$0.07/rated or modeled kBtu/year for new solar thermal facilities greater than fifteen collectors in size; and
- Expansions to existing solar systems are not eligible.

Category 2:

> 100 kW AC and ≤500 kW AC incentive level for PV systems

- \$0.55/Watt AC for new electric facilities.
- Expansions to existing solar systems are not eligible.

Contact CISolarRebate@puc.nh.gov or at (603) 271-2431.

Note: Category 2 may have a waitlist.

For C&I solar program details, go to: <http://www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-CI.html>

PACE

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://cpace-nh.com/index.html> for more information.

Residential Renewable Electric Rebate Program.

\$0.20/watt up to \$1,000 or 30% of system costs, whichever is lower, effective Jan. 2, 2018. <http://bit.ly/NHResidentialRebate>

Contact karen.cramton@puc.nh.gov

Residential Solar Water Heating Rebate Program

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

Commercial Bulk Fuel-Fed Wood C&I Pellet Central Heating Systems

- 40% of the heating appliance(s) and installation cost, up to a maximum of \$65,000. An additional 30% up to a maximum \$5,000 is available for thermal storage. Systems must be 2.5 million BTU or less

Residential Wood Pellet Boiler/Furnace

- 40% of installed system up to \$10k
- Must meet thermal efficiency and particulate emissions standards

Contact barbara.bernstein@puc.nh.gov

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

LOCAL INCENTIVES

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

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

NH Electric Cooperative Incentives for Electric Vehicles and Electric Car Charging Stations

- NHEC offers a \$1,000 incentive on a Battery Electric Vehicles (BEV), \$600 on a Plug-In Hybrid Electric Vehicles (PHEV), and \$300 on Electric Motorcycles.
- NHEC offers incentives on Electric Vehicle Supply Equipment (EVSE) of up to \$2,500 (only Commercial and Municipal members are eligible for incentives)
- Pre-approval is required.
- Visit: <https://www.nhec.com/>

NH Home Performance with ENERGY STAR

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

- Visit www.NHSaves.com/HPWES for more information and an online Home Heating Index calculator

NH ENERGY STAR Homes

- Incentives for new homes which meet ENERGY STAR guidelines. Incentives include
- HERS rating fees paid by the utility, rebates for ENERGY STAR lighting, appliances –up to \$4,000 based on the HERS score.
- Visit www.NHSaves.com/newhome for more details.

NHSaves Residential ENERGY STAR® certified Products Program

- Mail-in/online rebates are available toward the purchase of the following ENERGY STAR® certified products: Clothes Washers, Clothes Dryers, Room Air Conditioners, Room Air Purifiers, Refrigerators, Dehumidifiers, and Pool Pumps. For current rebate information and forms go to www.NHSaves.com/appliances.
- Refrigerator/freezer recycling is available – unit must be in working condition (10 – 30 cubic feet in size), program includes free pickup and \$30 rebate. For program requirements and scheduling information go to www.NHSaves.com/recycle.
- Instant rebates available on certain ENERGY STAR® certified LED light bulbs purchased through participating NH retailers, and instant or mail-in rebates available on ENERGY STAR® certified light fixtures (varies by retailer, see store associate or rebate form for details). For more information please visit www.NHSaves.com/lighting.
- Rebates are available only to residential electric customers of the four NHSaves utilities.

NHSAVES Online Store

- Our extensive online store offers discounted pricing for residential electric customers of the four NHSaves utilities on a large variety of LED light bulbs and fixtures, as well as offering additional products to make your home more efficient, such as lighting controls, advanced power strips, thermostats, water saving devices, and various weatherization products. Orders and product fulfillment are handled by our vendor, EFI.
- Visit www.NHSaves.com/lighting-catalog.

PAREI

- To explore the possibility of a solar installation. Plymouth Area Renewable Energy Initiative. www.plymouthenergy.org
- www.nhsaves.com

Energy Star® Residential Heating, Cooling, & Water Heating Equipment Rebate

- Rebates of up to \$500/ton on Air Source and Geothermal Heat Pumps. Rebates of \$500 - \$600 on Heat Pump Water Heaters. Rebates of \$100 on WiFi Thermostats
- Program details and application at www.NHSaves.com/heating_cooling

Other NH Electric Utility Programs

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

- Visit www.NHSaves.com/resource/ for individual utility contact information.

Business Programs

Includes programs for: small and large business, new equipment and construction, seminars, lighting incentives, and catalog, and low and no interest financing programs.

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

NH Weatherization Assistance Income-Eligible Programs

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

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

MASSACHUSETTS

Commonwealth Solar Hot Water (SHW) Programs

- Applicants must be served by National Grid, Unitil (Fitchburg Gas and Electric), Eversource or a participating Municipal Light Plant community
- Homeowners are eligible for a base rebate amount of the lesser of \$4,500 or 40% of the installed cost. The system may also be eligible to receive additional funding (“adders”) which increase the amount of the rebate. Adders are detailed in the program manual at http://files.masscec.com/get-clean-energy/residential/commonwealth-solar-hot-water/SHW_Program_Manual_Small_Scale.pdf
- Visit <http://www.masscec.com/programs/commonwealth-solar-hot-water>

MassSave Heat Loan SHW

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

Energy Efficiency

- After conducting a free residential Energy Audit, residential customers are eligible for up to \$25,000, commercial loan up to \$100k at 0% interest heat loan with terms up to 7 years to cover the following energy efficiency improvements: attic/wall-base-ment insulation, high efficiency heating systems, high efficiency domestic hot water systems, solar hot water systems, 7-day digital programmable thermostats, Energy Star replacement windows
- Available only to utility customers of W. Mass Electric, National Grid, Berkshire Gas, Nstar, Unitil and Cape Light Compact
- Visit www.masssave.com/residential/heating-and-cooling/offers/heat-loan-program Please call 866-527-7283 to schedule a free home energy assessment.

Massachusetts Solar loan Program

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

- The \$30 million program, a partnership between the Massachusetts Department of Energy Resources (DOER) and MassCEC, will work with local banks and credit unions to provide financing to homeowners interested in solar electricity. DOER's program works with banks and credit unions to expand borrowing options through lower interest rate loans and encourage loans for homeowners with lower income or lower credit scores.
- Since 2008, the solar electric industry in Massachusetts has grown into a robust economic sector with over 1,400 businesses and 12,000 workers, with enough solar electricity installed in the Commonwealth to power more than 100,000 homes.
- Mass Solar Loan will continue to grow this sector, while allowing more homeowners the ability to achieve the cost savings and environmental benefits of this clean, renewable energy source. www.masssolarloan.com. The most updated loan principal buy down rate based on household income can be found at www.masssolarloan.com/loan-support-incentives.

DEPT OF ENERGY RESOURCES

- Solar renewable-energy credits (SRECs) associated with system generation belong to the system owner and may be sold via the Department of Energy Resources (DOER) SREC 2 program. Systems sized under 10kW single phase or 25kW three phase have an extension until the new incentive program starts in 2017. Note: appropriate, approved Data Acquisition System monitoring must be utilized for PV systems >10kW in order to qualify to sell SRECs.
- Next solar incentive information can be found at <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/development-of-the-next-solar-incentive.html>
- MA State Income tax credit for residential solar hot water or PV systems are eligible for a one-time 15% off system cost, capped at \$1000 max tax credit.
- No sales tax on residential solar hot water or PV system.
- There is no increase in property tax assessment for residential solar hot water or PV systems for 20 yrs.

MA SREC II Policy

Massachusetts' Solar Renewable Energy Credits Program, SREC II prioritizes sites, by using an SREC factor based on the type of installation.

- The credits provided for energy produced by a system are calculated by multiplying the factor times a full credit value.
- Full credit is given for residential, parking canopy, emergency power, or community-based systems, or any other system of less than 25 kW.
- Larger systems get a factor of 0.9, if they are building-mounted or at least 67% of the power produced is used at the site. If a larger system meets neither of these criteria, but is built on a landfill or brown-field site, or if it is less than 650 kW, then it gets a factor of 0.8. Systems that qualify for none of the foregoing get a factor of 0.7.
- Expect changes in spring 2018.
- http://bit.ly/Mass_SREC_II.
- MA State Incentives can be found at: www.masscec.com/get-clean-energy

Woodstove Change-out Program

- The Commonwealth Woodstove Change-Out program, a partnership between MassCEC, the Massachusetts Department of Environmental Protection and the Department of Energy Resources, offers rebates to assist Massachusetts residents in replacing non-EPA-certified wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves.
- Standard rebates range from \$500 to \$1,750 per change-out, and low-income rebates range from \$1,500 to \$3,000, based on stove specifications
- http://www.masscec.com/get-clean-energy/residential/commonwealth-woodstove-changeout?utm_source=Woodstove%20Change-Out%20Announcement&utm_campaign=Woodstove%20&utm_medium=email

Electric Vehicles

- MOR-EV provides rebates of up to \$2,500 for the purchase or lease of zero-emission and plug-in hybrid light-duty vehicles. Visit: <https://mor-ev.org/>

**UP-TO-DATE INCENTIVE INFO
CAN BE FOUND AT:
WWW.DSIREUSA.ORG**

NEW YORK

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH

Welcome to the 2017 New York solar incentive and rebate information: 169 programs and incentives at: <http://dsireusa.org> (enter your zipcode) Programs and Services from NYSERDA:

- [https://www.nysersda.ny.gov/All-](https://www.nysersda.ny.gov/All-Programs)

Programs

New York State Energy Research and Development Authority.

- Business & Industry
- Communities & Governments
- Partners & Investors
- Cleantech & Innovation
- Residents& Homeowners

Home Energy Waste

Getting a home energy assessment can help you take control of your energy costs. It can identify where your house is using the most energy and which improvements would have the biggest impact on your bottom line. Heating and cooling costs frequently account for 50% of residential energy bills. Identifying your energy waste can lead to big savings.

Visit: <http://bit.ly/ny-nrg-waste>.

RENEWABLE ENERGY INCENTIVES OFFERED THROUGH NY-SUN

<http://ny-sun.ny.gov/>

NY-Sun is structured around customized Megawatt (MW) Blocks targeted to specific regions of the state. To learn more, see the Megawatt Block Incentive Structure.

The Megawatt (MW) Block Dashboard provides real time information on the status of block and current incentive levels by sector and region. Block status is updated as applications are submitted, so click the refresh button to see the current status.

- <https://www.powerclerk.com/nysuninitiative/dashboard.aspx>

Residential and Small Business

<http://ny-sun.ny.gov/Get-Solar/Residents-And-Small-Business>

Commercial and Industrial

- <http://ny-sun.ny.gov/Get-Solar/Commercial-and-Industrial>

Community Solar

- <http://ny-sun.ny.gov/Get-Solar/Community-Solar>

Commercial/Industrial PV Installer

- <http://ny-sun.ny.gov/For-Local-Government/Local-Government>

Residential/Small Commercial Solar PV Installer

- <http://ny-sun.ny.gov/Get-Solar/Find-A-Solar-Electric-Installer>

Financing Options

- <http://ny-sun.ny.gov/Get-Solar/NY-Sun-Financing>

Clean Power Estimator

- <http://ny-sun.ny.gov/Get-Solar/Clean-Power-Estimator>

Geothermal

- rebate of \$1500 per ton of installed capacity for residential/small-scale systems, \$1,200 per ton for commercial/large-scale systems up to \$5000

Electric car

- buyers in New York State can now get a rebate of up to \$2,000 on qualifying EV models from participating dealers. See <https://www.nysersda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/How-it-Works>.

Utility sponsored incentives & tips:

http://bit.ly/utility_sponsored_incentives

The Race to the Top in Home Energy Performance Data: Why It Pays to Go First



There is tremendous risk and reward to being a first mover. News that Tesla overtook Ford in market value is perhaps the most illustrative example of what's possible when innovative technologies disrupt the market.

While not all companies are set to be the next Tesla, many are placing very calculated bets on the clean energy revolution, and racing quickly to offer products or services that will open up new markets and capture significant share in existing ones. One such race is occurring in "green real estate," with the potential to change how we search for real estate, how real estate professionals market homes, and how we view the performance and value of our own properties.

More and more online real estate portals in the U.S. are rolling out home energy

scores on property listings. For example, Hotpads (a Zillow Group property, which, like others, is working with UtilityScore) and Estate.com (which recently announced a partnership with Clearly Energy) feature a home energy score. In December, Home Energy Magazine wrote about the launch of Energy realScores on realestate.com.au, which provides an instant snapshot of whole home energy performance across more than 80% of Australia's home market. Most recently, RealEstate.com launched a home energy score with data from UtilityScore for all active for-sale listings.

Now, Redfin—the fastest-growing top-ten real estate website—has added a home energy score thanks to a partnership with Tendril. They hope the home energy scores fill the growing satisfaction gap that exists amongst homeowners who cite that improved energy performance is their number one unmet need.

Why Bet on Home Energy Scores?

Rocky Mountain Institute's Residential Energy+ initiative has been closely tracking developments with real estate platforms, as we believe the increased transparency of home energy performance will have a tremendous ripple effect in driving both the supply of and demand for home energy performance improvements as a means to mitigate the carbon footprint of the

residential buildings sector. But climate is merely one reason that so many companies consider the introduction of energy scores as a low-risk, high-reward endeavor. Let's look at three major industry trends:

Trend 1: More and more customers are, and will be, demanding higher-performing homes

U.S. homeowners spend on average \$2,200 per year on energy bills and increasingly indicate demand for energy-efficient homes. Values beyond energy cost savings associated with home performance, such as improved comfort, health, and technology and connectivity, are becoming more and more recognized by today's home buyers, especially millennials, who represent the largest growing U.S. home-buying demographic. The visibility of home energy performance through energy scores is well aligned with these customer trends, and can help savvy customers ensure that the value of their investment matches their expectations.

Trend 2: Real estate professionals are "seeing green" and increasingly turning to home energy performance as a way to connect with a new set of buyers

Real estate professionals can embrace and profit from these market trends by making home energy performance a core

component of the support they provide for buyers and sellers. According to the National Association of Realtors 2017 Sustainability Report, 56% of survey respondents find that clients are interested in sustainability, and 71% said that energy efficiency promotion in listings was very or somewhat valuable. However, only 43% of respondents indicated that their region's multiple listing service (MLS) has a green data field. More transparent home energy scores can fill this important gap and help real estate professionals embrace these market trends and take the initiative to make home energy performance central to their client support.

Trend 3: Energy scores can help connect the dots between motivation and financing

More and more financing options are available for homeowners—depending on their state or municipality. But without transparency into current or expected levels of home energy performance, it is difficult for homeowners and lenders alike to determine the level of risk undertaken when a loan is offered. According to RMI's Finance the Future project, the increased transparency that performance data can provide can help scale the market for energy efficiency finance products. A study published by the Institute for Market Transformation (IMT) and the University of North Carolina shows that home energy upgrades reduce default and collateral risk significantly. Homes that receive home energy upgrades saw reduced default rates of over 30 percent. When financial markets respond to energy performance through mechanisms like an energy score, underwriters can consider

Cont'd on p.19

UV Green Real Estate Network Launches in January

Vital Communities has announced that an Upper Valley Green Real Estate Network will be launching this January for real estate professionals across our region.

Energy is often the second highest cost of home ownership for Upper Valley residents. The real estate brokers, lawyers, lenders, home inspectors, appraisers, and energy experts engaged with our Vital Communities' Green Real Estate Network are teaming up to help home buyers understand and reduce energy costs in their new homes.

Four Reasons Buyers Care about Energy

1. The Upper Valley is home to some of the oldest housing stock in the nation.
2. Energy is often the second highest cost of home ownership (behind mortgage/taxes/insurance).
3. \$7,000 to 12,000 of air sealing and insulation can reduce energy costs by 15% to 30% and improve home comfort. Rebates and special financing programs exist to help residents pay for energy improvements.
4. Cost-effective energy efficiency improvements are possible in almost any home.

Why Time of Sale?

Energy efficiency upgrades deliver cash savings and home comfort from month one. Waiting to weatherize means leaving cash on the table. Buyers can use the transaction process to gather necessary information for efficiency improvements. For example:

Past heating fuel use data needed to qualify for rebate programs.

Confidence that cost-effective energy improvements are possible.

Ability to secure financing for energy improvements alongside a mortgage.

Learn more about the Upper Valley Green Real Estate Network at:

VitalCommunities.org/GreenRealEstate.



SANVILLE
REAL ESTATE LLC

1792 Route 58W - Irasburg, VT 05845
802-754-8457 HOME .. 802-673-8102 CELL
sanville.cindy@gmail.com
www.SanvilleRealEstate.com

• RESIDENTIAL •
• LAND •
• COMMERCIAL •


*As an accredited Buyer Broker,
I will work to find you the
perfect property for your solar,
wind, hydro, geothermal
or bio project.*

Cindy S. Sanville
OWNER/BROKER

SOUND SLIDES

Tell your story. We can help.

Created for storytellers on deadline,
Soundslides is designed to make quick work
of audio slideshow production.

 soundslides.com/get

HOW GREEN IS YOUR MONEY?

Let our **FREE** portfolio
analysis show you,
along with your
performance and risk.



GREENVEST®
Socially and Environmentally
Responsible Investing

www.greenvest.eco

Vermont Office:
Todd Walker | Todd@greenvest.eco

Securities offered through Vanderbilt Securities, LLC,
member, FINRA, SIPC, registered with MSRB.
Advisory Services offered through
Vanderbilt Advisory Services, LLC.
Clearing Agent: National Financial Services, LLC.
Supervising Office: 55 Main St, Suite 415,
Newmarket, NH 03857 • (603) 659-7626.

ENERGY FINANCING AVAILABLE THROUGH VEDA

By N.R. Mallory

The Vermont Economic Development Authority (VEDA) is Vermont's statewide economic development finance lender. Created by the General Assembly in 1974, VEDA's mission is "to contribute to the creation and retention of quality jobs in Vermont by providing loans and other financial support to eligible and qualified Vermont industrial, commercial and agricultural enterprises."

Since 1974, VEDA has provided over \$2.49 billion in financing assistance to thousands of eligible Vermont entrepreneurs, manufacturers, small businesses, and agricultural enterprises, helping them to realize their business growth goals, create jobs, and enhance the vitality of Vermont's economy. Working in partnership with Vermont banks to help meet the financing needs of Vermont businesses, VEDA's low-interest programs help Vermont's economy grow and prosper.

For over four decades, VEDA has partnered with Vermont banks and other lenders to provide low-interest loans to



The Town of Stowe and Village of Hyde Park's 1.4MW solar farm is expected to produce approximately 1,568,000kWh of electricity per year. Photo: Encore Renewable Energy.

Vermont businesses and farms, both large and small.

Among other financing options available, VEDA provides financing for commercial and agricultural energy generation and efficiency projects with these programs:

Commercial Energy Loan Program.

Loans up to \$2 million to finance qualifying renewable energy generation and energy efficiency projects. Eligible

businesses include all those listed in the Direct Loan Program and Small Business Loan Program, as well as non-profit business entities and municipalities, with the exception of residential housing.

Agricultural Energy Loan Program.

This program helps Vermont agricultural and forest product-based businesses to finance qualifying renewable energy generation and energy-efficiency improvement projects, and to adopt technologies that enhance or support the development and implementation of renewable energy or

energy efficiency, or both.

Montpelier Heating District Loan Program.

This program makes loans to Montpelier businesses that wish to connect to the City of Montpelier's new heating district improvements.

Electric Vehicle Charging Station Program.

This program utilizes State Infrastructure Bank (SIB) funds to finance the purchase and/or installation of electric vehicle charging stations available for public use.

The story about how the Town of Stowe and Village of Hyde Park benefited from financing through VEDA for their Renewable Energy Projects is summed up by Ellen Burt, the general manager for Stowe Electric Department and Carol Robertson, general manager of the Village of Hyde Park, Hyde Park Electric. "Working in partnership, Stowe and Hyde Park originally sought to bring our municipal solar projects to fruition through third-party ownership. But, when VEDA offered assistance to secure Clean Renewable Energy Bonds (CREBs) that would provide the lowest-cost financing, the benefits to our ratepayers were clear. Our governing bodies supported us in quickly securing approvals from voters to pursue CREB financing, and VEDA moved with precision to help us meet the CREB application deadline and secure the bonds. Our solar projects began producing electricity on August 5, 2016 with municipal ownership on day one. Both projects were ahead of schedule and under projected cost. We are most grateful for VEDA's diligence and professionalism that resulted in the success of our solar projects."

VEDA has branches in Burlington, Middlebury, Montpelier, and St. Johnsbury, VT. More information is available at <https://www.veda.org>. Contact them at 802.828.5627 or through email at info@veda.org.

Google – 100% Renewable

Google Officially Off-setting 100% of Its Energy Usage With Renewables

By Green Energy Times Staff

Google, the well-known provider of internet services, is now getting 100% of its electricity from renewable sources.

That might not mean much to a person who occasionally does a search or gets emails from Google. In terms of real energy usage, however, it is an enormous statement. Google may be the largest corporate buyer of electricity, at over 3,000 megawatts (MW). That is about 150% of what the two nuclear reactors at Indian Point produce when they are both operating at full power. It uses over twice as much renewable power as Amazon and four times as much as the United States Department of Defense.

World-wide investments by Google in power generating capacity have come to \$3.5 billion. About two-thirds of that has been in the United States. Roughly 90%

of Google's investment has been in wind power, much of it in the Midwest.

Google got to 100% renewable status through its most recent power purchase agreements. The four contracts included two for wind farms in North Dakota, each of 98MW, belonging to Avangrid. There was also one wind farm of 200MW in Iowa, belonging to EDF, and one more of 114MW in Oklahoma, owned by GRDA.

Google has received a lot of press coverage because of its commitment to renewable energy and reducing its carbon footprint. The praise largely belongs to others, however, according to the tech giant. The push to renewable power came about because of the 60% to 80% drop in the cost of electricity from solar and wind facilities.

Google's environment report can be seen at <https://environment.google/>.

Home Energy Data

Cont'd from p.18

the cash-flow risks associated with energy-hog homes, and perhaps better incentivize and price mortgages for energy-efficient homes versus high-energy-use homes.

What's Happening Now vs. What's Next

RMI's new report, An MPG for Homes, presents a robust dive into the state of the energy performance transparency market today and the potential for the market to grow further. This will benefit homeowners, real estate professionals, lenders, technology providers, and the environment; will instill confidence among first movers that they are placing the right bets; and will motivate fast followers to adopt home

energy scores before the market—and their customer base—leaves them behind.

Download RMI's latest report, An MPG for Homes: Driving Visible Value for Home Energy Performance in Real Estate, and check each of the real estate platforms above to see how your home stacks up at info.rmi.org/MPG_for_Homes_Report.

All links available on Home Energy Magazine's posting of the original article at: <http://bit.ly/HomeEnergy-Race-to-Top>.

The National Association of Realtors 2017 Sustainability Report is available at <http://bit.ly/Ntl-Assoc-Realtors2017-report>.

Reprinted with permission from Home Energy Magazine: www.homeenergy.org.

MONTPELIER IS COMPETITION FINALIST



How will we get to net-zero? What will it take to reach Vermont's renewable goals? Courtesy of Net Zero Montpelier

Cont'd from p.10

science research to help their communities rethink how they use energy.

"This is a national effort, so participants were encouraged to find solutions that were likely to yield continuing improvements within their own communities and also inspire replication in other communities," said Brandes, who prior to joining Georgetown was Senior Vice President of the Urban Land Institute. "Montpelier should be commended for their tremendous efforts and creative contributions to reduce energy consumption and innovate new best practices."

The following 10 communities (in alphabetical order) have been selected to advance to the final phase of the Georgetown University Energy Prize:

- Bellevue, Washington
- Bellingham, Washington
- Berkeley, California
- Chula Vista, California
- Fargo, North Dakota
- Fort Collins, Colorado
- Oberlin, Ohio
- Montpelier, Vermont
- Takoma Park, Maryland
- Walla Walla, Washington

In December, the Energy Prize Judging Panel will review final reports about each community's energy-saving plan, performance, and future prospects. The final reports, submitted by the communities in November, will be scored in weighted categories, including innovation; potential for replication; likely future performance; equitable access, community and stakeholder engagement; education; and overall quality and success.

The Energy Prize Judging Panel will select a winning community, based on the combination of these scores and the results of the two-year energy-saving period.

The winning community will be recognized in December and provided with a prize package that includes support toward \$5 million in financing for an energy efficiency dream project, as well as workshops and education opportunities for the winning community.

The Georgetown University Energy Prize aims to rethink America's energy use by harnessing the ingenuity and community spirit of towns and cities all across America. Throughout the competition, local governments, residents, utilities, and other community leaders worked together to demonstrate success in sustainably reducing energy consumption. For more information, visit www.guep.org.

WARNER, NH: Groundbreaking News of A Community Design for a Community Microgrid

Cont'd from p.1



Downtown Warner, NH. Photo by Larry Chase.

Just as a microgrid can operate independently of the main electric grid, a microgrid can be subdivided into a set of smaller nanogrids, each capable of operating independently. In Warner's microgrid, each building will be able to function on its own, generating its own power, and storing its own energy. Combining them together is essentially a bookkeeping problem under computer control, based on practices of

wise, utilities have to buy on the spot market, but they normally have to sell at fixed rates. When demand is high, the spot rates can be a multiple of the retail rates, and this means that the utility loses money on all the electricity it sells. With a virtual power plant offering another alternative, the utility can save a good deal of money.

For many utilities, transmission costs are partly based on their peak load for the previous year. A virtual power plant reduces that peak load, saving money for the utility, and all of its customers.

Warner's microgrid has already received some important support. The Carsey Institute at the University of New Hampshire



power and batteries decline. "The thing that is interesting is that suddenly the microgrid is a very attractive economic proposition that is emerging," he said. The utilities do not yet make money by being smart, in the sense of computer systems, but rather by operating the distribution system. Their practices may change quickly, as the prices for battery storage drop.

The microgrid in Warner will start with just three buildings, the pioneers, whose experiences will inform its expansion to 25 early adopters. In time, the microgrid could grow to provide both security and savings to the entire community.

A network of nanogrids could be the foundation of a community microgrid. Community solar, wind, storage, and bio-diesel backup could be added as needed. The whole could power a community at the utility feeder or substation level. It is a plan that might be adopted in many places.

Even where laws do not support aggregation and utilities are unsupportive, the costs of solar power and batteries have become so low that we are clearly moving into a new age. Now, when it comes to electricity, ordinary people can take hold of their own power, getting security and saving money as they do. ♻️

electric system that can provide power to the community when the main power grid fails. To build one means that the community has to have systems for generating power, storing it, and distributing it, possibly with secondary generation for redundant backup. The system might include a sufficiently large set of solar arrays with a large battery, probably distributing power over the same local transmission lines as the main grid, with a diesel generating plant for backup. The system would also include a set of switches to separate it from the main grid.

The thing that makes Warner's design really exciting is that it addresses a number of questions relating to microgrid development. Some of these relate to how to build the microgrid's physical system, including details of how to connect together the buildings on the microgrid. Others relate to the costs, including how the microgrid is paid for by customers. Still other questions have to do with community acceptance and what to do, for example, about a person whose home is physically within the microgrid's area but does not want to participate.

The proposed design from the Warner project solves those issues very easily by taking a single novel approach. It virtualizes the microgrid. The overall microgrid is, in fact, a virtual power plant consisting of smaller, individual microgrids (for purposes of clarity, the smaller individual microgrids are here referred to as nanogrids). Each nanogrid draws power or contributes it, according to demand and under the guidance of a system of computers.

While that might sound like computer babble, the nuts and bolts of this approach are fairly easy to understand.

the microgrid and the local utility.

One function of the microgrid is to organize the various nanogrids to communicate with each other. With organization, the microgrid provides an aggregated virtual power plant through which the nanogrids can communicate with the main utility grid.

One obvious advantage of such a system is its resilience. When the main grid goes down, those local nanogrids will continue to function. If they are connected together with transmission wires that are still functioning, they can support each other. If there are enough of them, they can support the rest of the community, including those people who decided not to participate in the system.

With resiliency built into a sufficiently large percentage of local homes and businesses, the community continues to function even in an extended outage. It might be well to think of the effect of this on the community's attractiveness to, for example, a bank, a supermarket, or a pharmacy that is looking for a town to be a home to a branch or business. And this is especially true, given that more than one agency of the federal government has told us that we need to be prepared for grid outages lasting as long as three years due to such disparate threats as solar storms and terrorism.

Even if the grid never went down, the system offers a good deal of value. One of the functions it should perform is to buy and sell electricity at spot market rates. When the rates are low, the microgrid can buy power to charge batteries, even if the sun is not shining. When the rates are high, it can sell power at a profit.

From the point of view of the utility, such a system could offer very important advantages. When they do not have enough power to meet demand other-

is already giving assistance as Warner moves forward. Schneider Electric has been identified as a possible supplier, as it establishes microgrids as a business all over the world. Direct Energy is another, and it makes systems available for a lease for zero capital cost.

One person involved in the project is Roy Morrison, who has contributed to G.E.T. and may be known to many of our readers as the author of the book, *Sustainability Sutra: An Ecological Investigation*. He pointed out that things are changing for utilities as the costs of solar



Above left: the Main Street Bookends store and gallery in the hub of downtown Warner, NH; Above is the Town Hall building. Both photos by Larry Chase.



A 114-kW solar array for Warner, NH will help to keep the power on even if the grid goes down. Courtesy photo.

THE COST OF DENIAL

Cont'd from p.9

its maple products, or the tourist industry supported by fall colors, all of which depend on the old weather patterns that are now disappearing.

Governor Scott seems not to know that Lyme disease, which has spread through Vermont since 1990, is arguably driven by climate change, as are babesiosis, West Nile virus, eastern equine encephalitis, and other diseases yet to come.

It may be true that for certain purposes, a warmer Vermont would be better. Certainly those of us who wish to grow peaches or pawpaws will find the environment better suited to their purposes. But any agriculturalists who grows apples or blueberries would have to replace his

trees and bushes, and that means delays in production.

We could assume that Governor Scott's expectation of a "boon" might be based on something other than anything like the traditional products of the state. After all, while climate change may be the greatest problem humanity has ever had, addressing it is very probably the single biggest business opportunity we have ever seen.

But another clue tells us this is probably not the case. A draft report from the Vermont Natural Resources Board on updating Act 250 had all mentions of climate change redacted by the governor's office.

And that looks like denial, pure and simple. ♻️



The solar for Main Street Bookends also powers the stage for community gatherings. Courtesy photo.

Ten More Cities Across America Commit To Going 100% Renewable

By Chris Gillespie

'Ready For100' Program Case Study Highlights Ten Cities That Have Joined Nationwide Movement Plus: Check Which Local Communities Are Seriously Considering Doing the Same

The Sierra Club recently published their 2017 case study "Ready For 100," which features ten cities in the U.S. that have recently joined 37 others in committing to use 100% renewable energy within the next several decades.

Here are the American cities that make up the "Ready For 100" Class of 2017:

ABITA SPRINGS, LA

Located an hour north of New Orleans, Abita Springs has pledged to use 100% renewable electricity by 2030. The resolution was passed by the Town Council in March 2017 and is supported by Mayor Greg Lemons, who happens to be a Republican and who has said, "Clean energy just makes good economic sense."

ATLANTA, GA

In May 2017, Atlanta's City Council voted unanimously to power all municipal facilities in the Georgia capital with renewable energy by 2025, including Hartsfield-Jackson Atlanta International Airport, the busiest airport in North America. The rest of the community is committed to being powered by 100% renewables by 2035.

BOULDER, CO

Boulder made history in 2007 when it became the first city in the U.S. to enact a voter-approved carbon tax. In December 2016, the people of Boulder proved their commitment to the environment once again by passing a city council-approved goal of going 40% renewable by 2020 and 100% renewable by 2030.

HANOVER, NH

As reported in the June edition of GET, Hanover made national history in June 2017 when its residents voted on and approved a goal of transitioning to 100% renewable electricity by 2030 and 100% renewable heating and transportation by 2050. Hanover is home to Dartmouth College, which has set its own goals of using 50% renewable energy on campus by 2025 and 100% by 2050.

MADISON, WI

The Madison Common Council made Wisconsin history in March 2017 when it approved a commitment to utilize 100% clean energy in electricity, heating and transportation. Madison, the largest city in the Midwest, will release a plan by January 2018 that details how and when Madison can reach its 100% goal.

PORTLAND, OR

Earlier this year, within hours of President Trump announcing the U.S.'s withdrawal from the Paris Climate Accord, the Portland City Council and Multnomah County Commission voted to adopt a 100% renewable energy goal for the entire city by 2050.



Residents of South Lake Tahoe are switching to renewables to preserve their scenic home and their tourism-based economy. Photo courtesy of Mark James Miller via Wikimedia Commons.



Residents of St. Petersburg, FL are ready to set sail on going 100% renewable. Photo courtesy of John O'Neill via Wikimedia Commons



Madison, WI, one of the largest cities in the Midwest, is leading the region in committing to renewables. Photo courtesy of Pixabay.

Truckee, CA Becomes 50th U.S. City to Commit to 100% Clean Energy

On November 29, Truckee, California, became the 50th U.S. city to commit to 100% clean energy as part of the Sierra Club's Ready for 100 campaign. The Sierra Nevada mountain town resolved to get all its electricity from renewable sources by 2030, and supply all its energy needs from renewables by 2050.

PUEBLO, CO

Community officials in Pueblo hope that switching to renewable energy will provide economic relief to Pueblo's low-income residents who have struggled for years with suffocating electricity bills. In February 2017, Pueblo's City council voted 6-to-1 for a 100% clean energy resolution. Pueblo is already home to the world's largest wind-tower manufacturing plant.

SALT LAKE CITY, UT

Proposed by Mayor Jackie Biskupski and adopted by the City Council in November 2016, Salt Lake City's joint resolution to acquire 100% of the community's energy from renewable sources by 2032 and to reduce community greenhouse gas emissions by 80% by 2040 was adopted out of concern for public health and the local economy.

SOUTH LAKE TAHOE, CA

In April 2017, South Lake Tahoe adopted a goal to transition to 100% renewable energy by 2032 and reduce greenhouse emissions by 80% by 2049. Says Mayor Austin Sass, "The passion to protect our natural resources made this commitment possible and reflects the city's vision statement to 'reflect the National Treasure in which we live.'"

ST. PETERSBURG, FL

In November 2016, St. Petersburg's City Council voted unanimously to allocate \$250,000 from BP Deepwater Horizon oil spill settlement funds to develop an Integrated Sustainability Action Plan, which will chart a course for the Florida city to transition to 100% renewable energy.

MORE REGIONAL TOWNS ARE CONSIDERING 100%

GET readers should keep their eyes out for several New Hampshire towns that might possibly appear in upcoming "Ready for 100" reports.

According to the Sierra Club, the energy committees of Concord, NH, Plainfield, NH and Cornish, NH have all endorsed the 100% renewable goal and are "nearing" commitments.

For the complete case study and for ways you can take action in your own town, visit ReadyFor100.org.

LATE BREAKING NEWS: Phil Swanson, Municipal Manager for the Town and Village of Woodstock, Vermont, has told GET that Woodstock just signed on to the "Ready For 100" program. More details to come in the February 2018 edition of Green Energy Times.

Chris Gillespie is a contributing writer for Green Energy Times. He can be reached at chris@greenenergytimes.org.

ARC MECHANICAL CONTRACTORS

Cold-Climate Heat Pump Experts

Why Pay More to Heat Your Whole Home When You Only Live in a Few Rooms at a Time?

Get a year-round heat pump that outperforms central furnaces in cold climates as low as -13°F.

- ▶ Up to 40% more efficient
- ▶ Up to 8 individual zones (per system)
- ▶ Provides year-round comfort that keeps you cool in the summer, too
- ▶ Quieter than a human whisper
- ▶ Requires no ductwork, so professional installation is quick and easy
- ▶ Remote control technology via kumo cloud™ or other smart home connected devices



AMERICA'S #1 SELLING BRAND OF DUCTLESS
mitsubishicomfort.com



Call ARC for a free no-obligation estimate!

We've installed more than 600 heat pump systems since 2013!

(802) 222-9255
Bradford/Woodsville

(603) 256-8533
Keene/Brattleboro

(603) 443-6111
Lebanon/White River Jct.

arcmech.com

(603) 444-3440
Littleton/St. Johnsbury

Responsible, Affordable, Light Industrial Heating with Wood Biomass

By Barb and Greg Whitchurch



Vermont Artisan Coffee and Tea Company in Waterbury, VT. Photo Joseph Architects.

On November 2nd Renewable Energy Vermont held a press release event to announce its 5-Year Action Plan. The event was hosted by VT Artisan Coffee and Tea Co. (VAC&T) at their brand-new headquarters in Waterbury, VT, right next to the Green Mountain Club's headquarters on Rt. 100. The 5-Year Action Plan focuses on locally harvested and prepared wood biomass fuel and advanced wood heating systems, and VAC&T was just the place to launch the new plan. (A separate article on the Five-Year Action Plan itself as well as more information on wood appliance metrics appears on page 24.)

We won't extol the glories of coffee or the wonders of VAC&T - you already know about coffee, and the accomplishments, plans and the passion of the owners, Holly and Mané Alves, are well represented on their website. (Mané "teaches coffee" all over the world!) We want to focus on their choice of heating plant for their facility, which houses the afore-named roastery as well as its sister businesses: The Coffee Bar, The School of Coffee, and Coffee Lab International.

The facility is a 15,000 sq. ft. light industry-type building housing all four sister businesses, with about a dozen employees and as many or more coffee bar customers at any particular time. Outside parking includes two free Level 2 EV chargers and a solar canopy covering twenty employee/business parking spaces. Back inside, the coffee roaster machines themselves hail from Italy, Israel, and other countries - one roaster is wood-fired!

Speaking of wood, we've arrived at the crux of the "green" heating issue: the entire facility is heated by a Fröling pellet boiler.

(Note: the large silo out front labeled "Coffee" actually contains the wood pellets.) This boiler is capable of very high-efficiency, clean burning (bit.do/EPA-BOILERS), and there are two 400 gallon, R-20 insulated water tanks next to it for hot water storage. This water is circulated throughout the building's zoned radiator systems until it needs re-heating; then the boiler re-starts and burns at its most efficient rate, heating the building directly and bringing the

tanks back up to temperature.

There is a second, matching backup boiler -- just in case. These are not your grandfather's pellet stoves. Both boiler systems are computerized and monitored over the internet, allowing real-time, off-site evaluation, notification and control. A 20% cost incentive was provided through the Clean Energy Development Fund, so the long-term cost and environmental benefits of this energy choice were accelerated by quite a bit. (See incentives in VT: bit.do/WH-VT, NH: bit.do/WH-NH, ME: bit.do/WH-ME, MA: bit.do/WH-MA, NY: <http://bit.do/WH-NY> and pages 16 and 17 herein.)

Building designers use energy modeling software so that, based upon the particular building's construction and the historical climate data for the site, they can be sure that the appropriate size of heating system is selected. As with residential heating systems (and cars, for that matter), installation of too large a system costs more up front, as well as requiring more fuel and creating more pollution when it's choked down and not allowed to run at its most efficient rate.

In summary, when a company realizes that it needs a new or refurbished building in VT, the best first step these days is to contact the Commercial New Construction Program at Efficiency VT (<http://bit.ly/comm-new-const-vt>). With the free advice from their engineers, one can select a knowledgeable, certified, up-to-date architect and embark on a "green" and affordable path toward the best solution for any particular need.

For many years, Barb and Greg Whitchurch have heated their house, cooked, and heated their water with cordwood in a masonry stove, cookstove and a parlor stove. They are board members of Vermont Passive House and owners of a net-zero passive house in Middlesex, Vermont, a LEAF, and a Prius. <http://bit.ly/2nRCdGL> (802) 223-2416.

Links: Renewable Energy VT, bit.do/REVT; 5-Year Action Plan, bit.do/REV5-Y; VT Artisan Coffee and Tea Co. bit.do/VAC-T; Clean Energy Development Fund, <http://bit.ly/CEDF-VT>. ☑



One of the two state-of-the-art, computerized, internet-connected, clean-burning pellet boilers at VAC&T. Photo Greg Whitchurch.

The Vermont Bun Baker

An All-in-One Heating Marvel ...

By George Harvey



Vermont Bun Baker 750

mother had, or the Montgomery Ward cook stove I once used, the operation is theoretically pretty much the same. To start the fire, a damper inside the stove is opened, allowing the flue gas to rise without obstruction. Once the chimney is warm, the damper is closed, and the flue gas is drawn downward, on a path surrounding the oven with heat, before it rises in the chimney. Oven temperature is maintained by keeping the air intakes and damper in proper adjustment.

There are a couple of important differences between the Vermont Bun Baker and those old stoves I was used to. One is that the Vermont Bun Baker's firebox is much, much larger. In fact, it looks like a fireplace and takes enough wood to keep it going for three or four hours. My old stove had a small iron firebox that needed an-

other stick about every fifteen or twenty minutes, when I baked bread. Another difference is that because the Vermont Bun Baker can take such a large load of wood, it can serve as the primary heat source for a home. The standard sized stove can produce 33,000 BTUs per hour, and the XL can produce 65,000.

The history of the company shows the beautiful way it can sometimes develop. Thompson's background in stone work got him into the business of selling masonry heaters. For those who do not know, a masonry heater consists of a firebox with convoluted flue system that runs through a block of tons of stone. While that may sound inconvenient, it does not take as much floor space as you might think. It can be very beautiful. It provides even heat with limited work, because it

extracts as much heat as possible from actively burning flames in the firebox and radiates that heat slowly into the home. Two downsides of masonry heaters are their weight and high initial cost.

Several years ago, Thompson took notice of a line of wood cook stoves made in Australia. The stoves had a simple, rectangular shape, and he quickly realized that they could be easily covered with veneers of soapstone. This could provide much of the advantage of the masonry heater, because of its high thermal mass, in a really good cook stove with an oven. The combination reduced the weight to a fraction of what it is in a masonry heater, but also greatly reduced the cost.

The stoves can be purchased with two different thicknesses of soapstone, or without the veneer at all, in which case the stone can be added later. Covered with stone, they have a lovely appearance.

While the Vermont Bun Bakers can heat homes, they are designed to be primarily cook stoves, and so they are exempt from EPA pollution standards. This is not an untoward loophole, but a concession to the fact that wood stoves, by their nature, produce low emissions because of the way they are built and used. They emit about four grams of particulates per hour, an amount that is slightly more than new proposed EPA limits for heating stoves. The low emissions also make chimney cleaning much easier.

The Vermont Bun Bakers are approved by the EPA/OMNI test laboratories. They qualify for incentives, which vary by location.

The Vermont Bun Baker is available throughout the United States and Canada, with about forty local dealers. You can see the stoves at <http://bit.ly/vermont-bun-baker>. ♻️



**EZ- Firelogs are
100% Wood and 100% Easy!**

How So? 50 bags 48x40x40 creates as much heat as full cord of wood.

No Bugs, Bark, Mess or Stacking

Try this made-in-New England product.

High Heat, 1% Ash, %100 Easy

ezfirelogs.com • 603-234-7239

Many people who cook with wood stoves absolutely love them. It is an entirely different experience, in which the stove itself almost seems to be a living thing, with its own soul, the goodness of which it imparts to its food in some mystical fashion. Those I have talked with often agree with me on this.

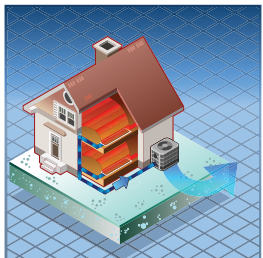
I was really delighted to be able to talk with Paul Thompson of the Vermont Marble, Granite, Slate and Soapstone Co. This company sells a number of wood-burning products, and one of them is a series of cook stoves, called the Vermont Bun Baker. They come in two sizes, standard, and XL, and the stoves can be covered with a veneer of soapstone, providing some important advantages.

While the Vermont Bun Baker does not look like the McGee Grand my grand-

Putting the Power in Your Hands™

Become less dependent on fossil fuel and market volatility, install air source heat pumps today!

Air source heat pumps require electricity; however minimizing fossil fuel costs and lowering annual system maintenance provides an economic benefit to the homeowner.



Key Benefits:

- Reduce your annual fuel expenses
- Lower your home's carbon emissions
- Heat and cool your home more efficiently
- Easy to install, contact your HVAC contractor
- Qualify for incentives through NHEC

Call NHEC Energy Solutions today to learn more of the benefits of heat pump technology.

Get started today!
1.800.698.2007



New! The Vermont Bun Baker!

• ALL IN ONE!





• Wood Cook-Stove • Cook-Top
• Bake Oven • Hot Water*
• Broiler • With or Without Soapstone Veneer

Vermont Marble, Granite, Slate & Soapstone Co.

Showroom: 10014 US State Route 4, Whitehall, NY

802.468.8800

VermontMarbleandGranite.com

Advanced Wood Heating: REV's 5-Year Plan

By Barb and Greg Whitchurch

On November 2nd, Renewable Energy Vermont (REV) held a press release event to announce their 5-Year Action Plan (bit.do/REVT5-Y). The event was hosted by Vermont Artisan Coffee and Tea Co. (VAC&T) at their brand-new, wood-heated headquarters in Waterbury, Vermont. The 5-Year Plan focuses on locally harvested and prepared wood biomass fuel and advanced wood heating systems. (More about the press release event and VAC&T appears in a companion article on page 22.)

Renewed interest in wood heating has been driven by the need for pollution reduction; the rising price of fossil fuels; the availability of high-tech measurement sensors that can measure the efficiency of the burn; and computerized systems that use these sensors to calculate and then control proper carburetion and temperature settings. Likewise, there has been a revolution in how we prepare wood for burning, and what grades of wood can be used given these new methods.

Many people are unaware that softwoods as well as hardwoods are good candidates for fuel. When dry, both types give about the same heat output pound



Road through a managed forest. Public domain.

for pound -- but left as cordwood, the heavier, denser hardwoods take up far less space to store than softwoods. However, when processed into pellets or chips, this space and weight variation is reduced to insignificance. In Vermont, the logging, trucking and manufacturing of these chips and pellets, and their subsequent use as heating fuel, can help to solve modern-day problems: land use, forestry, employment, weather event resiliency, stable fuel cost and availability, and personal and state financial challenges.

REV set about addressing all of these issues and opportunities. By applying the principles of sustainable forestry, maximized efficiency, local acquisition and production, energy security, and pollution mitigation, they determined that by the

year 2030 Vermont could obtain 35% of its heating energy needs through the use of locally-produced wood chips, pellets and cordwood burning in advanced heating systems.

With respect to our mission here at G.E.T, let's consider our air quality and climate first. A study commissioned by the Northern Forest Center (bit.do/WP-GHG) found that the harvesting, transportation, manufacture and burning of wood pellets created less than half the greenhouse gas (GHG) emissions of oil and natural gas. A healthy, managed forest also helps to clean our air of CO2 while providing O2. The low-grade wood used for chips and pellets encourages better forest stewardship by providing a market for what's often left damaged and behind - you won't see a forest clear-cut for the low-grade wood used in wood chips and pellets.

Recent temporary drops in fossil fuel prices and the loss of a major portion of our pulp-for-paper industries have conspired to reduce demand for low-grade woods in Vermont. Workers, businesses, jobless benefits, and food shelves have felt these pressures. About 78¢ of every dollar spent on fossil fuels leaves Vermont; implementing the 5-Year Plan would add \$70 million and about 580 new jobs in Vermont. Our two pellet mills are

expected to increase to six next year.

Although these heating systems easily make financial

sense over the longer term, the upfront costs can prove to be a hurdle in our current economic model -- therefore, the many incentive programs available (e.g. Clean Energy Development Fund - <http://bit.ly/CEDF-VT>). There is currently a bipartisan-sponsored bill (H.357 - see bit.do/WP-TAX-VT) before the Vermont legislature that would eliminate the sales tax on these systems, and REV is proposing such an approach for the bulk delivery of wood fuel which, unlike fossil fuel deliveries, is currently taxed.

What can you do? There are wood stove "change-out" programs available for older wood stoves and boilers (including outside boilers) that will pay most of the cost of a new, efficient stove at RERC-VT.org. (google "wood stove changeout your state" or bit.do/WS-CHANGE.) The editor of this paper recently replaced the older stove in her basement with a brand new Quadra-Fire Discovery II

Cont'd on p.33

Many thanks to our Heating Section Sponsor:



WE CAN WARM OUR HOMES WITHOUT WARMING THE PLANET!

Rally for renewable heat in Albany calls for swift transition off oil and gas and for New York to ramp up investment in heat pumps to reach climate goals

By Lindsay Speer

Albany, NY - As lake effect snow hits parts of Upstate New York on December 6, 2017, supporters of renewable heat gathered in New York's Capitol Building to demonstrate their support for renewable heating. Homeowners, energy activists, and installers called on Governor Cuomo and New York State to aggressively ramp up support for renewable heating technologies, such as ground-source (geothermal) and air-source heat pumps, in order to reduce New York's dependence on fossil fuels and meet New York's greenhouse gas reduction goals.

"Momentum and excitement are building as people across New York learn about alternatives to heat their homes without oil, gas, and other fossil fuels," said Jessica Azuly of Alliance for a Green Economy. "All over the state, people are looking for ways to save money and protect our climate, and they are looking to Governor Cuomo to continue to enact game-changing policies that will make heat pumps affordable and available for all."

The Renewable Heat Now campaign has already seen successes, as the New York State Energy Research and Development Authority (NYSERDA) this year announced \$15 million in rebates for geothermal system installations and \$10.95 million in incentives for air-source heat pumps. On November 29, 2017 Governor Cuomo signed a bill that allows geothermal to qualify for on-bill financing, allowing homeowners to pay for the installation of their systems over time through their energy bill. This allows many homeowners

to see immediate cost savings due to the efficiency of the new systems.

"Moving New York towards a renewable future requires innovative developments in clean energy," said Assemblywoman Patricia Fahy (D-Albany), who voted for the bill. "I'm proud to be a voice in New York supporting geothermal energy as an important component in meeting our ambitious emission reduction goals."

Over 38% of New York's greenhouse gas emissions come from combustion of fossil fuels in our buildings, mostly for heating. Physicians, scientists, and engineers for healthy energy estimate that in order to achieve New York's goal of a 40% reduction in greenhouse gas emissions by 2030, 126,000 buildings per year must convert from fossil fuels -- including natural gas and oil -- to efficient electric heat pump systems.

"Any heating and cooling contractor currently operating in New York has an opportunity grow their business in the transition to heat pumps," said John Ciovacco, President of Aztech Geothermal. "The sheer volume of conversions needed will spur significant job creation for local installers, plus attract equipment manufacturers and finance companies to support the growth."

Efficient electric heat pumps are commonly known and used in other states for heating and cooling needs. New Yorkers who move south are often astonished to find how cheaply, safely, and comfortably they can regulate the temperature in their homes

Cont'd on p.35

HEAT CLEAN, HEAT LOCAL

Now you can have the same auto-delivery, hands-off convenience of oil with Wood Pellet Central Heating.



WOOD PELLET BOILERS, FURNACES, AND AUTOMATED SYSTEMS
Find pricing and more at pellergy.com

Eliminates high heating bills.

The Classic Edge is the perfect combination of performance and value

- Easy to operate and easy to maintain
- EPA-Certified, clean-burning
- Stainless models available, ask about our Titanium Series

The Farmyard Store
3262 U.S. RT 5, Derby, VT
(802) 766-2714

*Instant rebate of \$2,000 off of select in-stock Central Boiler outdoor furnace models, available at participating dealers only. Savings shown is on an E-Classic 1450 model. See dealer for details.



CLASSIC EDGE

Outdoor Wood Furnace

CentralBoiler.com

16-3010

Robbing Our Children's Future

By Dr. Alan K. Betts



At the weather this past summer was a wake-up call. It was exceptionally warm across the western United States, and there was little rainfall across the

Northwest. The result was widespread forest fires, which filled the cities with smoky, polluted air. In the south, Hurricane Harvey gave near-record summer precipitation and extreme flooding. Across the warm waters of the Caribbean, two powerful hurricanes, Irma and Maria, did immense damage to a dozen islands including Puerto Rico. Their recovery will be very long. Some islands such as Barbuda have simply been evacuated. Much of Puerto Rico still has no power. Without power, modern society crumbles, and basic survival depends on cooperation and the sharing of resources.

Our society has not put aside the money to rebuild after these disasters, which will only increase as the Earth gets warmer and extreme weather increases. The increase in the greenhouse gases, triggered by the burning of fossil fuels, reduces the cooling of the Earth to space. So, vast amounts of heat are now being stored in the oceans, and, inevitably, stronger storms develop when conditions are favorable, as they were this summer.

In October, I discussed the paradox that although we as individuals are deeply concerned for the lives of our children and grandchildren, we support an economic system that places little value on their lives, because it discounts the future.

Investments in an energy efficient society powered by renewable energy are often rejected as "not cost-effective." A closer look shows that this means not cost-effective for the present bottom line. If we ask whether

billion dollars now on this transition will save 50 billion dollars in damages later this century. Since national governments have conflicting interests, it has been proposed recently that the global insurance industry could manage a global levy on carbon emissions to fund adaptation costs and the low-carbon transition. This would lower their insurance risks.

What we need is economics where we really value the future of the Earth, and the future of our children and our grandchildren.

The 2015 Encyclical by Pope Francis mapped out the corruption and immorality of our present economic system, where the exploitation of the Earth and the poor have become inseparable. The Catholic church, and some Protestant churches, are now giving this more careful attention. Not surprisingly, our economic system is still avoiding this issue, so it is up to us all to speak up!

I am indebted to Joanna Macy for another insight. We are encouraged to become happy isolated individuals addicted to consumerism, escapism and the media. The mass media as a rule will not show us, as isolated individuals, that runaway corporate capitalism is on a path to destroy much of life on Earth. But as communities with courage, determination, caring and creativity, whether secular or communities of faith, we can face this reality, and together search for a sustainable alternative. I know this will not be

easy, but there is almost no limit to what we can do for the sake of each other and the Earth..

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



Evacuees wade down a flooded section of Interstate 610 in Houston as floodwaters from tropical storm Harvey rise Aug. 27, 2017, in Houston. Credit: AP Photo/David J. Phillip

this energy transition is cost effective for the future of our children, the answer is absolutely yes. Staying with an inefficient fossil fuel energy system is a catastrophe for both our children and the Earth.

Economists estimate that spending a

Yet, I often see articles claiming that renewable energy is a bad investment: that we are wasting money on the transition away from fossil fuels. This is phony economics where we ignore the present and future costs of accelerating climate change.

Vermont Research Climate Change News Rain, Road Salt, Water Pollution and ER Tick Visits



Image from The Brattleboro Reformer

MORE RAIN EXPECTED

The northeastern U.S. has experienced dramatic changes in precipitation over the past century. A study co-authored by Dr. Brian Beckage found that annual extreme precipitation was 53% higher from 1996-2014 than it was from 1901-



Deicing winter roads by applying salt is poisoning Vermont's ecosystems, and experts say it's over-salting by private contractors in parking lots and other urban areas that are increasingly the source of the salt. Modfos / iStock

1995. Although coastal areas experience more extreme and total precipitation on average, the increase was largely uniform across the northeast. (See interview with State Climatologist Lesley-Ann Dupigny Giroux at <http://bit.ly/interview-Lesley-Giroux>.)

ROAD SALT

While road salt may make icy roads safe during Vermont winters, it negatively affects the health of nearby waterways like Lake Champlain. A study conducted by researchers at the Global Lake Ecological Observatory Network looked at the effects of salt on freshwater lakes in the North American Lakes region, including Vermont. Read more at <http://bit.ly/Road-salt-study>.

More information from the Center for Research on Vermont can be found at <http://bit.ly/Center-for-research-on-VT>.

WATER POLLUTION

Is New Jersey's water safer than Vermont's? The Garden State recently revised its standards for safe levels of PFOA (<http://bit.ly/NJ-safe-PFOA>), a manufactured chemical found in household and commercial items, to 14 parts per trillion—6 parts per trillion lower than Vermont's safe standard, according to VPR. Last year, PFOA levels in drinking water around the Bennington area were found to exceed state standards, and a Department of Health report noted that residents' blood levels of the chemical were strongly correlated with levels found



Image from Matthew P. Lerman Photography

in contaminated wells. See the report at http://bit.ly/Dept-Of-Health_PFOA-report.

Norwich University Geology Professor Laurie Grigg's work has long focused on climate change, including her recent contribution to a global pollen and charcoal database to document vegetation and fire responses to abrupt climate change during the last glacial period. Professor Griggs is now examining lake sediment to determine how aquatic ecosystems have acclimated to climate changes over the last ten centuries using a federal grant. Read more at <http://bit.ly/pollen-charcoal-climate>.

EMERGENCY ROOM TICK VISITS

For 2017, tick-related emergency room and urgent care visits in Vermont have been consistently above average. The adult ticks will remain active through November. Ninety-nine percent of tick borne disease in Vermont is caused by the black-legged tick. Encounters with

black-legged ticks can occur anytime during the year when the temperature is above freezing.

And speaking of ticks, the Vermont Fish and Wildlife Department's multi-year long study gauging the impact of winter ticks on the state's moose has ended. After its first year, eighteen of the thirty radio-collared moose calves survived their first winter, with the twelve that died exhibiting signs of winter tick infestation and severe weight loss. As for the adults, twenty-seven of the study's thirty collared cow moose survived, with fifteen producing calves in the spring. Read more at <http://bit.ly/VT-winter-tick-study>.

Reprinted with permission from the Center for Research on Vermont, November 15 edition of Vermont Research News. ♻



Photo by Dan Bergeron (from NH Fish and Game website)

A NEW METRIC FOR TRACKING NET-ZERO ENERGY CODES

By Kevin Carbonnier

ACEEE's 2017 State Energy Efficiency Scorecard was released in late September with Massachusetts leading based on six categories including utility programs, transportation, building energy codes, combined heat and power, state initiative and appliance standards, according to ACEEE. Looking ahead, there are changes afoot for the 2018 scorecard ranking methodology that will incorporate a new metric: the zEPI Jurisdictional Scores.

The new scoring approach was developed by New Buildings Institute (NBI) staff—Codes and Policy Director, Jim Edelson, and Kevin Carbonnier, Project Manager, to address the growing number of states looking to drive local building stock toward zero energy (ZE) performance. That is, homes and commercial buildings that produce as much energy as they use over the course of a year, with performance achieved through energy efficiency and renewable technologies. California's zero net-energy goals for residential and commercial new construction, the District of Columbia's proposed net-zero energy code path, and city- and county-led efforts in Idaho and Colorado are a few examples of locales amending building energy codes to deepen savings and move states closer to ZE goals.

To develop a common baseline against which the energy performance of code-compliant buildings can be compared across

states, NBI has applied the Zero Energy Performance Index (zEPI) scale to create the zEPI Jurisdictional Score. This new method uses a framework for calculating scores for entire states based on their adopted energy policy, and taking into account statewide energy codes and local stretch codes. By leveraging new code analysis published by Pacific Northwest National Labs and combining it with NBI's in-house policy tracking work, we were able to calculate zEPI Jurisdictional Scores for

reported percent better than code figures. Another question that comes to mind is: which code? There are over a dozen to choose from. Few of us are familiar with how the expected performance between codes compare. Would you be able to say whether an office in Portland that is 20% better than the 2015 IECC (International Energy Conservation Code) uses less energy than one that is 25% better than ASHRAE 90.1-2013?

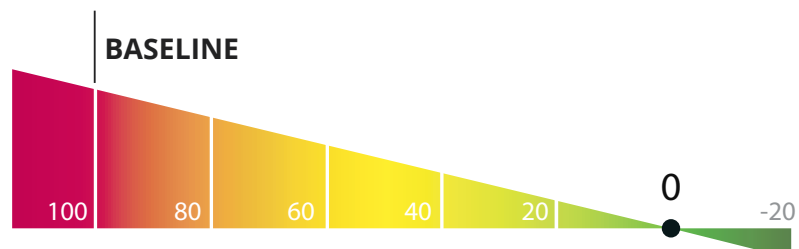
With the zEPI scale, we can easily compare between different code levels, climate zones, and building types. By fixing the baseline to CBECS 2003 performance levels (zEPI 100) and the goal to net zero (zEPI 0), we create a linear scale which can be used to track progress towards zero.

Beginning next year, ACEEE plans to transition to the zEPI Jurisdictional Score as the new basis for ranking state building energy performance in an effort to more accurately assess the levels of savings achieved by each state's

adopted building energy codes. With their absolute baseline and common zero value, the zEPI rankings for jurisdictions will allow the ACEEE Scorecard to look beyond simple code status and actually monitor how states are improving the performance of their codes. See the chart for how the top 10 state residential and commercial codes currently rank on the zEPI scale, based on adopted codes effective as of January 2017. While Massachusetts ranked first in the current Scorecard, it drops slightly to second behind Hawaii in the

Cont'd on p.27

Zero Energy Performance Index (zEPI) scale



zEPI: a simple metric for measuring building energy performance on the path to zero.

every state with adopted energy codes and for others without a statewide code which have sufficient data available on local adoptions.

zEPI scale offers a measure for progress and comparison.

So why zEPI? NBI has long been a proponent of zEPI, created by Charles Eley and further developed by Eley, NBI and others. What zEPI offers is a steady, linear metric focused on zero energy which does away with the ambiguous "percent better than code" issue. Comparing buildings, code, jurisdictions or any scale of energy impact is challenging with the commonly

LOCAL WOOD! LOCAL SERVICE!

Let us help you with your new house or renovation

1 Semi Load Wide Pine Flooring

9" - 17" widths from \$1.30/sq.ft.

2 Semi Loads Long Length Prefinished Vermont Hardwood Flooring

3", 4" and 5" widths
from \$4/sq.ft.

Lumber hardwoods and softwoods
4/4-12/4 thickness

*Celebrating a 150 Year
Family Tradition 1867-2017*

Exclusively Vermont Wood Products

Hewitt Road, Bristol, VT
802-453-2897

5th generation lumberman
Tom C & Pam Lathrop



CALL TOM FOR BROCHURE & PRICES!

GO GREEN WITH SPRAY FOAM INSULATION



Leaders In Spray Foam Insulation Technology

SAVE UP TO 45% ON ENERGY COST

REDUCE YOUR CARBON FOOTPRINT

CALL TO SCHEDULE A FREE ESTIMATE TODAY!

(802) 624-3993



FULLY INSURED

TRAINED PROFESSIONALS

FAMILY OWNED &
OPERATED COMPANY

Just like your house. Only more affordable.



- More comfortable than Passive Solar
- Uses 60-90% less energy than code homes
- More sustainable than LEED
- Greener than Energy Star
- For new buildings and remodels
- Easy to Net Zero
- Supported by Efficiency VT
- US and Internationally certified



www.phausvt.org

802-223-2416 info@phausvt.org

*A non-profit organization

Come to a meeting. Speak with architects and builders. Get references and information.

TIMELESS CRAFTSMANSHIP. THE LATEST IN ENERGY EFFICIENCY. PASSIVE HOUSE DESIGN/BUILD. CUSTOM CABINETRY & TILE.



MONTPELIER CONSTRUCTION
BUILDERS AND FINE WOODWORKERS

MONTPELIERCONSTRUCTION.COM

802-229-6575



WEATHERIZING THE UPPER VALLEY

Round Two Launches in January

By Paige Heverly, Vital Communities



Most basements have no air sealing or insulation around the band joists. Installing foam insulation and air sealing around the edges is one option for reducing the heat loss and the infiltration of cold air into the home. Courtesy: Efficiency Vermont.

After a successful pilot round in 2017, Vital Communities is bringing Weatherize Upper Valley back in 2018 to help more Upper Valley residents complete home energy upgrades. This time, the campaign will run on both sides of the Connecticut River with six towns in New Hampshire and five towns in Vermont participating in the program.

Home energy efficiency projects are great home improvements, because they can increase your comfort and increase a home's value. A typical home energy project costs between \$6,000 and \$12,000, and focuses on air sealing and insulation. Figures from Efficiency Vermont and the NHSaves program typically result in average heating costs savings of 20% or more. To sweeten the deal, rebates up to \$2,500 in Vermont and \$4,000 in New Hampshire make weatherization all the more cost-effective. And these figures don't take into account the benefits of increased home comfort. Say goodbye to drafts and cold spots!

Many homeowners resign themselves to leaky homes and high heating bills. Weatherize Upper Valley makes it easy for homeowners to take back control, improve home comfort, and start saving. In fact, Vital Communities aims to double the number of home energy projects completed each year in participating Weatherize towns.

But Vital Communities isn't in it alone. The nonprofit is working closely with Efficiency Vermont, NHSaves, and many local energy committees and contractors.

In Vermont Weatherize Upper Valley campaigns, a group of qualified local contractors will offer free home visits and work proposals to residents in participating towns who sign up between January and March 2018.

Residents in participating New Hampshire towns will receive comprehensive home energy audits for \$100 (usually costing \$400 or more!).

Any Weatherize participant, in Vermont or New Hampshire, who signs a contract

to complete work with a partner contractor by May 31 will be entered to win \$500 toward the cost of their project.

How Weatherize Upper Valley works:

1. Sign Up and attend a launch event in January.
2. Complete a Home Energy Questionnaire by March and get connected with a contractor.
3. Receive a home visit and work scope.
4. Take Action! Sign a contract by May 31 and be entered to win \$500.

Residents of Weatherize Upper Valley's 11 round two teams are invited to attend their community's kick-off event to learn about the program and meet each town's partner contractors. Interested residents can sign up for more information at VitalCommunities.org/Weatherize or contact their volunteer team.

- Orford-Piermont-Lyme, NH: David Perlman, davidaperlman@gmail.com
- Lebanon, NH: Lynne Garfield, lynnagarfield17@gmail.com
- Plainfield-Cornish, NH: Steve Ladd, StevenALadd@gmail.com
- Springfield-Chester, VT: Char Osterlund, charmf@vermontel.net
- Woodstock-Pomfret-Bridgewater, VT: Zach Ralph, zach@sustainablewoodstock.org

Weatherize Partner Contractors for 2018 include ABC Energy Savings, Build Basic Green, Building Alternatives, Building Energy, Earthshare Construction, Farnum Insulators, Quality Insulation of Meredith, Shakes to Shingles, van de Ven Construction, Vermont Foam Insulation, Weatherization and Renovation of Montpelier, and Yankee Thermal Imaging.

For more information about Weatherize Upper Valley and the January kick-off events, visit VitalCommunities.org/Weatherize.

Paige Heverly is a project coordinator focused on energy and transportation at Vital Communities. Paige can be reached at Paige@VitalCommunities.org or 802.291.9100 x114. ☕

A NEW METRIC - Cont'd from p.26

The New Metric for Scoring State Progress

State	zEPI Score
Hawaii	51.1
Massachusetts	51.7
California	51.7
Washington	51.9
New Jersey	52.0
Texas	52.9
Illinois	53.1
Alabama	53.7
Utah	54.6
Vermont	55.0

new rankings with California ranking third.

To see the full preliminary results of the new zEPI Jurisdictional Scores, visit page 86 in the 2017 list (<http://aceee.org/research-report/u1710>). For details on methodology, go to <http://bit.ly/nbi-zEPI-methodology>

With a metric that gives a clear vision to zero energy, tracking the zEPI rankings of energy code models and jurisdictional adoption will provide straightforward feedback to policymakers and a variety of stakeholders on how they are progressing toward a low-carbon future. As is the case with the annual Scorecard, the new zEPI Jurisdictional Scores are expected to promote a little competition between states, to boot!

New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in commercial buildings. They work collaboratively with industry market players—governments, utilities, energy efficiency advocates and building professionals—to promote advanced design practices, innovative technologies, public policies and programs that improve energy efficiency. They also develop and offer guidance and tools to support the design and construction of energy efficient buildings. Learn more at newbuildings.org or contact Jim Edelson, jim@newbuilding.org or 503-209-4625.

This article is reprinted with permission from NBI and can be found at <http://bit.ly/nbi-zero-energy-tracking>. ☕

Many thanks to our sponsor:



Invest in Comfort!

Heat Pumps • Solar Systems • Energy Audits • Insulation



BuildingEnergyVT.com
802-859-3384

VT Offices in Williston and White River Junction

Schedule
an Energy
Audit
Today!



ABC Energy Savings
Weatherize Upper Valley Contractor



Reduce Your Energy Usage
Decrease Your Energy Bills,
Reduce Ice Dams, and have a
more Comfortable Home

FREE HOME ENERGY SCORE

With Completed Projects

U.S. DEPARTMENT OF ENERGY
Home Energy Score



(603) 344-4540

Bob@ABCEnergySavings.com

SNOWDOG CONSTRUCTION, LTD.

Repairs
Remodeling
Renovations
Energy Efficient Retrofits



Norwich, Vermont 05055

(802) 649-3605

michael@snowdogvermont.com

Snowdog Construction donates
1% of gross sales to Cover Home Repair

Understanding the Sustainable Supply Chain

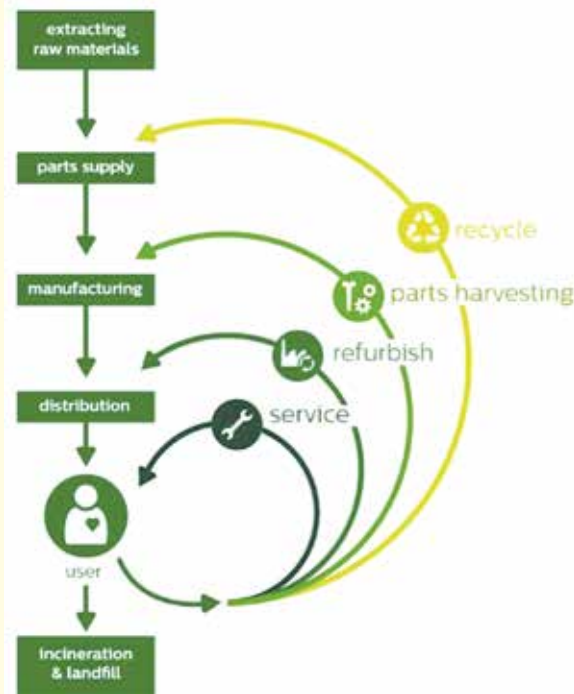
By Alex Popp

Many green building programs put a heavy emphasis on not only the sustainability of a building once it is built, but increasingly so on the sourcing and management of building materials in an environmentally responsible way. Sustainable Supply Chain (SSC), sometimes referred to as "cradle-to-cradle," is the standard term to reference this process. But what does that really mean?

What is a Sustainable Supply Chain?

SSC embodies a cyclical approach to manufacturing that considers both the recovery and reuse of materials. This supply chain's reverse logistics strives to continually sustain itself by returning materials to the land in either a safe molecular form or by continually reusing those materials for future products. Fully developed SSC's consider sustainability for every contributor at every step – from design to manufacture, transportation, and storage to eventual end-of-life with a goal of re-use, recycling, or low impact disposal. This forward-thinking perspective serves to reduce waste, promote ethical and socially beneficial manufacturing practices, minimize or eliminate adverse health impacts, and enable compliance with increasingly stringent regulations.

In addition to giving you the warm fuzzy feeling that comes with reducing the environmental impact of product manufacturing, utilizing Sustainable Supply Chain materials has several business benefits. For corporations, it can help generate positive environmental and



Circular Sustainable Supply Chain Image via <https://www.cerasis.com>

social impacts, and improve brand reputation, affecting numerous positive outcomes from increased sales to lowering operational costs. It can also simplify compliance efforts and mitigate regulatory risk.

The Cost of Materials on a Macro Level

Unlike the conventional supply chains, the SSC has a broader view of the system that internalizes operational costs and ultimately converts them into sources of value. A simple

example would be an internalized cost for deforestation for wood and paper-based products. Although a tree can be a renewable resource, the conventional method often results in deforestation, transforming our theoretically renewable resource into one that is not. By implementing a cost for deforestation, the renewability of trees as a resource can be maintained and the negative impacts on biodiversity can be mitigated. Internalized costs such as these are pertinent to closed loop mechanics.

The Challenges of Sustainable Supply Chain Adoption

Managing the Supply Chain

The success of the SSC and subsequent benefits are intrinsically rooted in effective management which can be complex to navigate. Companies must actively include suppliers and service providers in the "greenification" of the supply chain to improve sustainability. Participants of the SSC must also collaborate with one another to find better

ways to address environmental degradation, rising energy and raw material prices, and discrepancies between labor/environmental standards in one country and legal and consumer expectation in another.

Developing Sustainable Supply Chain Standards

For SSCs to flourish, widely-recognized industry standards and programs must be adopted. There is a strong need to regulate the advertising, labeling, and promotion of genuine sustainable practices to differentiate them from the superficial and misleading promotion of falsely-labeled green products known as "greenwashing."

Businesses must decide what practices to adopt and what sustainability certifications/labels to pursue. There are many certifications/labels/declarations to choose from, and many more being added each year. Businesses must consider cost, ROI, and credibility of the label. There are some existing recognized labels that are leading the way, such as Cradle to Cradle, Environmental Product Declaration (EPD), Carbon Trust Reduction Label (CTRL), and Fairtrade. While these labels



Sustainable Supply Chain Labels and EcoLabels

and others are making strides in the right direction, labeling SSC products is challenged by the complex and large scope of factors. A comprehensive and all-encompassing labeling system remains to dominate the industry.

Redeveloping supply chain methodologies takes time. It is a complete paradigm shift that involves widespread collaboration, a reprioritization of values, and incentivizing responsible behaviors. Incorporating SSC's is not associated exclusively with green building programs; however they are helping to lead the way in this shift by enforcing a reliable set of standards and increasing the visibility of responsible product sourcing and management. And just as many of the sustainable building practices became more widespread and eventually mainstreamed because of these programs, it is our hope that so too will Sustainable Supply Chains.

Alex Popp is a sustainability consultant for Steven Winter Associates, Inc.



The perfect cold weather climate ERV

www.renewaire.com



- ◆ INDUSTRY LEADER SINCE 1983
- ◆ No Condensate Drain
- ◆ No Defrost Required
- ◆ BROADEST PRODUCT LINE

Contact RST Thermal at:
781.320.9910
RSTThermal.com



WRIGHT
CONSTRUCTION COMPANY, INC.
Building Excellence Since 1984!

| Quality Residential | Commercial | Historical Preservation | Covered Bridges |

www.WrightConstruction.com
31 Station Rd. P: 802-259-2094
Mount Holly, VT 05758 F: 802-259-2689

Representing the finest in high performance fenestration products:
Loewen, Kohltech uPVC* & Tanner*
* passive house rated

LOEWEN WINDOW CENTER
OF VERMONT & NEW HAMPSHIRE

52 Bridge Street, White River Jct., VT 05001
800.505.1892 • 802.295.6555 • info@loewenvt.com
WE SPEAK TRIPLE GLAZING

BURLINGTON 2030 CREATED TO ADDRESS CLIMATE CHANGE

Leading Burlington, Vermont businesses and institutions have committed over 3.6 million square feet to participate in the Burlington 2030 District, a private-public partnership working to reduce building energy consumption, water use and transportation emissions 50% by 2030. By establishing the economic case for the necessary reductions, the District helps property owners increase asset value, reduce operating costs, and create a healthier community.

Burlington is the seventeenth city to join a national network of 2030 Districts including Seattle, San Francisco, Pittsburgh, Ithaca and Cleveland. In April 2017, local non-profit Vermont Green Building Network (VGBN) became the non-profit sponsor organization of the newly established Burlington 2030 District. "VGBN sees the Burlington 2030 District as an important tool in the achievement of VGBN's mission," stated Jenna Antonino DiMare, VGBN Executive Director. "We are excited to support this new initiative in Vermont and are committed to extending the lessons learned and benefits beyond Burlington as momentum grows."

The Burlington 2030 District initiative has strong support from both the private and public sectors, including the Burlington's municipal electric utility, Burlington Electric Department (BED), as well as Vermont Gas. "Burlington Electric Department's 2017-

2018 Strategic Plan includes a ten-year vision to transition Burlington to a 'net-zero energy city' across electric, thermal and transportation sectors by reducing demand, realizing efficiency gains, and expanding local renewable generation, while increasing system resilience," stated Chris Burns, Director of Energy Services at BED. "The 2030 District program is uniquely designed to help BED with this vision."

The District was spearheaded by a highly dedicated Steering Committee, which include several local architects, City of Burlington employees, property owners, community and professional stakeholders, and representatives from the University of Vermont. Some of the first property owners/managers to participate in the program include City Place Burlington, Champlain College, Burlington School District, Farrell Real Estate, Nick and Morrissey, and Main Street Landing.

"Main Street Landing prides itself for the work we have done over the years to help preserve our planet – being a part of the Burlington 2030 District puts our hearts and more importantly our actions right where they need to be – living our values," Main Street Landing's CEO Melinda Moulton states. "It is a terrific program, and we all benefit at the end of the day."

The Burlington 2030 District project is open to all businesses in the City of Burlington and intends to offer a residential program within

three years. The District provides a framework to advance, inspire and unify climate change efforts, and the Vermont Green Building Network is pleased to support this important initiative.

About VGBN: Founded in 2002, the Vermont Green Building Network is a non-profit working with the building industry to achieve its vision

of fostering green building in Vermont, thereby contributing to a thriving local economy, a healthy environment, and high quality of life in all communities. To learn more, please visit: www.vtgreenbuildingnetwork.org or call Jenna Antonino DiMare at 802-735-2192.

To learn more about the Burlington 2030 Dstr, please visit: www.2030districts.org/burlington.




Fossil Fuel Free High Performance Homes

Zero Energy Modulares or Site-Built
Deep Energy Retrofits
High Performance Upgrades for existing homes

BOB IRVING Owner/Builder • Serving New Hampshire & Eastern Vermont

www.rhirvinghomebuilders.com • 603.648.2635


bob@rhirvinghomebuilders.com • Salisbury, New Hampshire



EverLED-XO™
by LEDdynamics

*A breakthrough in LED Plug & Play
Fluorescent Replacement from technology
originators, LEDdynamics*

- Easily upgrade your fluorescent fixtures, no modification required
- Works with Instant Start, Rapid Start, and dimmable ballasts
- Uses half the energy, qualifies for efficiency rebates
- Extended lifetime for long-term maintenance savings
- Be Green, remove toxic chemicals found in fluorescents
- Innovative one-piece, impact resistant construction
- Perfect for food service applications
- UL approved for damp locations
- Designed and manufactured in Vermont



Visit us at EverLED.com or call us at 802.728.4533

LEDdynamics, Inc.
802.728.4533 P
802.728.3800 F
sales@everled.com
www.EverLED.com

LEDdynamics
what a bright idea

We build high-efficiency and Net-zero homes in the Capitol Region

www.halfmoonconstruction.com



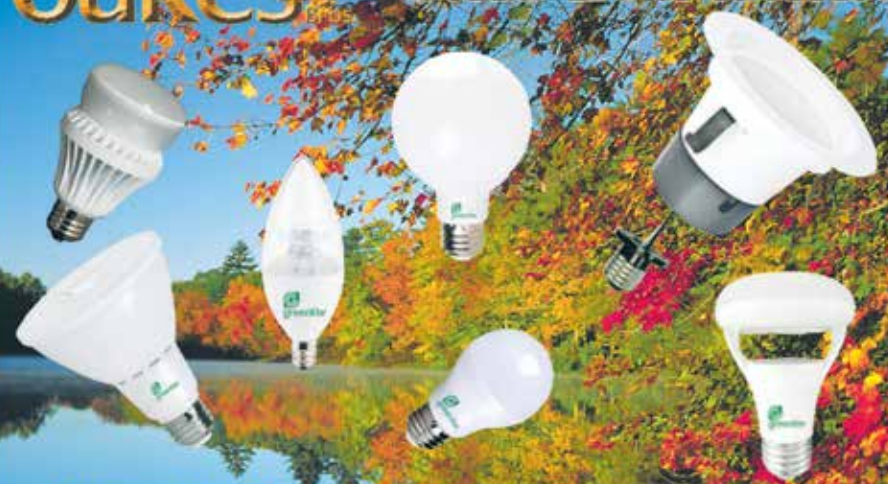
HALFMOON
GREEN BUILDING, LLC

518.269.8619



Sustainable Living Homes • Net-zero Buildings • Logix Insulated Concrete Forms
Andy Ellis, Custom Builder • halfmoonconstruction@gmail.com

Oakes Sale Led bulbs



LED SHOPLITE

Efficiency Vermont

975 Lower Plain Bradford VT 05033 Tel: 802-222-5280



GEOBARNs
Vermont Craftsmanship since 1991

603.359.1912 / geobarns.com

TORTORICE'S TIPS:

Snow On Your Roof - Do You Treat the Symptom or the Cause?

By Bob Tortorice



Snow build-up and icicles can damage your roof. Proper air-sealing and insulation can help avoid this problem. Photo: allstate.com

Believe it or not, snow build-up on your roof is caused by the lack of heat escaping to it, in a manner similar to what happens with an unheated garage or a well-insulated house.

In the past, houses didn't have much insulation, oil was cheap and heating with firewood was common. The heat reached the attic and melted the snow off the roof. Even now, almost anywhere, you can still see many roofs with little or no snow indicating a lack of insulation.

Snow on the roof of an unheated and uninsulated garage is typically melted by the sun, and not by heat escaping through the roof. A well-insulated house sees its built-up snow melt for reasons other than escaping heat. A particular kind of problem house is the one that is poorly insulated, but where lost heat from the building is not enough to clear the volumes of snow delivered by Mother Nature in our typical winters. The heat only melts the bottom layer of snow creating heavy water- and ice-laden snow conditions. The result is significant icicles, damage to roofing materials, or worse yet, structural roof failure, when the roof collapses under the weight of the snow and ice.

What should you, the homeowner, do? Today, you may have to treat the symptoms of problems and remove the snow by shoveling it off the roof. Tomorrow — meaning spring or summer — you have a chance to treat the fundamental cause by properly insulating both the attic and the basement. Those basement walls have no insulation and the exterior walls are generally poorly insulated, and may have open gaps and holes dating from construction or due to other causes, creating open pathways for heat to find its way into and through to the poorly insulated attic, causing ice dams and very large icicles.

A word of caution: beware the roof of a newly air-sealed and insulated house that was not designed for today's snow loads. Thirty plus years ago, roofs were designed for 30 to 40 pounds per square foot of snow load. Today's roofs are designed for snow loads between 65 to 110 lbs. If you decide to insulate your home later this year, it is essential to confirm that your roof is able to handle heavier snow loads. Just adding insulation to the attic floor is not enough, nor even the best first step. Heat loss is also caused by airflow of heated air, in the house's framing, structure, and finishes, or "shell." A principal means of airflow is through gaps, holes, and pas-

sages. Forty percent of a home's heat loss is through infiltration, which causes many of the drafts you feel every day. The attic and basement must be air-sealed before any insulation is added, using a variety of approaches and methods, most of which are basic, and many of which can be done by handy homeowners.

The sequence is (1) snow on the roof, (2) building heat loss causes icicles, (3) icicles create ice dams, and (4) ice dams cause the back up of water that leaks into your attic and home causing major damage. Treating the symptom by removing the snow doesn't treat the cause at all. It's a temporary fix, which will be repeated year after year, snowstorm after snowstorm. If this is what you experience this winter, take the spring and summer to hire an energy auditor to investigate and treat the cause so that you can enjoy the rest of this winter and future winters without the worry of ice and water backups into your home. And you'll be warmer, too!

Bob Tortorice has over 30 years of green building experience. He is the owner of Building Alternatives, Inc. and Alternative Energy Audits in Franconia. Call 823-5100 or visit www.buildingalternatives.com or www.epsbuildings.com to learn more about "Building Life Long Savings." ♻️

NHCDFA's Low Cost Energy Audit Program



A program through the NH Community Development Finance Authority offers NH agricultural producers and rural small businesses up to 75% off the cost of a comprehensive energy audit. This can help identify many cost-saving opportunities for your business as well as opportunities to improve comfort and productivity.

For more information and how to apply, contact CDFA Director of Clean Energy Finance, Scott Maslansky at <http://bit.ly/Ag-Audits>, 603-717-9123.



BUILDING ALTERNATIVES INC.

ENERGY EFFICIENCY SPECIALISTS

BY BOB TORTORICE
A DIVISION OF BUILDING ALTERNATIVES, INC.

"Building Savings for a Lifetime" • Multiple Award-Winning Green Builder • 30+ years serving all of NH

NEW CONSTRUCTION

We build **energy-efficient** homes from the design up! Utilizing the business model of **consultation, construction management** and **general contracting**, we are your agent!

GREEN BUILDING TECHNOLOGIES (energystar)

- Custom Modular
- Passive Solar Design
- Log
- Advanced 2x6 Framing
- Timberframe
- Structural Panels (SIPs)
- Insulated Concrete Forms (ICF)

RENEWABLE ENERGY OPTIONS

- Active Solar Systems
- Geothermal Systems
- Wind Power

Let us perform an **energy audit** on your home, or a home you're considering purchasing, to determine where the house is losing energy, and then develop a plan to **reduce heating bills by 25-50%**, as well as increasing the comfort of your current or soon-to-be home!

THE BENEFITS OF A HOME ENERGY AUDIT INCLUDE:

- Prevent repainting the exterior of your house year after year
- Claim your basement and attic as additional living space
- Solutions for problems such as mold, frost, cold, drafty rooms or ice dams
- Possible rebates for existing homes, and piece-of-mind for homebuyers before you sign!



BuildingAlternatives.com
info@BuildingAlternatives.com
Phone (603) 823-5100 Toll Free (877) 823-5101

BOB TORTORICE
Green Builder



Garland Mill Timberframes

273 Garland Road Lancaster, NH 03584

tele/fax 603.788.2619 www.garlandmill.com

High-Performance Homes

SOLAR-POWERED DEALERSHIP

Cont'd from p.6



Front view of Contemporary Automotive's new eco-friendly designed dealership in Milford, NH makes use of energy efficient LED lighting throughout the facility. Courtesy photos.

service drive-thru and repair shop with the help of an optimized HVAC system and large de-stratification fans, which facilitate the circulation and blending of the warm air near the ceilings with the cool air near the floor.

The heat Contemporary Automotive produces will stay in the building thanks to the facility's energy-efficient building envelope. R38 roof insulation, 2" under-slab hard foam insulation, 3" insulated metal panels and light reflective exterior windows all work to conserve the facility's warmth.

Outside of the building, Contemporary Automotive's landscape is populated with drought-tolerant plants, trees and grasses that are native to New Hampshire, as to significantly reduce water consumption. Contemporary Automotive is also home to four large bio-retention gardens that help manage storm

water runoff by allowing more water to be absorbed into the ground before flowing to detention ponds.

The Contemporary Automotive team is excited about the new facility and proud to have a workplace that reflects and expresses their commitment to the environment.

"All-in-all, we're very pleased with the transition," said Hammer. "We're settling into the new facility more and more each day."

Contemporary Automotive's new location was designed in conjunction with Sanford Survey-



Contemporary Automotive's new facility has a 135kW rooftop solar PV array consisting of 450 panels. The array will generate approximately 149,700 kilowatt hours of clean energy each year and will offset the majority of the dealership's electric load while offsetting 157,634 pounds of carbon pollution per year.

ing & Engineering of Bedford and Warrenstreet Architects of Concord. Site work and construction were managed by Turnstone Corporation of Milford.

For more information on Contemporary Automotive, visit www.contemporarychryslerdodgejeep.com or call (877) 824-0621.

Chris Gillespie is a contributing writer for *Green Energy Times*. He can be reached at chris@greenenergytimes.org. ♻️

NEW RECORD LEVELS OF CARBON DIOXIDE (CO2)

By George Harvey

According to the World Meteorological Organization (WMO), the levels of carbon dioxide (CO2) in the atmosphere set a historic record in 2016. The same levels had been reached 800,000 years ago, but since then, things have changed quite a lot.

The first thing to understand about the significance of the current levels of CO2 is that they have been increasing many times faster than they ever had in the past. The difference is rather like getting hit by a car. You can adapt to a car going one mile per hour, just as the Earth did to changes in CO2 levels 800,000 years ago. But today, CO2 levels are going up a hundred times as fast as they did then. You cannot adapt to being hit by a car going a hundred miles per hour.

The second thing to understand is that we are really only beginning to see the damage coming. 800,000 years ago, when the CO2 levels were the same, sea levels were about 35 to 70 feet higher than they are today. The difference is in the ice in Greenland and Antarctica. As today's CO2 levels create temperatures that melt our ice, our coastal areas will have sea levels much higher than they are today. Assuming we stop CO2 emissions now, many of our cities will be worthless underwater real estate.

There is an aspect of the WMO observations that is frightening. It is that the levels of CO2 and methane have been increasing much faster than expected. Based on figures from the countries that subscribe to the Paris Climate Accord of 2015 (i.e., all of them, apart from the United States), we would have expected CO2 levels to have remained steady, or close to it.

There are natural reasons why CO2 levels would have been higher in 2015 and 2016. They relate to droughts that resulted from the El Niño of the period,

which caused less CO2 to have been taken out of the atmosphere by plants. But science suggests that is not the major cause.

Another frightening aspect of the time is an increase in the levels of methane in the atmosphere that is unexpected and unexplained. The increase happened in tropical and semi-tropical areas, and scientists are at a loss to say what has caused it.

One more thing is that new modeling suggests that the goals of the Paris Climate Accord are entirely insufficient to address global warming. One recent paper published in the journal, *Nature*, stated researchers had concluded that the Paris Accord goals had a 93% chance of producing temperature increases of 4° C, if they are left unchanged. The Paris Accord attempted to keep changes to 2° C.

There is good news. It is that we can save a lot of money and live more comfortably if we use the sustainable technologies that will stop climate change. Economics may produce changes for which honor, decency, morality, ethics, patriotism, and love of our children and grandchildren are insufficient. ♻️



CO2 levels increased during the El Niño period (2015-2016) due the droughts causing less vegetation available to take CO2 out of the atmosphere. Photo: Pixabay.

Tesla Keeps On Truckin'...

By George Harvey



Tesla Roadster 2.0. Tesla image.

Readers of *Green Energy Times* will probably recall an article that appeared on the front page of the October issue, "New Tesla Semi-Truck" (<http://bit.ly/GET-Tesla-semi>). We had expected to go to press with an article on the new Tesla truck, which was scheduled to be unveiled just before our press deadlines. But, as the article explained, our plans had to change.

Elon Musk, Tesla's CEO, had decided to go in an entirely different direction. Instead of unveiling its new truck as planned, he announced that Tesla was putting its efforts into recovery efforts in Puerto Rico, which had been devastated by Hurricanes Irma and Maria. The truck unveiling would be put off

until November.

By the time that announcement was made, things were already hectic for Musk. He had promised months before that he could install the largest battery ever built and connect it to the South Australian power grid within 100 days from the time the grid interconnection contract was signed, or it would cost the state nothing. And that contract had been signed, so the time had come to move on the promise or lose a lot of money. But it was signed just days before Hurricane Irma hit Puerto Rico.

With Irma, soon followed by the more destructive Maria, Puerto Rico needed heroic efforts. There was plenty of work to be done, and the pace was intense. An early sign of success for Tesla came on October 24, when Musk sent out an Instagram post saying that Tesla had just provided power to Hospital del Niño, a children's hospital with 3,000 patients, in San Juan. That installation, including 700 solar panels and battery backup, was completed in a couple of weeks. And Musk said the installation would be just the "first of many" such projects.

Meanwhile, Tesla had to continue working hard on what looked to be a daunting deadline in South Australia. The monster battery, the Hornsdale Power Reserve, would have a power capacity of 100 megawatts and a storage capacity of 129 megawatt hours. It would be three times the size of the next largest

battery ever built. And Tesla had to finish it by December 1st or lose \$50 million.

Do you get the idea that unveiling the Tesla Semi Truck came during a time full of distractions? Musk must have been in a state of stress when the rescheduled Tesla Semi Truck was finally held on November 16th. Nevertheless, it was an event worth remembering, and we might bet he enjoyed it thoroughly.

Elon Musk showed off the new Tesla Semi Truck in a carefully staged event. At a typical Tesla multi-media show, with gigantic screens and lights, Musk kept the audience spellbound as he talked about what will probably be the most advanced semi-tractor ever to be produced. It will come in two versions, expected to be available in 2019. One will have a 300-mile range and will cost about \$150,000. The other will have a 500-mile range and cost \$180,000. Given the low operating costs, these prices are considered very competitive by many people in the industry, and orders started coming in soon after the press conference.

But even with the truck's presentation complete, the event was not over. In fact, unveiling the truck was only the first act, and perhaps what came next was its high point. Musk unexpectedly went offstage, and something appeared that nearly no one seems to have expected.

Musk was not just unveiling the truck as he

had long promised. He was also very unexpectedly showing off the new Tesla Roadster 2.0.

Tesla's new roadster will be faster than any gas-fueled production car ever built, Musk told the audience. It would accelerate from 0 to 60 miles per hour in 1.9 seconds, and from 0 to 100 in 4.2 seconds. Top speed is 250 mph. The base model is expected to cost \$200,000, and a deposit of \$50,000 is required to pre-order one (though it is possible to make a \$5,000 down-payment on the pre-order price). Plans are for the new Tesla roadster to be available in 2020, and people are already lining up.

Elon Musk said "The point of all this is just to give a hardcore smackdown to gasoline cars." Compared to the Model 2 Roadster, he said, driving a gas-powered sports car would be like driving "a steam engine with a side of quiche."

Meanwhile, Tesla's work elsewhere has gone on. The Hornsdale Power Reserve, the battery in South Australia, with a 100-MW/129-MWh battery was put online a day early, on November 30, because the state had a power shortage and asked for whatever power could be delivered. Tesla had met the deadline in under 100 days.

This fall's work must have been hectic for Elon Musk. We are all worn out just reporting it. ♻️

A CLEAN ENERGY TRANSITION

Solar Advances Sustainability at Dartmouth College

By Charlotte Albright | Dartmouth News



An aerial view of the new solar panels on the roof of Berry Sports Center at Dartmouth College in Hanover, NH. Photo by Robert Gill.

"These three systems are installed at no cost to Dartmouth College right now, and the College is purchasing the electricity generated by the solar panels from ReVision at a discounted rate. In six to seven years the College can buy the panels outright at a significantly discounted cost," said Hasselbeck.

PPAs are motivating many nonprofit institutions to go solar, Weeks said. To encourage the transition to solar energy, the federal government provides tax credits, and many states, including New Hampshire, offer tax rebates. Dartmouth does not carry a tax liability, so it cannot benefit directly from those financial incentives. On the other hand, ReVision can qualify for those subsidies, allowing it to pass along savings to customers in the form of discounted kilowatts.

"Dartmouth is going to save six figures over the life of the array, and we expect our systems to have a 40-year life span," said Weeks. "Larger projects could yield seven-figure savings. It's wonderful to see Dartmouth providing an example for other institutions, as people realize they can save the planet and a bunch of money."

Dartmouth's first rooftop solar system was installed in 1995, on Murdough Hall, through an alumni donation. "In recent years," says Abbe Bjorklund, Dartmouth's director of engineering and utilities, "advances in solar technology, combined with financial incentives, have made installation basically cost-free to us, through purchased power agreements. And we are buying the electricity generated by ReVision's solar

panels at the same rate or lower than we had been paying electric utilities." Bjorklund says these three initial projects allow the College to "get experience with this technology and purchase power agreements on campus." Increasing reliance on renewable sources of energy is one of several goals set forth in

**New Solar Panels
Help Reduce
Dartmouth's Reliance
on Fossil Fuels**



Above: The Davis Varsity House has an 18.3-kW solar array with an annual generation of 20,725-kW consisting of 60 panels. This system has an annual CO2 offset of 21,823 pounds. This solar array was commissioned in September 2017.

Below: The MacLean Engineering Sciences Center has a 53.7-kW solar array with an annual generation of 70,000-kW consisting of 179 panels. This system has an annual CO2 offset of 73,710 pounds. This solar array was commissioned in August 2017.

Over 400 photovoltaic panels atop Berry Sports Center are part of how Dartmouth College is already harnessing energy from the sun. Berry Sports Center is one of three campus buildings with new solar systems installed by ReVision Energy, a company based in Northern New England. The roofs of Davis Varsity House and the MacLean Engineering Sciences Center have also added solar arrays in recent months.

Under a warm sun on Berry's flat, black roof, Dan Weeks, ReVision's director of market development for New Hampshire and Massachusetts, and James Hasselbeck, its operations manager, explained that ReVision and Dartmouth have entered a mutually beneficial "purchased power agreement," known as a PPA.

**Dartmouth
aims to reduce
greenhouse gas
emissions by
50% by 2025.**



the campus sustainability plan announced by President Phil Hanlon '77 last April. Dartmouth aims to

Cont'd on p.39

The Largest School Solar in Vermont - St. Albans is Amazing

By Green Energy Times staff

The St. Albans Town Educational Center (SATEC) has an impressive new solar array on the roof. In fact, it can claim to be the largest solar array for any school in the state of Vermont.

The 2,029 photovoltaic panels in the array have a total capacity of 640 kilowatts. They all sit on the roof of the SATEC building, creating a really impressive sight. They also are expected to save the school system about \$400,000 over the term of the lease. With financing provided by a private investor, there was no initial cost to the school system, so having the array is all savings.

There are 750 students in the school, which serves students at the kindergarten through eighth grade level. The solar array will provide all the power the school needs,



A flyover view of the St. Albans Town Educational Center's array. Courtesy of SunCommon.

with some to spare. The extra will go to Bellows Free Academy, the high school in St. Albans.

The Maple Run School District is a newly formed system that includes both schools, along with four others. Dr. Kevin Dirth, the

school district's superintendent, said that the work on solar for the schools of St. Albans is just beginning. "Our newly merged school district has also approved projects at St. Albans City School and Collins Perley Sports Complex. Why not put our rooftops and parking lots to work, powering the education of our 2700 students?"

SATEC's eighth grade class attended an inauguration ceremony for the

system. Principal Angela Stebbins said the class had been spending time focusing on the issues of energy, pollution, and climate change. Four students in the eighth grade spoke about the issue of climate change, saying their research had shown it was a

real problem that had to be addressed.

SunCommon, which may be Vermont's largest solar installer, put the system in. The company is a Certified B Corporation, and has a triple bottom line that includes people and planet along with profit. With headquarters in a net-positive building in Waterbury, Vermont, it has about 100 employees. The company stresses a belief that everyone has a right to a healthy environment and that renewable energy is a starting point for that vision. It says it has a mission to use its business as a force for good.

While SunCommon was building the array on SATEC, it looked elsewhere in the community of St. Albans for other possible customers. By doing business in the same community at the same time, it could realize the potential benefits of a solarize campaign, both for itself and for those customers. When a number of customers have installations done in the same community at the same time, the resulting efficiencies keep costs down for everyone.

SunCommon's web site is <http://www.suncommon.com>. ♻️

HAWAII MAUI COLLEGE ON TRACK TO BE 1ST NET-ZERO COLLEGE

By George Harvey



Over 750kW of PV carports installed at UH Maui College by HNU Energy was the first major step toward UH Maui College's vision to become the nation's first net-zero college campus. Courtesy HNU Energy.

In June of 2015, Governor David Ige of Hawaii signed a set of laws relating to the state's electric power. One of them set out a requirement that by 2045 all electric generation in the state had to be from renewable sources. That was sufficiently remarkable that many people did not notice another very progressive law about renewable power. It made it mandatory for the University of Hawaii (UH) to have all ten of its campuses use net-zero electricity by 2035. This meant that the university will have to produce, from renewable sources, at least as much electricity as it uses.

Progress on fulfillment of that law has been rapid. In fact, construction of the first net-zero buildings began only a little more than a month after the law was signed, at the UH Manoa campus, in Honolulu. The building, which had clearly been planned before the law was passed, opened in November of 2016. The Manoa campus, incidentally, was where Governor Ige had earned his Bachelor of Science degree in Electrical Engineering.

Another campus that has been making news is UH Hilo, on the "Big Island" of Hawaii. UH Hilo has a variety of initiatives underway, ranging from solar photovoltaic systems and lighting, to battery backup. The overall goal of the campus is to go beyond net-zero electricity to being entirely carbon neutral by 2050.

The most ambitious short-term goal, however, might be at the UH Maui College campus. UH Maui is on track to get to net-zero electric use by 2020, at the latest. In fact, people on the campus have hopes to reach that goal in 2018. If it can achieve that goal, it will probably be the first college campus in the United States to do so.

HNU Energy was the solar installer for the Hilo and Maui campuses. HNU Energy installed over half a megawatt of PV at UH Hilo and over three quarters of a megawatt of PV carports at UH Maui. Dr Michael Reiley, President of HNU Energy states, "HNU Energy is committed to exceeding Hawaii's aggressive renewable energy goals, beginning with making UH

Maui the nation's first net-zero college campus. We couldn't be prouder of the leadership the University of Hawaii Maui College is demonstrating in sustainability and renewable energy generation and storage."

There are strong financial incentives for the UH campuses to get to their legally required goal well ahead of schedule. The cost of electricity in Hawaii is among the highest in the nation. In fact, residential rates range from a little over 26¢/kWh on Oahu, the island Honolulu is on, to a little over 31.5¢/kWh on the island of Hawaii, which has commercial rates ranging upwards from over 18¢/kWh. This is because there is no local source of fossil fuels, and historically electricity has been generated with oil, brought in by ship.

Fortunately for the people of Hawaii, there are other resources. The state's abundant sunshine makes it possible to get quite a lot of sunshine out of a solar array. This lowers the cost of solar power into the range of being very affordable, even by the standards of the rest of the country. The current levelized cost of electricity (LCOE) for utility-scale solar power with battery backup is about 8.2¢/kWh,

according to Lazard Associates (<http://bit.ly/LCOE-2017>). With its sunshine, Hawaii's average costs for solar power should be lower than that of the nation as a whole. This means the payback period for the UH campuses would probably be very short. ♻

MANY THANKS TO OUR SPONSOR



Wood Heating

Cont'd from p.24



Wood chip stove fire box. Public domain.

for ¼ of its list price. Auto-feed wood chip and pellet stoves also qualify.

This 5-Year Action Plan is endorsed by many organizations and agencies in G.E.T.'s distribution area including Pellergy and New England Wood Pellet.

For many years Barb and Greg Whitchurch have heated their house, cooked, and heated their water with cordwood in a masonry stove, cookstove and a parlor stove. They are board members of Vermont Passive House and owners of a net-zero passive house in Middlesex, Vermont, a LEAF, and a Prius. <http://bit.ly/2nRCdGL> (802)223-2416

Links: Renewable Energy Vermont (www.revermont.org); Vermont Artisan Coffee and Tea Co. (www.vtartisan.com). ♻

Self-built Home Construction

- Storm, fire and earthquake safe
- Low insurance and maintenance pay for the construction costs over time.

Contractors, add about 15% to bid



What kind of society pays for our housing and has fun healing Earth?

That question is a subject at:

ferrocement.com

Visit ferrocement.com to study water Imagine security with hurricane harvest dual tanks; locked emergency and sales



YOUR SOLAR SCHOOLS EXPERTS

Announcing the new **SOLAR ON SCHOOLS** Program



- Experience with hundreds of schools
- Exclusive Curriculum Resources Portal with every project
- Maximize grants, rebates and tax credits
- PPA = No out of pocket costs.
- Save \$ on electricity costs

necsolarservices.com

RESOURCES

350-Vermont: General group that coordinates a variety of statewide actions.
To join this group go to: <http://350vermont.org>

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

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

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

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

Carbon Tax: carbontax.org

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

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

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

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

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

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

Energy Efficiency & Renewable Energy Clearinghouse (EREC): eetd.lbl.gov

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

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

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

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

Find Solar: www.findsolar.com

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

Greywater Info: www.oasisdesign.net/greywater

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

Home Power Magazine: www.homepower.com

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

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

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

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

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

National Solar Institute: www.nationalsolarinstitute.com

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

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

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

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

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

Renewable Energy World: www.renewableenergyworld.com

Renewable Energy Vermont: www.revermont.org

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

SmartPower: www.smartpower.org

Solar Components: www.solar-components.com

Solar Jobs: Listed by city, state, and district, SolarStates.org

Solar Living Source Book: realgoods.com/solar-living-sourcebook

Solar Power Rocks: Impressive data and info ,including per state. www.solarpowerrocks.com/

Solar Store of Greenfield, MA Stock & install a wide variety of solar & environmentally friendly technologies. SolarStoreofGreenfield.com

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

The Energy Grid: www.pvwatts.org

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

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

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

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

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

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

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

www.susdesign.com Online info for solar benefit with house design: overhangs, sun angle & path...

CLASSIFIEDS

ADVERTISE IN GREEN ENERGY TIMES
Call us with your ad info or e-mail ad copy to: INFO@GREENENERGYTIMES.ORG. Up to 50 words: \$25. Each additn'l word 65¢
Deadline for the next issue is Feb. 1, 2018.

ADVERTISING SALES POSITIONS
Advertising Sales Positions open for *Green Energy Times*. Experience preferred. Must be reliable, have computer, phone and internet skills. Work from home. Must have good communication skills asnd very self-disciplined. Full or part-time. *Serious inquires only.* Reply to info@greenenergytimes.org

HARVEST HURRICANE RAINWATER

A dual tank harvested hurricane rainwater reservoir eventually pays for an additional dual tank hurricane harvester; and then those two double again. This life-like growth of security is ferro economics from ferrocement.com. It is an example ferrocement need awaiting massive numbers of spontaneous as well as planned projects. Operation can be managed by elders. Check ferrocement.com how-to manuals on line. Helps create independent water and sanitation security.

NEW NOVEL RELEASE

Many Rivers is a new novel by Garrett Connelly. It has been released in serial form chapter by chapter, starting this April, 2017. Many rivers is rated UP and VF; ultra progressive and very fun. Individual chapters arriving weekly have proven a temporary diversion for those recovering during a long healing process, e.g. joint replacement. You may set up a weekly chapter arrival of Many rivers or buy the entire story at www.ferrocement.com in the English section. There is a link to read the first chapter on line.

EZ FIRELOGS

EZ- Firelogs are 100% wood and 100% Easy! How So? 50 bags 48x40x40 creates as much heat as full cord of wood. No Bugs, bark, mess or stacking. Easy, Right!? Try this made-in-New England product. High Heat, 1% Ash, 100% Easy. ezfirelogs.com. Call 603-234-7239.

SECONDHAND SOLAR

Pre-owned solar equipment for sale: Enphase m210 - \$50; (1) Enphase m190 - \$40; (2) Enphase m215 - \$50; (2) Solectria PVI 5000S - \$500; (2) SunnyBoy 6000 - \$300; (1) Xantrex/Schneider XW-MPPT - \$125; (4) Soladeck 0786 - \$25. Also many Enphase trunk cables w/ connections. Sunnyside Solar Store, 499 W. Brattleboro, VT. (802) 280-7319. joe@sunnysidesolar.com • www.sunnysidesolar.com

2000 VW BEETLE DIESEL TDI

Blue. 147,000 miles. Good Condition. \$4,400. Converted to run on 100% vegetable oil (as well as diesel). Manual transmission. New Snow Tires. New clutch. New brake booster and master cylinder. New starter. 50 gallons of veggie fuel comes with the deal. Run your car on used veggie oil from restaurants! CALL 802-296-8318.

SUBSCRIPTION FORM

☼ 1 YR...\$30 ☼ 2 YRS...\$50 ☼ 3 YRS...\$65

name _____

address _____

city,state,zip _____

phone _____

email _____

website _____

Offer good in U.S. only. Canada: \$US 34.00. Foreign: \$US 40.00
Gift subscriptions available! One year = 6 Issues!
please send check to 1749 Wright's Mountain Road
Bradford, Vermont 05033
802.439.6675
info@greenenergytimes.org
www.greenenergytimes.org
Energy Awareness, Understanding & Independence!

GUIDE TO ADVERTISERS	
ABC Energy Savings	27
Alchemist	37
ARC Mechanical	22
Barrington Brewery	15
Building Alternatives, Inc.	30
Building Energy	27
Burlington Mitsubishi	5
Catamount Solar	10
Cindy Sanville Realty	18
Contemporary Automotive	6
Dan and Whit's	38
Eastman Electric, LLC	8
Elmore Roots	36
Energy Emporium	12
Exclusively Vermont Wood Products	26
EZ-FireLogs	23
Ferro Cement	33
Frase Electric	13
Garland Mill Timberframes	30
Geobarns	29
Grappone Auto Group	4
Green Earth Health Food Market	37
Green Energy Options	9
Greenvest	18
Halfmoon Green Buildings	29
Kingdom Bio Foam	26
KW Management	12
LEDdynamics	29
Loewen Window Center	28
Middlebury Natural Foods Co-op	37
Milhouse Enterprises	12
Monadnock Food Co-op	37
Montpelier Construction	26
NE Commercial Solar Services	33
New England FarmCon	2
New England Wood Pellet	24
NH Electric Co-op (NHEC)	23
Norwich Solar Technologies	40
NY Solar Energy Society	11
O'meara Solar	8
Oakes Bros. Lumber	29
PAREI	12
Peck Solar	10
Pellergy	24
R.H. Irving Homebuilders	29
RAE Batteries	9
RenewAire	28
Revision Energy	13
Revolution Solar	11
Rock Art Brewery	37
Saxtons River Solar	9
Sleepy Hollow Ski Center	39
Snowdog Construction	27
Snowdragon Solar	12
Solar Source	12
Solar Store of Greenfield	15
Solartech	7
Soundslides	18
Steven Winter Associates	1
TARM USA	40
The Farmyard Store	24
The Flying Goose Restaurant	37
Upper Valley Co-op	37
VT Marble..., Soapstone Co.	23
Vermont Passive House	26
Vermont Soap Organics	38
Wright Construction Co., Inc.	28
XC Ski Resorts.com	39



Ingredient of the Month INTENT

By Larry Plesent

My buddy Ivan claims that electron beams come out of our eyes when we look at something.

"How else would you explain why people almost always know when someone is watching them?" he would demand.

Anyone who has had the experience of turning suddenly to find someone staring at them, or been thinking of a friend or relative only to have them ring the phone a few seconds later, has experienced the phenomena known as "intent."

I first learned about intent from a Kung Fu instructor who had formerly been a trainer of Special Ops personnel. He taught us to tune our minds to sense dangerous intent focused on us. In this way, we would know if someone intended to do us harm before they had a chance to act on it, just like in the movies.



Kung Fu fighters: Pixabay

On another level, intent seems to solicit a "call and response" reaction from the world at large. We put our intentions out there, loudly or softly and the world and people around us mirror them. Individuals and resources are attracted or repelled to us every day, and the mysterious and extraordinarily

literal process that makes this happen is intent.

So constantly being on guard against attackers might well have a role in bringing trouble into our lives. However, being unprepared could easily put us into unexpected danger.

"Hope for the best, prepare for the worst," is a good old New England motto, and one I highly recommend for personal adoption.

As long as I am jumping down and down on the limb of yet another difficult to prove hypothesis about the basic workings of existence, and since you haven't stopped reading this to better utilize your time scanning for household battery pack deals; let's talk about species evolution and intent.

Everyone seems to have an opinion on the subject of evolution and I defend wholeheartedly your right to have one! This question is linked with our basic individual belief system of just what this existence is, and what, if anything, is the purpose of the whole beautiful mess of it. It's all incredible stuff to think about and form opinions on. You of course may already have some opinions on the subject.

So here's mine. What if DNA mutation is not just about random mutation caused by gamma rays, survival of the fittest or just plain dumb luck? What if it is also about intent, defined in this context as focused consciousness? Nothing language-based, this is more akin to the urge to pee. You just gotta go. And it always happens. Fins to legs, baby! There are new lands to conquer up ahead. Think of it as intelligent design from the inside out.

Crazy and simplistic? You bet! And I do hope you have enjoyed this sound bite philosophy moment. Keep thinking! Whatever we think, it is more than that. ♻️

WARM OUR HOMES WITHOUT WARMING THE PLANET!

Cont'd from p.24



© Erik McGregor 2017

The Renewable Heat Now Campaign Rally. Photo by Erik R. McGregor

with heat pumps. Geothermal systems are the most efficient way to heat and cool buildings in New York and are a complete alternative to burning fossil fuels. Cold climate air-source heat pumps are also a good alternative for many buildings. Lack of knowledge of these alternatives, however, results in over 90% of New York homes still relying on combustion heat from gas, oil, and propane.

"We should not be investing our money in fossil-fuel infrastructure that will soon be obsolete," said Irene Weiser, Coordinator of Fossil Free Tompkins and Town of Caroline Councilmember. "Instead, we should invest in the infrastructure of the future - energy efficiency and heat pumps."

"We also need to reverse New York's current gas expansion policy, which incentivizes utilities and customers to convert households from fuel oil to gas,"

noted Aaron Mair, former President of the Sierra Club. "The technologies to achieve these goals are available today, and we cannot afford to wait."

"Without swift and dramatic action from Governor Cuomo and other leaders, we face nothing less than climate catastrophe," said Laura Shindell, New York Organizer for Food and Water Watch.

The Renewable Heat Now campaign launched in 2017 to help educate New Yorkers and advocate for incentives and policies to promote this transition. The campaign's educational talks by experts Dr. Arjun Makhijani and Jay Egg have drawn crowds all over the state, from curious homeowners and architects to energy activists. The campaign's platform calls for updated building codes to eliminate fossil fuel heating in new construction, rebates and incentives to promote installation of heat pumps, and policies and assistance especially for low-income homeowners to afford the initial investment in equipment.

Rally speakers also proposed alternatives to New York State's plans to run the Empire State Plaza on a combined heat and power plant burning fracked gas.

"We are calling on Governor Cuomo to open a request for proposals so that engineers that are learned in geothermal technologies can implement practicable solutions for the proposed Sheridan Avenue Project, to supply renewable energy for the Empire State Plaza and other buildings. New York State can be a national model for sustainable energy," said Merton D. Simpson, Albany County Legislator and Co-Chair of SHARE.

"Geothermal provides all of the heating and cooling needs for millions of commercial and residential buildings worldwide," observed geothermal expert Jay Egg, who taught renewable heating and cooling workshops across the state this fall as part of the Renewable Heat Now campaign. In November, he penned a critique of the New York Power Authority's dismissal of geothermal as a viable option for the Empire State Plaza and met with Albany Mayor Kathy Sheehan. "Let's help Empire State Plaza lead the way for New York and become a geothermal beacon for the Empire State."

Lindsay Speer is an organizer with the Renewable Heat Now campaign, and the Director of Creating Change Consulting, helping people advocate for environmental justice and climate solutions. Follow her on Twitter @CareOfTheEarth. ♻️

NH Solar Shares Over the Top

Cont'd from p.12

Shares met the matching-fundraising challenge issued by the NHEC Foundation by raising more than \$10,000 through individual donations. The Foundation's matching grant will allow NH Solar Shares to break ground on the Plymouth PV array as soon as this spring, with expected completion by summer 2018.

"We're always looking for creative ways to ease the financial burden faced by some of our members living on low or fixed incomes," said NHEC President/CEO Steve Camerino. "NH Solar Shares does that, while also reducing the impact of electric consumption on the environment and increasing the portion of clean renewable energy on the grid. NHEC and NH Solar Shares is a partnership that accomplishes a lot for our members and the community."

The donation caps a fundraising campaign that attracted sizable donations and pledges from businesses such as Dunkin Donuts Plymouth, The Common Man Family, Avangrid and ReVision Energy, as well as over \$14,000 in donations from individuals wishing to support the project.

NH Solar Shares was recently awarded a \$75,000 CDFA Business Tax Credit Grant. This allows businesses to dedicate a portion of their New Hampshire taxes to a local charitable project. Donations of any size are welcomed and appreciated. Businesses interested in pledging their support to NH

Solar Shares should visit www.nhcdfa.org/tax-credits/current-projects.

The NHEC Foundation is funded by the generosity of NHEC members who participate in the Round Up Program. Participating members agree to have their monthly electric bill rounded up to the next dollar with the proceeds benefiting the NHEC Foundation. The average contribution is about \$6 a year per person. Over 10 years, that small change has added up to more than \$3 million, which has been awarded to non-profit organizations that are working to improve the quality of life in the NHEC service territory. For more information about



The New Hampshire Electric Co-op Foundation recently awarded a \$10,000 grant to NH Solar Shares, which will allow the group to break ground on their first solar electric array. Marking the occasion were (from left) NHEC President/CEO Steve Camerino, Dunkin Donuts Plymouth owner and Solar Shares contributor Chris Swanson, PAREI Co-Director Sandra Jones, Plymouth State University student volunteer Sophie Edwards, NHEC Foundation Employee Board member Scott Knapp, NHEC Foundation Executive Director Sara Thielbar, NHEC Foundation Board Chair and NHEC Director Sharon Davis.

the Foundation and the Round Up Program, visit www.nhec.com/nhec-foundation.

NHEC is a member-owned, non-profit electric distribution cooperative serving 84,000 homes and businesses in 115 New Hampshire communities. www.nhec.com. ♻️

Elmore Roots' Permaculture Know-How

HOW TO FLY

by David Fried



Paintings by Gabriel Tempesta

The apple was waiting to take its first steps away from its tree. It had made it through the winds of winter and the hot evenings of summer when it rarely rained or cooled off. She heard the pears in a tree nearby saying, "Wait, wait, soon it will be your turn, soon you will soar through the air." Would this be the morning?

A group of kids came by with their teacher into the fruit grove. Some of the tall kids reached up and picked apples, but one apple was much too high up to reach. A small kid saw her way up there and yearned to pluck her and taste her, but

there was no way to get her down. Then the wind picked up. "Class!" the teacher called, "five more minutes and we're out of here."

The smallest kid looked up at the apple, and the apple looked at the smallest kid. With all her might, the apple stretched this way and that to try to dislodge herself from her high branch. Then the wind gust pushed all the branches this way and that way. The apple came clean from her twig and began flying through the air. The smallest kid, watching the whole time, opened her hands and caught the flying apple.

On the bus back to school, the smallest kid reached into her pocket and felt her apple from the high branch. It seemed it had flown right to her at just the right moment. She lifted it to her mouth and took a bite. Ah, so crisp and so juicy. She thought about how long that tree may have been growing there, and who had planted it. She also realized she had been very fortunate that this apple had flown directly into her hands. She told herself that she would tell this story to others. She hoped it would inspire them to visit trees and look up into their branches and plant more so there would always be trees.

Each time we plant an apple tree, we are starting a new story. We are feeding the pollinators with the flowers, the wildlife with the apples and the earth with the leaves and oxygen. The tree we plant grows up towards the sky, higher than we can jump or reach, and the top of it lives up in the air. Each breeze sends the branches flying this way and that. Each autumn the leaves fly up and around. Each harvest the apples fly across the hillside into waiting arms or baskets.

When we plant an apple tree, we are a partner in the earth's magic life. As the "parent" who guides this tree into the ground and into successful long life, we get to ride along with its accomplishments. When the fruit sails, we sail. When the leaves swirl, we swirl. As they say, "the apple doesn't fall far from the tree." Keep sailing, keep flying, keep dancing, keep planting.

David Fried is the grower/poet of Elmore Roots fruit tree nursery in Elmore, Vermont. ♻️

heirloom apples * siberian quince * elderberries * hardiest plum and pear trees * paw paws * northern kiwi vines * seaberrries *

Elmore Roots

Not like any other nursery we can deliver or ship!

GIFT CERTIFICATES AVAILABLE ONLINE

elmoreroots.com 802.888.3305

* blueberry bushes ready to fruit! *

elderberries * hardiest plum and pear trees * paw paws * northern kiwi vines * seaberrries *



What the End of Oil Looks Like

Cont'd from p.15

cars will become "electrified," some barely. The Chinese manufacturers will go global and be very competitive, buying more of the West's manufacturers. In the U.S. market, manufacturers will try to retain SUVs and trucks as plug/hybrids (profit), while issuing CUVs (Crossover vehicles) and sedans as EVs. Hybrids will proliferate for a while, to retain the value of engines, but fade as battery technology improves and battery electrics take over the market.

Car dealerships will get squeezed as sales margins get tighter for EVs, while volume ramps up and the Chinese move in. Maintenance facilities are key revenue generators now, but service needs will shrink (EVs need one-third the maintenance of fossil-vehicles, over-the-air updates take root). Still, dealerships will remain and focus more on sales (new and pre-owned). Gear-headed sales and service staff will have to learn about EVs or stay with the shrinking combustion market.

Effect on Oil Industry: As CAFE (Corporate Average Fuel Economy) standards get tighter and combustion vehicles get displaced by PEVs (especially EVs), the demand for oil will shrink (peak demand predicted within 10 years). It won't take much demand shrinkage to affect oil prices (ex; past oil supply jolts). The long range effect will be continued low oil prices. Oil and gas investors and lenders will get much tighter, squeezing smaller independents and projects with more expensive oil and gas into bankruptcies or orphaned fields (such as tar sands, shale oil, tertiary production). Low cost oil from large fields and improved production techniques like fracking and 4D reservoir tracking will rule. Oil based products (plastics, fertilizer) will proliferate.

Gas stations vs charging infrastructure: As combustion vehicles get displaced by



Tesla charging station with a rooftop solar collector. This station is located in Tejon Ranch, California. Photo:Wikimedia Common

PEVs, the number of gas stations will shrink. Hardly perceptible now, but as the market moves en-mass (a decade away), finding a gas station could feel more like finding a charge station now. How/when will this affect car buying decisions? I think sooner than later.

The electric charging business will be complicated. About 80% of charging will be done at home (90% for suburbs, lower for cities). Travelers will charge up along the highway with ever faster chargers. The number of local charge/gas stations (level 2 and 3) will shrink. The whole design of charge locations will be different from gas stations since the dwell time for charging will remain longer than for fueling. Fast charger (Level 3+) locations will need large power feeds, large battery banks, and sit-down cafes with tables and Wi-Fi in the middle of a wired parking lot. Medium (Level 2) charger locations will be wired parking lots convenient to the destinations.

The charging business has problems. There are currently 3 standards; CCS (USA), Chademo (Japanese), and Tesla. Tesla is winning the speed and competence game

so far, as the U.S. standard is mired in car manufacturer foot dragging. Charge station speeds need to improve from max 50-100kW now to 500kW-1MW (400 mile battery in 10 minutes). Then, car charging speeds need to follow suit. Hopefully, one standard will win. Another problem; charging stations need to be installed before cars are sold, and the economics of the charging business are not so good. That's part of the reason that we are NOT awash in charge stations now. This area needs a massive infusion of money/buildout, technology, and competent operators. Tesla has done well here (hence their fast sales), while the other car makers (and charge standards) are playing catch up. Electric utilities should be an obvious player. But, most seem hamstrung by their public utility commissions and their own regulated business pace. They can't/won't move fast enough to fill the business vacuum.

Ironically, this vacuum may play to the oil companies. Oil companies have the cash, the locations (gas stations), and operation expertise to thrive in this field. I predict they will move in. But in some locales (like New England), they won't make much money

getting their electricity from utilities. So, they may use more of their cash to become clean energy suppliers (wind and solar, as an energy company). They may even go for distributed power, linking their power sources to their charge locations. If their power sources undercut utility prices, they become profitable. Shell and Total have taken the first baby steps in this direction, while BP walked away a few years ago and may have to get back in. Exxon-Mobil is the pink elephant. In an oil and energy companies vs utilities contest, there will be sparks flying!

In summary, as battery technologies improve, electric drive will overrun combustion drive, and those businesses or industries that help make it happen will be the winners. It will take decades to unfold. But, I can't wait to see it happen.

Randy Bryan has been an advocate for electric cars for over eight years. His company, ConVerdant Vehicles, has converted vehicles to plug-in hybrids, including his own Prius in 2008 and developed and sold inverters that turn a Prius into an emergency generator. He is one of the co-founders of Drive Electric NH. ♻️

Five Ways to Cut Down on Post-Holiday Food Scraps

HERE'S HOW TO DO YOUR PART TO KEEP FOOD FROM GOING TO LANDFILLS

In the United States alone, approximately 133 billion pounds of food is wasted each year. According to the EPA, that's 31% of our total food supply. These food scraps go to landfills and release methane, contributing to global warming. Whether or not you're cooking this holiday season, here are five ways to avoid wasting food.

FOOD CALCULATOR

What do you need to host a holiday dinner? With the food calculator from the National Resources Defense Council at (<https://www.savethefood.com/guestimator/guests>), you can find out in minutes. This guestimator takes into account the expected number of guests, their projected eating capacity, the number of leftover meals you desire, and the type of meal you're looking for (vegetarian, classic, or smorgasbord) to create the perfect grocery list. Enjoy.

REFRIGERATOR THERMOMETER

Now that you have your ingredients, you have to keep them fresh for the big day. The fridge thermometer is an essential and affordable gadget. Incorrect temperatures are one of the biggest contributors to household food waste; a recent study by Daily Mail found that a whopping 75% of people are running their fridges at too high of a temperature. That accounts for 4.2 million tons of food

waste and represents even more wasted money and time.

Thermometers help to reduce wasted food because the temperature in your fridge may not be accurate.



OLIO

Now that you have made your meal and preserved your extra ingredients,

you might consider giving your leftovers away. OLIO can help (<https://olioex.com/about/>). It's a free app that connects neighbors and local businesses so that surplus food can be shared instead of thrown away. This includes food nearing its sell-by date in local stores, spare home-grown vegetables, and the groceries in your fridge. For your convenience, OLIO can also be used for non-food household items. It's easy. To make an item available, simply open the app, add a photo, description, and when and where the item is available for pickup. To access items, browse the listings available near you, request what you'd like, and arrange a pickup via private messaging.



Discs absorb rot-inducing gases and extend food's shelf life.

FRUIT AND VEGETABLE DISK

Even if your refrigerator is just right, you need to preserve that extra half sweet potato. Once you cut your produce, it can quickly rot before you have time to eat it. Spoiled produce can be frustrating and expensive, not to mention wasteful. A fruit and vegetable disk, like the ExtraLife Produce Preserver, takes care of that (<http://bit.ly/Fruit-Veggie-disk>). Fruit and vegetables emit ethylene gas as they ripen, which accelerates spoilage, so these affordable little disks aim to absorb rot-inducing gases and extend food's shelf life in the process.

COPIA

Another way to recycle your excess food: the Copia app (<https://www.gocopia.com/how-it-works.html>). For a small, volume-based fee, the app schedules pickups of your surplus food by certified food handlers, who safely deliver it to local nonprofits in need. You can track surplus trends, make better buying decisions, access tax deductions, and even receive photos from the people you fed. Download it today for a seamless food recovery that can make another's holiday season happier.

Content was reproduced with permission from SIERRA, the national magazine of the Sierra Club, ©2017. The content was modified from the original article, 5 Ways to Cut Down on Post-Thanksgiving Food Scraps, by Ariel Gans | Nov. 21, 2017. <http://bit.ly/Holiday-food-scraps>.



Bio waste. When food waste goes to landfills, it releases methane, contributing to global warming. Photo by Maerzkind/istock. All photos from Sierra.



193 North Main St
White River Jct, VT
(802) 295 5804
uppervalleyfood.coop

SHOP CO-OPS

Co-operatives are businesses that are member-owned collectively managed by paid staff and a member-elected board of directors. Values include democracy, self-help and a concern for families and the community.



CAFÉ

**EAT IN OR TAKE OUT!
WE USE LOCAL AND ORGANIC INGREDIENTS**

607-432-6600 Mon - Sat: 8am-5pm
4 Market St, Oneonta Sun: 10am-4pm
GreenEarthOneonta.com Delivery: M-F 10am-3pm



MIDDLEBURY NATURAL FOODS CO-OP

Open 7 Days 8am-7pm
9 Washington St 388-7276 middlebury.coop

everyone can shop
anyone can join

MON - SAT
7AM - 9PM
SUNDAY
9AM - 9PM

34 CYPRESS ST.
KEENE, NH
603 355 8008



**monadnock
FOOD CO-OP**
good.local.food.





NH'S FIRST SOLAR-POWERED BREWERY!



THE FLYING GOOSE BREW PUB & GRILLE

*A family-friendly
sustainable restaurant*
~ Serving Lunch/Dinner Daily ~


20 Handcrafted Brews on Tap




603-526-6899
40 Andover Rd, New London, NH
(1 mile east off exit 11, I-89)
www.flyinggoose.com

Come Visit Our Tasting Room & VT Gift Shop

Open Mon.-Sat.
10 a.m.-6 p.m.



**VERMONT'S 1ST
100% SOLAR
ELECTRIC ENERGY**

**632 LaPorte Rd., Morrisville, VT
802.888.9400
rockartbrewery.com**

Sustainability is Rising at Local Ski Slopes

EASTERN SKI RESORTS INVESTED IN SUSTAINABLE ENERGY

By Roger Lohr

The recreation of skiing, while a healthy and enjoyable activity, is often attacked on the grounds of ski areas being energy hogs, but they have been doing plenty that make them leaders among businesses for sustainable and renewable energy.

The Ski Magazine Golden Eagle Awards program has recognized many New England ski areas among winners each year and participants in the National Ski Areas Association's "Climate Challenge Program" include Hunter, NY, Killington, Stratton, Sugarbush, and Pico in Vermont and Jiminy Peak in Massachusetts.

BERKSHIRE EAST - MA. This year's winner of the small ski area category Golden Eagle Award was Berkshire East of Massachusetts. In 2011, the ski area added a PowerWind 56, 900kW wind turbine and in 2012, formed a construction and power purchase agreement with AllEarth Solar, to build and use the electricity from an 1800 panel, 500kW solar tracking system. These additions, makes Berkshire East the first (and only) ski area in the world to be 100% powered by onsite renewable energy. They also installed 500 LED lights. According to the ski area website, they are applying for a grant to acquire a battery back-up storage system and a biomass chip burning system to burn wood harvested on site.



Bolton Valley
Ski Resort

Bolton Mountain Ski Resort. Courtesy photo.

BOLTON VALLEY - VT. Bolton Valley in Vermont has had its 121 foot tall wind turbine since 2009, annually producing 300,000kWh of power and generating electricity at wind speeds as low as 6 mph. The ski resort uses net metering for a price reduction on electric rates, and the energy produced is the equivalent of 45 Vermont households. The system was installed by Northern Power Systems. Ice on the blades does happen, and the turbine shuts off automatically when it gets iced, thus making the winter months the least productive for the wind turbine.

GORE MOUNTAIN - NY. Gore Mountain in North Creek, NY was recently awarded the SKI Magazine Golden Eagle for Overall Environmental Excellence based on the contracting of two 25-year solar power purchase agreements, which combine into a massive 5.325MW system. Using remote net metering, Gore Mountain will offset 85% of its electrical needs. In cooperation with Borrego Solar, there are 14,589 ground-mounted solar panels located on 20 acres of farmland. The agreement is projected to offset 113,919 tons of CO₂, 71,634 pounds of nitrogen oxide emissions, and 131,835 pounds of sulfur over the life of the contract.



Gore Mountain
Ski Resort

Gore recently entered into a PPA of a massive 5.325MW solar system consisting of 14,589 ground-mounted solar panels located on 20 acres of farmland. Courtesy photo.

JIMINY PEAK - MA. Jiminy Peak Mountain Resort located in the heart of the Berkshires of Western Massachusetts constructed a 2.3MW community solar facility located on 12 acres of the ski area and resort's property, owned and operated by Nexamp. Renewable energy is not new to the resort – back in 2007 it was the first ski area in North America to generate power from its own GE 1.5MW wind turbine.

The solar project significantly expanded Jiminy Peak's renewable energy program, while extending the environmental and cost-saving benefits of solar to up to 200 neighboring homes and small businesses. By adding the solar power facility to Jiminy Peak's existing

wind turbine, 75kW cogeneration unit, and extensive conservation efforts, the resort can claim to be one of the few resorts in the U.S. powered 100% by renewable energy and one of the most sustainable energy ski resorts.

KILLINGTON - VT. Killington's numerous new solar power projects are slated to generate more than 3,300,000kWh of clean electricity annually for the resort

and sister property, Pico Mountain.

The eight new solar installations on-site at Killington and Pico will include fourteen AllEarth Solar Trackers which have been designed, tested and engineered in Vermont. The units use GPS technology to follow the sun throughout the day, allowing them to produce up to 45% more energy than a fixed system. The trackers, plus three new rooftop installations on the Pico Base Lodge, Pico Administration Building and Killington Golf Course Maintenance Building are expected to annually generate approximately 200,000kWh of clean electricity.

In addition to the on-mountain solar installations, Killington partnered with Namaste Solar to develop four off-site solar farms within a short drive from the mountain. The four projects will generate more than 3,100,000kWh of electricity per year, which is more than 10% of the resort's annual usage. The electricity produced from all solar initiatives would power 370 homes annually and conserve 2,471 metric tons of CO₂, according to the EPA's Greenhouse Gas Equivalencies Calculator.

The Cow Power program is a unique form of producing energy whereby about a dozen Vermont farmers use cow manure at their farms in an anaerobic digester system to generate electricity to sell to Green Mountain Power, and Killington purchases 1,125,000kWh annually of this energy to power the K-1 Gondola and the Peak Lodge. ♻️



MAKE YOUR HOME SPARKLE,
naturally!

NON-TOXIC, MULTI-PURPOSE CLEANER
THAT IS SAFE FOR YOU AND YOUR HOME!
GENTLE ON SENSITIVE SKIN, TOUGH ON GRIME

Free of Artificial : COLORS, SULFATES,
FRAGRANCES, DETERGENTS,
CHEMICALS OR SYNTHETICS

Come visit our outlet!

616 Exchange Street Middlebury, VT 05753

WWW.VERMONTSOAP.COM

D a n & W h i t ' s



If we don't have it, you don't need it!

319 Main St, Norwich VT 05055 (802)649-1602

Open daily • 7am - 9pm

*Just in!
Dan & Whit's skirts
designed by Up-Pup VT*

danandwhitsonline.com

Jiminy Peak
Ski Resort



Jiminy Peak is one of the few resorts in the U.S. powered 100% by renewable energy and one of the most sustainable energy ski resorts. Courtesy photo.

NORDIC SKI AREAS

Nordic ski areas are also becoming more sustainable. Two local examples are:

Sleepy Hollow Inn Ski & Bike Center in Huntington, VT added 10kWh of solar this summer and now has 50kWh of solar net metering from its solar panel arrays to provide for electric needs that include power for a snowmaking system used to guarantee snow early in the season. A solar hot water system heats 50% of the hot water use at the inn, and the lights on the ski trail have been converted to LED lights. Sleepy Hollow's proprietor, Eli Enman, commented, "By April, we're expecting to see that close to 100% of our total electricity is powered by solar energy and that includes our all-electric snowmaking system water and air pumps."

Their most recent initiatives include three eighty gallon heat pump hot water heaters for the eight bedroom inn, cold climate heat pumps installed in the whole inn for both heating and cooling, and conversion of the gas-powered, zero-turn lawn mower into an electric mower.



Sleepy Hollow XC Ski Center

Sleepy Hollow Ski & Bike Center is a pioneer of sustainability that keeps evolving. Courtesy photo.

Craftsbury Outdoor Center in Craftsbury, VT has incorporated sustainability in its mission statement to be carbon-neutral. They use eight tracking solar panels for 35% of their electricity, highly efficient wood-fired boilers for heating, and a solar hot water system.

At Craftsbury Outdoor Center everything is net metered with 32kW on the trackers and 3,000 square feet of panels on the roof, supplying the Activity Center with close to 70kW. Between the two, that provides 63% of operation's electricity, and there is also solar thermal to provide summertime domestic hot water, which is supplemented with heat pumps.

Stand Up for Snow! Skiers and Riders in Vermont Support Carbon Pricing

By N. R Mallery

Join the many Snowriders throughout the country in voicing your support for carbon pricing in Vermont!

Snowriders International is an organization of skiers, snowboarders and mountain recreation enthusiasts dedicated to the promotion of winter sports and the protection of the environment across the globe.

Send a message to your governor today and let him know of your concerns for fighting climate change.

As skiers, snowboarders and outdoor enthusiasts, you can strongly support this critical step towards fighting climate change.

Vermont's natural beauty is one of the state's greatest assets, and snow sports are a vital part of the Vermont way-of-life. To preserve these things for future generations, Vermont must continue its legacy of leadership in climate action against the impacts of climate change that our state is already feeling.

- The average annual temperature in our state has risen 1.3°F since 1960.
- Our annual freezing period has shortened by four days every decade.
- By the end of the century, ski resorts like Stratton, Killington and Sugarbush could be facing 'Tennessee-like' winters.



Absfreepic.com

Carbon pricing is right for Vermont. As part of the Regional Greenhouse Gas Initiative (RGGI), Vermont has already taken a significant step in putting a

price on carbon emissions by participating in a cap and trade program for power plants' carbon emissions. This program has already significantly reduced carbon emissions in the state, improved air quality in the region and spurred investment in renewable energy and efficiency programs.

But more decisive action is necessary. According to an independent analysis by Regional Economic Models, Inc. (REMI), extending carbon pricing to include emissions from heating and transportation could cut carbon pollution by an additional one-third!

Do your part and tell the governor in Vermont that you support carbon pricing in Vermont for a healthy environment and snowy winters in Vermont for many generations to come.

You can also sign the letter to Governor Scott at the Snowriders International website directly at: <http://bit.ly/Snowriders-carbon-pricing>. Send a message directly to Governor Scott from his website: <http://governor.vermont.gov/contact> or call 802 828-3333.

Think snow and have a great time playing in our snow this winter. The Snowriders International website is: snowridersinternational.org or call them at 1-855-KEEP-SNO (1-855-533-7766).

Craftsbury has incorporated massive amounts of insulation into all of the new buildings and locally sourced many of the wood products used in the building construction. The roof of the Activity Center is at R72 and the walls are R46.

High efficiency wood gasification boilers provide all of the heating and domestic hot water demands during the cooler months. They are tied into the 10 million BTUs of thermal storage in the form of 20,000 gallons of water. This storage system allows them to cogenerate with the snowmaking generator, providing electricity for the pumps and guns, and catching waste heat off the engine.

These investments at eastern ski areas are only a few examples of what the re-

sorts are doing to take the lead in becoming sustainable businesses.

Roger Lohr is the founder and editor of XCSkiResorts.com and prolific national writer on cross country skiing. He lives in Lebanon, NH. ♻

Sustainability at Dartmouth College

Cont'd from p. 32

reduce greenhouse gas emissions by 50% by 2025. Hanlon's plan of action also calls for a "corps of student analysts who will work with the Office of Sustainability to prioritize and conduct measurement and assessment studies to track progress toward sustainability benchmarks."

Berry's new solar panels will, therefore, be educational as well as energy-efficient. Each will have a weather station and energy-monitoring equipment, so that researchers can see how weather data impacts performance at any given time.

ReVision analysts have taken winter weather into account when estimating the

output of the system, which will not operate when covered with heavy snow. But on long, sunny days, they say the panels will probably generate more power than Berry Sports Center consumes, in which case the excess energy will flow to the College's electric distribution system for use in other buildings.

Bjorklund says these are "first steps" in weaning the campus from fossil fuels. "By next summer, we hope to be installing more solar panels on building roofs on campus," she says. "And we are also looking for sites for ground-mounted systems. Eventually, we would like to get at least 20% of our electric energy from the sun."

Follow Dartmouth's campus sustainability progress at the Office of Sustainability: sustainability.dartmouth.edu/

Re-printed with permission from Dartmouth News. Original article can be found at <http://bit.ly/Dartmouth-News-SolarReduces-FossilFuels>. ♻

SLEEPY HOLLOW INN

SKI & BIKE CENTER

802.434.2283 or 1.866.254.1524

- 35 km of Nordic Skiing and Snowshoeing
- Mountain Biking & Hiking
- Winter and Summer Round Barn Weddings

www.skisleepyhollow.com
info@skisleepyhollow.com
 427 Ski Lodge Drive
 Huntington, Vermont 05462





NORWICH
SOLAR TECHNOLOGIES

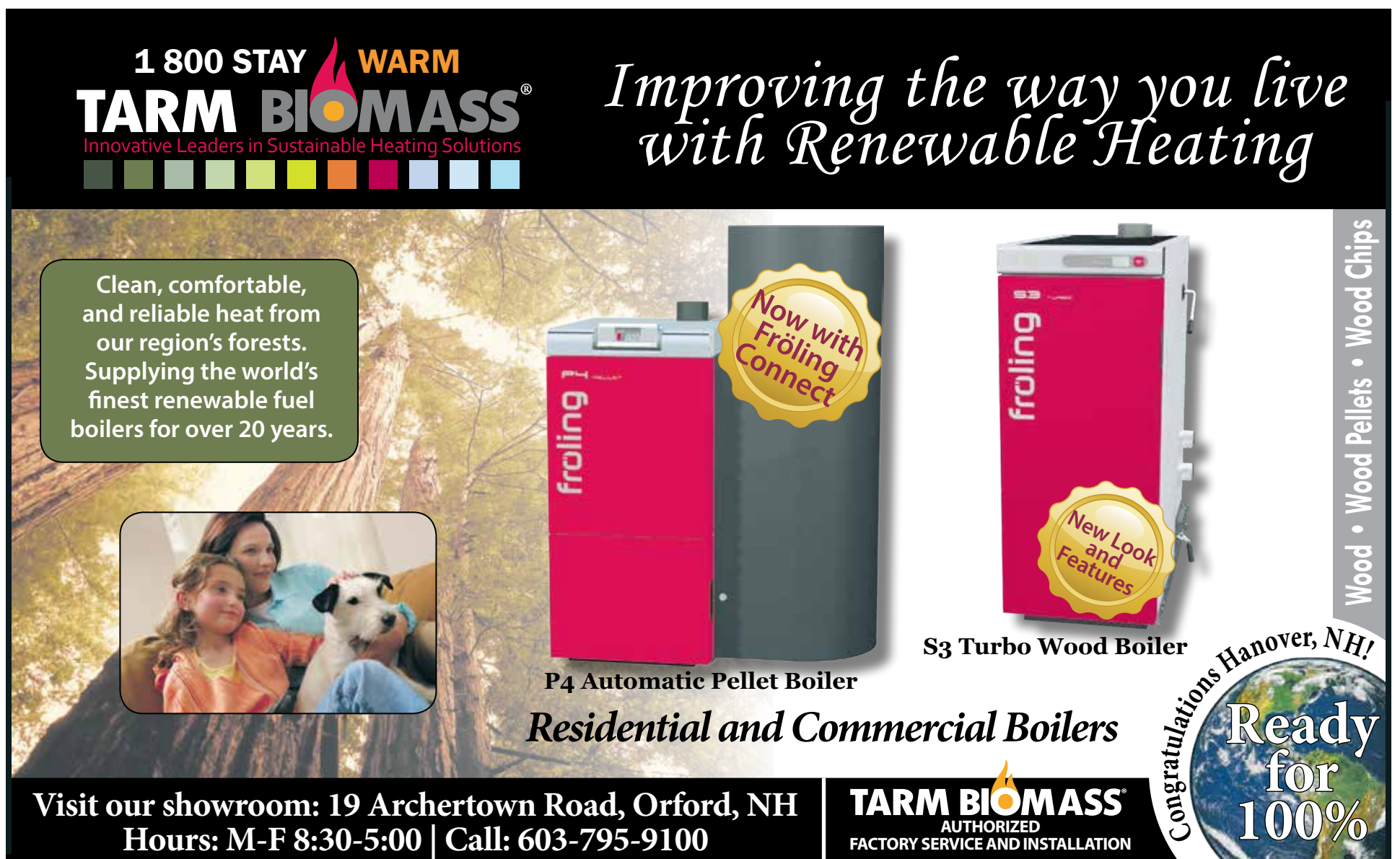
- Federal 30% Tax Credit
- Accelerated Depreciation for Renewable Energy
- Reduce & Stabilize Operating Costs
- Differentiate Your Business From Competitors
- Reduce Your Carbon Footprint
- No Capital Investment Options

Upper Valley Aquatic Center
500kw solar project

Call us for more information
802-359-7405

802-359-7405
52 Bridge St. White River Jct. VT 05001

norwichsolar.com sales@norwichsolar.com



1 800 STAY WARM
TARM BIOMASS
Innovative Leaders in Sustainable Heating Solutions

Improving the way you live with Renewable Heating

Clean, comfortable, and reliable heat from our region's forests. Supplying the world's finest renewable fuel boilers for over 20 years.

Now with Fröling Connect

New Look and Features

P4 Automatic Pellet Boiler

S3 Turbo Wood Boiler

Residential and Commercial Boilers

Wood • Wood Pellets • Wood Chips

Congratulations Hanover, NH!

Ready for 100%

Visit our showroom: 19 Archertown Road, Orford, NH
Hours: M-F 8:30-5:00 | Call: 603-795-9100

TARM BIOMASS
AUTHORIZED
FACTORY SERVICE AND INSTALLATION