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CO-OP CURRENTS



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February 2017

VELCO's Weather Analytics Working to Integrate Renewables, Prepare Us for Weather Events

Vermonters, Americans, Washington Electric Cooperative members – in short, people – have a long history of being passive “consumers” of the weather. We check out the forecast, we dress accordingly, we go about our day. In the increasingly more-frequent instances when the weather turns on us – in the form of tropical storms, hurricanes, microbursts, tornados, drought – our lot becomes not consumers so much as victims of the weather.

‘Twas ever thus. The weather is a natural force (perhaps more accurately, the product of interacting natural forces) that dwarfs us.

Well, not exactly. Scientific examination of climate change reveals that humankind decidedly influences the weather. Nevertheless, the weather seems to be more in charge of us than we are of it, sometimes with devastating consequences.

An effort is now underway in Vermont to reduce that victimhood and give utilities better tools to plan for tomorrow. It's a research and development project undertaken primarily by VELCO (the Vermont Electric Power Company), which owns and operates the high-voltage transmission system that provides

bulk power to Vermont's 17 electric distribution utilities, including Washington Electric. Uniquely in the U.S., those utilities jointly own their transmission server, VELCO.

“We get charged on the basis of what we tell the ISO power planners that we expect to need. The closer we come to the mark in our predictions, the more we can control our expenses.”

— Patty Richards

The project's goal is to help communities, residents, electric utilities, transportation and emergency services, and potentially other users, to anticipate and prepare for inclement, even dangerous weather. VELCO has been working in conjunction with IBM to apply leading-edge analytics to weather-related information gathered daily in the field. The

parties have created the Vermont Weather Analytics Center (VWAC), which uses interconnected software tools to aggregate, interpret, and disseminate data.

The participants foresee other benefits, as well. Pooling data from a great variety of sources (uplands, lowlands, villages, farmlands, southern Vermont, northern Vermont, etc.) and applying these advanced analytics, could lead to more-effective use of the renewable energy sources upon which Vermont is staking its future. Another objective – which has already proved beneficial to Washington Electric Co-op, according to WEC General Manager Patty Richards –

continued on page 5



George Springston, shown measuring snow depth in his backyard in Plainfield, has been a “cooperative observer” for the National Weather Service since 1999. Rose Paul, George's wife, provides backup when necessary. The often-minute data some 2,000 volunteers provide daily aids in NWS forecasts, which in turn helps WEC and other utilities work more economically.

Eyes Wide Open Money is Available, But Let's Do Things Right Under Tier III

EXCELLENT! By the first week of February, Washington Electric Cooperative's “Tier III” program had attracted a lot of interest.

The program, a joint effort with Efficiency Vermont, offers financial incentives for Co-op members to undertake specific renovations to their homes aimed at reducing their consumption of fossil fuels. WEC members are calling the Co-op to inquire about getting help with the costs of a home energy audit, purchase and installation of an ENERGY STAR heat-pump water heater or (alternatively) a solar water-heating system, a pellet boiler for home heating, or cold climate

heat pumps (CCHP) to alleviate the burdens on their existing fossil fuel heating systems.

The program had just debuted in January, so the level of interest during the first several weeks was encouraging. And there's no reason to think it won't increase as the year gets underway.

WORRISOME! While Co-op members seem eager to take advantage of WEC's “2017 Annual Plan for Tier III Compliance,” Washington Electric's “Energy Coach” is concerned that some people may choose to invest (with the program's help) in retrofits that

continued on page 7

Washington Electric Cooperative

East Montpelier, VT 05651

Inside

Snow and overgrowth can conceal potential dangers from electric power around your home and neighborhood. WEC urges you to be aware of them. Story on page 8.

Three candidates for your Board of Directors. A not-for-profit electric cooperative is led by people – “members” – who offer their time and ask for your vote. With WEC's 78th Annual Meeting approaching, meet the candidates who have come forward, on page 4.

A modified rate increase. With input from Vermont's Dept. of Public Service WEC has slightly trimmed its rate request to the PSB. Catch up with developments in the Manager's Report, page 3.

Tip of the cap to Dave Magida. This Middlesex resident has served his electric co-op well and selflessly for three terms on the Board. Read an appreciation in the President's Message, page 2.



Shadows trace the arc of a volunteer weather observer as he goes about his duties. See “Citizen Science,” page 6.

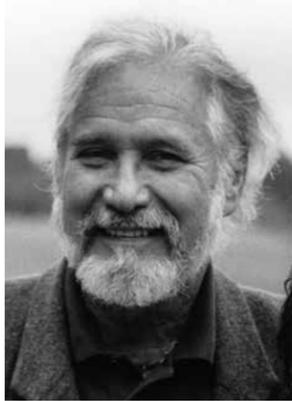
President's Message

We're All In This Together

A Vermont Tradition, And a WEC Tradition

By Barry Bernstein

Early February brought much-needed snow, up to two feet in much of our service area. Fortunately, my good neighbors Jeremy and Maggie Weiss and Mark Howard and Gina Mazur shoveled my front door, side deck, porch door, and unburied my car while I was away, out of state, after Brooke Howe had plowed my driveway. I am always so grateful for my neighbors, friends, and family who always lend a hand to others at times when help is needed. It's the part of Vermont that I cherish so much and I'm so appreciative of.



Nearly halfway into the first part of this year's legislative session, I also hope that our newly elected governor and legislative leaders will find a way to ensure that our neighbors and friends and greater Vermont community can meet their basic needs. A significant number of Vermonters are facing more intense and ever-more-serious issues, whether it be around opiate addiction, day care, mental health, obtaining services to be able to live independently at home, or receiving adequate wages to cover basic needs. While we always want to see services delivered more efficiently and at less cost, it has been a long



Lots of people rely on Dave Magida (right), including his colleagues at Norwich University, where he serves as Chief Administration Officer. Dave will be leaving WEC's Board after nine years of service.

Vermont tradition to help our neighbors in need, and that quite frankly may mean those of us who are more fortunate contributing more to ensure that that will happen. Over my lifetime I have been at different points on that spectrum, and I hope we do not forget the pendulum always swings both ways.

It has been a long Vermont tradition to help our neighbors in need, and that quite frankly may mean those of us who are more fortunate contributing more, to ensure that that will happen.

Our WEC 78th Annual Membership Meeting is fast approaching, set for Thursday, May 4, at U-32 Middle/High School. This year Director David Magida, from Middlesex, will be stepping down after serving for three terms, a total of nine years, on your Board of Directors. Dave has served on the FAPP committee (Finance, Administration & Power Planning), and *Co-op Currents* Editorial Committee during his time on the board. Dave has brought his many years of experience and expertise from his work at Norwich University, including as vice

president of physical plant. The amazing thing about Dave is his willingness to listen, express his opinions on matters, share his expertise, and at the end of the discussion accept the decisions made by the majority of the board, whether supporting or not supporting his preferred position. He has been a mentor, to me and other members of the board, willing to give time outside of the board meeting, offer

his assistance in reviewing contracts, or sharing various options on how to address complicated issues. His presence and input will be sorely missed.

I hope to see as many of our member/owners as can join us at this year's annual meeting. It's your Co-op. Please come share a meal and talk with board, staff and fellow Co-op members. You'll enjoy it, and we'll all gain from everyone's participation. 



Washington Electric Co-op has been touting the importance of home energy audits for years. We're sounding the trumpet again now, in the context of WEC's 2017 Tier III Compliance Program, as noted in our story on page 1. Above, Malcolm Gray (right), of Montpelier Construction, led a tour a few years back of a WEC member's home in Plainfield, where his company had performed an energy audit and followed up with weatherization work.

Co-op Currents

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WEC is part of the alliance working to advance and support the principles of cooperatives in Vermont.

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Editorial Committee

Patty Richards Donald Douglas David Magida Anne Reed Will Lindner

The Board of Directors' regularly scheduled meetings are on the last Wednesday of each month, in the evening. Members are welcome to attend. Members who wish to discuss a matter with the Board should contact the president through WEC's office. Meeting dates and times are subject to change. For information about times and/or agenda, or to receive a copy of the minutes of past meetings, contact Administrative Assistant Dawn Johnson, at 224-2332.

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Manager's Report

A Modified Rate Increase, And Proactive Planning For Renewables

Plus: Annual Meeting Drawing Nearer

By Patty Richards

We hope you are staying warm and busy through the winter months. We are feverishly planning for our upcoming Annual Membership meeting, set for May 4th at U-32 high school just outside Montpelier. Spring will be here before we know it, and so too will the Annual Meeting. So mark your calendars. I hope you'll plan to come out for a fun, interesting, and entertaining evening.

We continue to have more and more members turn out, which is a healthy sign for our Co-op. We will provide a free meal, and we always have an interesting, and sometimes very entertaining, guest speaker. Most important, though, is that we want to hear what's on your mind. Energy – where it comes from, how it's generated, and how it's provided to our members – is one of the most important subjects of our time. Equally important is how reliable our service is to you, and how well we respond to your needs and concerns.

So whether this is your first Annual Meeting or your 78th (!), please come and enjoy an evening with WEC. Our Board of Directors, our wonderful staff, and your general manager are eager to see you there.

A Smaller Rate Increase

As many of you know, WEC filed for a 6.52-percent rate increase that went into effect as a surcharge for service provided on and after January 1. As part of our efforts to control costs, WEC was able to work with the Department of Public Service, which is responsible for reviewing our rate filing, to lower the increase. We asked regulators to allow us to move excess funds from 2016 into 2017 to help cover costs in 2017, and we agreed with the Department's conclusion that this, and some other minor moves, could reduce the rate increase to 5.95 percent.

The Public Service Board will review our amendment and we hope to have approval soon. Assuming the amended rate filing is approved, we will issue refunds to members for the extra amount paid under the surcharge.



What's important is your involvement with the Co-op. It makes us stronger.

Net Metering

We are rolling out a new net metering program to comply with the Public Service Board's recent directives and rules. As a fully regulated utility, we must respond to mandates and directives which take the form of orders from the Vermont Public Service Board (PSB).

The PSB issued new rules and orders for the statewide net metering program in response to instructions from the Legislature in 2014

to alter regulations for non-utility scale generation (less than 500 kW). Typically, these net metering applications in WEC's service territory are taking the form of solar panels installed by Co-op members at their homes.

To comply with the PSB's new and somewhat different approach to net metering, WEC filed a plan that went into effect, as required, at the beginning of the year, and we have begun to implement that plan and bill our net-metering members accordingly. We are glad to report that there is still robust interest in net metering and home generation among Co-op members. We have 27 new applications and expect some of the biggest systems in our service territory to come on line in the near future.

Integrated Resource Plan (IRP)

Every three years WEC must complete and file an Integrated Resource Plan with the state regulators. Yes, this doesn't sound wildly exciting, but for utility geeks (guilty as charged!) it sure is. This is a chance for us to document and make public where your power comes from – not only this year but for the next twenty years. We are proud of that because we think our members will approve of these sources, both for financial and environmental reasons.

Also this year, we are changing our emphasis to focus the IRP on the impacts of small-scale "distributed" generation, like solar, on our substations, wires, and poles. We will run engineering studies to look at the impacts, on a circuit-by-circuit basis, of

how much solar energy our system can handle, and at what locations more distributed generation can help. As the number of solar installations increases we must be mindful of the impacts on our equipment and grid delivery system

Button Up Your Home

WEC wants to give its members money to lower their carbon footprint. Yes, you heard that right, and you have probably been reading about our Tier III programs in *Co-op Currents*, including an article in this month's edition on page 1.

Following instructions from the state, we have set aside money to help our members reduce their dependence on fossil fuels. Our programs include financial incentives to weatherize homes, install solar hot water systems, install heat pump hot water systems, install wood-pellet boiler systems, and to add cold climate heat pumps in tight, well-weatherized homes.

WEC is committed to working with its members to achieve meaningful changes, and we want to work with you to lower your carbon footprint and Vermont's greenhouse gas impacts. So if you are looking to weatherize



your home and to make some of the energy-saving changes noted above, this is a great time to do it. Also, read our recent issues of *Co-op Currents* (available on our website), and we then encourage you to call Bill Powell here at Washington Electric to learn more.

The Co-op Difference

Being part of a cooperative utility means you have a voice. You are not just a consumer, but rather you are a member. One of the many differences of being part of a co-op is not only the return of excess funds that you receive through what is known as capital credits (because co-ops, unlike investor-owned utilities, don't keep their "profits," but rather share them among their member/owners), but also that you can participate democratically in the decision making and direction of your cooperative. There is no better example of local control than the cooperative model.

You will receive materials for voting for candidates for your Board of Directors a couple months from now. The candidates for the three available seats introduce themselves to you

continued on page 4

A Reminder: Vermont Now Recycles Batteries, and WEC Will Gladly Take Yours Off Your Hands!

In 2014, Vermont was the first state to pass legislation requiring battery manufacturers to receive and recycle their used batteries. The state now provides many official drop-off locations for used batteries, but if it's easier for you to stop by the Co-op's home in East Montpelier we'd be glad to receive them and take it from there. The most important thing is to keep them out of the landfill!

The battery-recycling law applies to most non-rechargeable batteries. Bring yours by any time.



2017 Annual Meeting Set for May 4 at Union-32 High School

Three Candidates for WEC's Board of Directors

Three member/owners of Washington Electric Cooperative have come forward as candidates for the Co-op's Board of Directors in 2017. If elected, each will serve for three years, their terms ending in 2020.

Every year three seats on WEC's nine-member board expire, providing the membership an opportunity to elect one-third of the board that makes policy and leadership decisions for the customer-owned electric utility, and oversees management and staff. This year the directors whose terms will expire at the time of the Annual Membership Meeting are **David Magida of Middlesex, Donald Douglas of East Orange, and Mary Just Skinner of Middlesex**. Of these three incumbents, Donald Douglas and Mary Just Skinner are seeking re-election to the Board. David Magida, after serving three terms (nine years) for the Co-op, has decided not to run again. A third candidate, **Jean Hamilton of Plainfield**, has stepped forward to run for the Board.

The election of directors is performed by ballots sent to each Washington Electric Cooperative member by mail in the weeks prior to the Annual Meeting. **When your ballot arrives, check the accompanying materials to determine when the deadline is for posting your votes by mail.** Members who attend the Annual Meeting can vote there if they wish, rather than by mail. The meeting,

which includes dinner at no cost to WEC members, will be held at Union 32 Middle/High School, at 930 Gallison Hill Rd, Montpelier, VT. Reservations are required for dinner (**and are due at WEC's address by April 19**), but not for the meeting itself. **A registration coupon can be found on page 8** of this issue of *Co-op Currents*, and will be included in the next (April) issue, as well. The date of the 78th Annual Washington Electric Cooperative Membership Meeting is Thursday, May 4. A schedule of events will appear in the April issue, which is the official Annual Meeting issue of *Co-op Currents*.

Voters who choose to do so can write in the names of other Co-op members who are not official candidates on their ballot. Board candidates run at-large because Washington Electric Cooperative is not divided into districts.

Printed below are brief biographical sketches submitted by the candidates, in which they introduce themselves and provide information on their background and involvement with the Cooperative and other avenues of community service. The April issue will feature their responses to questions about issues related to board service and policy. It will provide readers a broader sense of the interests, viewpoints, and experience of the candidates. 

Donald Douglas

Residence: I live in East Orange at 21 Douglas Road. I bought this house in 1980 but have been a Co-op member since 1978. I can be reached at home at 439-5364, or by e-mail at dondougl@gmail.com (please note that my e-mail address is missing the s from my last name.)



Donald Douglas

Education/Profession: I graduated from high school in Kokomo, Indiana and went to college in St. Louis, Missouri, and then graduate school at the University of Texas at Austin. I traveled extensively in South America before moving to Vermont from Cochabamba, Bolivia. I retired in September 2016 after 37 years as a rural mail carrier, a job I began in 1979. For years, my 90-mile route served mostly Washington Electric Co-op members, which gave me the opportunity to hear members' concerns, answer their questions, and try to be a link between my customers and their co-op.

Community Service/WEC: I have been an active member of my community since moving here in 1981. I was a volunteer fireman for 14 years. I was the vice president of the Orange County Court Diversion Board. I have been a high school soccer referee, and I worked with Central Vermont Refugee Association to provide transportation and temporary housing. I have been a member of Washington Electric Cooperative's Board of Directors since 1999, and have been Treasurer of the Board since 2000. I am seeking another term because I enjoy the challenge of helping to chart the best course of action through the difficult energy future that I see ahead. I have the time, interest, and the energy to devote to serving on the Board.

Jean Hamilton

Residence: I live on my family's farm on East Hill Road in Plainfield and have been a WEC member since 2014. I moved to Plainfield from Starksboro, VT, where I was a member of the Vermont Electric Co-op. Members are welcome to contact me by phone at 802-777-6546, or by email: jean.myung.hamilton@gmail.com.



Jean Hamilton

Education/Profession: Since moving to Vermont in 2000, I have worked in sustainable agriculture and the local food system. I graduated from Middlebury College in 2004 with a degree in Environmental Studies and Religion. In 2012 I earned a master's degree in business management from SDA Bocconi. From 2006 to 2011 I worked for the Northeast Organic Farming Association of Vermont, managing market-development programs to enhance market opportunities for farmers in wholesale and direct-to-consumer channels. More recently, I have worked as a freelance business consultant helping small and mid-sized ag and food businesses achieve viability. I specialize in financial coaching, grant writing, and data management.

Community Service/WEC: I currently serve on the Town of Plainfield Planning Commission, UVM Extension Advisory Board, Plainfield Co-op Board of Directors, and Salvation Farms Board of Directors. I enjoy living in a rural community and appreciate central Vermont's shared values of land stewardship, resiliency, and neighborliness.

Mary Just Skinner

Residence: I have lived in Middlesex since 1977. I have been a WEC member for 40 years, and before that I was a Vermont Electric Co-op member for seven years. I am married and have two sons and two grandchildren. I can be reached at 223-7123, and by e-mail at maryjustskinner@gmail.com, or miskinner@sover.net.



Mary Just Skinner

Education/Profession: I graduated from Barnard College and earned my law degree from Columbia University. I have been a practicing lawyer in Montpelier since 1972. I worked for Vermont Legal Aid for four years and then opened my own law practice in 1976. My practice primarily involves family law and real estate, but earlier in my career I was involved in a number of utility cases. I represented a group of low-income Vermonters in what was known as the "purchased power" case in 1974, which went to the Vermont Supreme Court.

Community Service/WEC: I have been a member of the WEC Board for five years. I serve on three committees: Finance; Power & Operations; and Community Fund. I have been a Middlesex Select Board member for 22 years, the last 10 years as vice chair. I also served seven terms in the Vermont State Senate, including a period as chair of the Senate Finance Committee, which handles utility legislation. I am a member of the Vermont Human Services Board, which hears appeals from administrative decisions.

Energy Tip: Do your part for conservation by unplugging your wireless devices when the recharge is complete.

Manager's Report

continued from page 3

in this issue, on page 4. In our April, Annual Meeting issue, they will discuss

their interests and qualifications more deeply. I encourage you to read about them and cast your vote when the time comes. It's true that, at this point, there are three candidates and three

available seats on the Board, so in that sense the elections this year are not competitive. But what's important is your involvement with the Co-op. It makes us stronger.

We look forward to seeing you at the Annual Meeting. You'll hear more about it in our next issue of *Co-op Currents*. 



Weather Analytics

continued from page 1

is to help utilities project their power requirements with much greater certainty. Because of the way payments to the grid operator (ISO-New England) are structured, that can lead to cost savings, day in and day out, for the Co-op and its members.

A key component of this effort is what's been known for years in the U.S. and Vermont as the Citizen Science Program. It's a network of weather enthusiasts who collect temperature and precipitation statistics every day, right in their backyards, and provide it to the National Weather Service in Burlington or to Lyndon State College's Atmospheric Sciences Department.

One Citizen Science Program also has a more rhythmic, almost danceable, name: CoCoRaHS. It stands for "The Community Collaborative Rain, Hail and Snow Network." CoCoRaHS was initiated at Colorado State University in 1998, and has now expanded to 39 states. Vermont has participated for the past nine years.

Lyndon State Atmospheric Sciences professor Jay Shafer says there are somewhere around 100 Vermonters taking part in CoCoRaHS. More participants would be welcome. If you're a teacher, think of this as a simple, hands-on experiential opportunity for your students. However, thousands of people nationwide participate in citizen science simply because they enjoy it and are interested in documenting the weather events in their own locales.

For information about the collaborative's work, and how it ties into education, preparedness, and Vermont's effort to maximize the contributions of intermittent renewable energy, see "Are You The Right Fit For CoCoRaHS?" on page 6. And check out the following websites: <http://cocorahs.org> and the Atmospheric Sciences page at Lyndon State



College: meteorology.lyndonstate.edu/weather-data/cocorahs/.

For WEC, "Deep Thunder"

"Why should we, why do we, engage with the weather?" asks Kerrick Johnson, VELCO's vice president for strategy and communication.

There are lots of reasons, and foremost among them, for Washington Electric Co-op, is the duty to serve

WEC members as reliably as possible, and use every means available to economize on WEC's operations. Contending with weather is a significant cost-driver for electric utilities.

The improved forecasting tool that VELCO and IBM have devised and implemented, thus far, is called "Deep Thunder." WEC's Patty Richards says the Co-op uses it as a resource for

George Springston, who works for the U.S. Geological Survey at Norwich University, takes 5 or 10 minutes every morning to collect precipitation, temperature, and snow-depth measurements and send the information to the National Weather Service in Burlington.

predicting "load" – meaning, how much power the Co-op will need to draw from the New England grid the following day.

"We get charged on the basis of what we tell the ISO power planners that we expect to need," Richards explains. "The closer we come to the mark in our predictions, the more we can control our expenses. Payment to the grid gets very complex, but the gist of it is that when we're off in our predictions – it doesn't matter whether it's too high or too low – there are costs associated with squaring up afterwards.

"For the past couple of years Deep Thunder has helped us better forecast our load, hour by hour, and for the next day, and for the next week. It has proven to be a good resource for our Co-op."

Integrating 'intermittents'

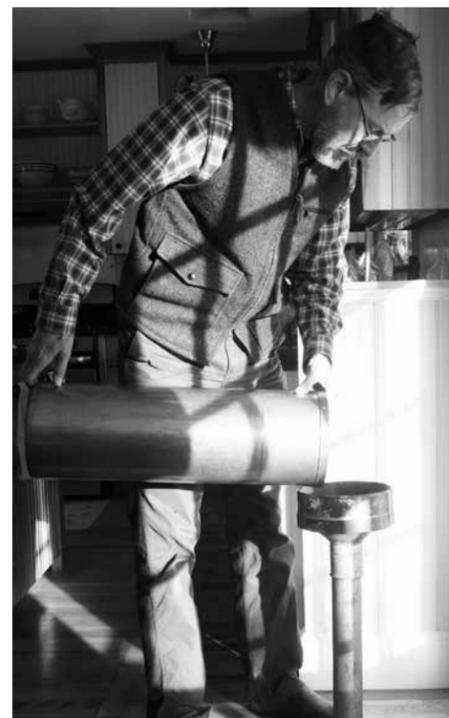
Johnson – himself a Washington Electric Co-op member from North Middlesex – provides another good reason for "engaging with the weather."

"VELCO, like WEC and the other DUs (distribution utilities), has a lot of assets out in the field," he says.

Utility equipment is expensive, and susceptible to damage from destructive storms. In December 2014, Winter Storm Damon – the costliest storm in Washington Electric's history – caused more than \$640,000 in damages, not to mention disruption for thousands of Co-op members. Knowing what's likely to happen ahead of time, and where the worst of a storm is likely to be centered, can help utilities prepare. (Fortunately, WEC was able to recover most of Damon's expenses through federal assistance.)

"Particularly in the last seven years," says Johnson, "Vermont has seen an

continued on page 6



The NWS network provides rain gauges 8 inches in diameter, a larger container than the CoCoRaHS program uses (page 6). Above, left, George holds the gauge on his knee, standing beside a device that records the temperature and wires its readings to a unit in the house. Center: George has melted the past day's accumulation of snow and is pouring it into a narrower tube, which makes the measurements more readable. At right, he uses a version of a ruler to measure the moisture. The verdict: 4 inches of snow yielded 0.31 inches of water.

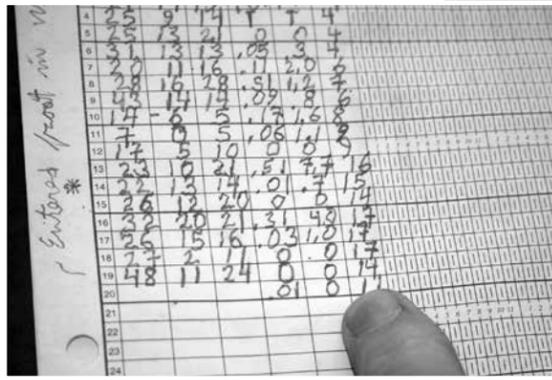
Weather Analytics

continued from page 5

increase in the frequency, the severity, and the cost of extreme weather events. That's one driving force for our VWAC and Citizen Science work.

"Another is the blossoming of distributed renewable energy."

"Distributed" energy is energy that's generated at many points within a utility's service territory and is added (all or in part) to the electricity carried on the utility's lines. It's a fairly recent concept, as the country's electric system developed along the lines of centralized, bulk power stations fueled by non-renewable sources like coal, oil, and nuclear, and dispatched over hundreds of miles of transmission lines. Much of the distributed energy now on Vermont's lines comes from the small net metered solar installations at people's homes, but also the larger solar arrays that are becoming part of Vermont's landscape. Bill Powell, Washington Electric's director of products and services, points out that wind turbines and run-of-river hydroelectric systems are additional forms of renewable energy, and have something in common with solar.



"The grid has become more populated by sources whose production is intermittent," Powell explains. "And that intermittency is mostly determined by the weather. Is it sunny, is it cloudy? Is it windy, is it still? Is it rainy, or has it been dry for weeks or months?"

"Intermittent" is a loaded word in utility and political circles. People sometimes use it to disparage the value of renewable energy. Vermont's Comprehensive Energy Plan requires the state to obtain 90 percent of its energy from renewable sources by 2050, just 33 years from now. But if power is intermittent, how can we rely on it?

Powell and Johnson both point out



Some cooperative observers report their daily findings using a NWS website. George Springston prefers the phone, pressing the numerals that correspond to his readings (shown at left) after prompts from the phone service.

that a vastly improved forecasting system, with more-explicit and better-targeted weather information, will provide more certainty about the production of weather-dependent power sources.

And actually, ISO – which stands for

Independent System Operator – really doesn't have a choice.

"The scale of PV (solar) generation is increasing dramatically," says Powell. "Now, the operators have to have a way to see it, to integrate it, and to use it."

continued on page 7

Citizen Science: Are You The Right Fit For CoCoRaHS?

(Here's How to Sign Up)

The VWAC – Vermont Weather Analytics Center – system that VELCO (Vermont's high-voltage transmission utility) and IBM have developed is high-tech. It uses sophisticated algorithms and computer modeling that are increasingly able to forecast, in surprising detail, the weather you and your neighbors will experience tomorrow, and it's moving toward ever-more targeted and localized forecasts. Communication of these data travel instantly to all points concerned, because Vermont invested in a fiber optic network to go along with the statewide buildout of AMI (advanced metering infrastructure, or "smart meters") under the Obama Administration's 2008 economic stimulus program.

But the means for gathering the statistics that verify the data and analysis?

Decidedly low-tech.

Says Jay Shafer, associate professor of atmospheric sciences at Lyndon State College, "It takes a volunteer with a \$20 plastic rain gauge, an internet connection, and an interest in weather. It involves going outside with their cup of coffee in the morning and checking out how much rain and snow fell. We offer the rain gauges for free when people sign up to participate."

The coffee isn't mandatory. In fact, this is an exercise that can fit nicely into an elementary school science curriculum. That's why one name for this simple but important daily ritual is Citizen Science. Another is the acronym CoCoRaHS, which stands for Community Collaborative Rain, Hail and Snow Network. Vermont has been involved in this project, which began 19 years ago in Colorado, for the past nine years.

Data collection like this has lots of uses. When CoCoRaHS got organized in Vermont, VELCO's VWAC project, undertaken in coordination with IBM, did not exist yet. But it does now, and VELCO Vice President Kerrick Johnson says it's a critical part of the project. VWAC's goal is to provide weather-forecasting information so precise and well targeted that it will enable electric utilities, highway crews, emergency service providers and others to plan and carry out their responses more quickly and efficiently. In an era of increasingly volatile weather. That's a valuable, cost-saving, and potentially life-saving service.

Precision forecasting will also help ISO-New England, which controls the region's electric grid, to improve the integration of intermittent renewable resources. That's become vital as we seek to edge away from fossil fuel-generated energy, to reduce air pollution and greenhouse gas emissions.

(See VELCO's 'Weather Analytics' and Citizen Science, page 1).

Says Johnson, referring to the CoCoRaHS network, "The greater the volume and quality of the information that comes in, the better the information that goes out."

"The greater the volume and quality of the information that comes in, the better the information that goes out."

— Kerrick Johnson, VELCO

However, CoCoRaHS isn't a forecasting tool, since the data collected reveal what has already happened.

"It's more a verification system," Shafer explains. The readings sent in from volunteers reflect how accurate the weather predictions were at given sites. That, in turn, helps fine-tune the system.

"We have a research team, students primarily," Shafer says. "We make predictions and use the data to help verify our

forecasts."

If there's anything onerous about participating in the CoCoRaHS data-collection effort, it's not the cost; it's the commitment. It only takes a few minutes a day, Shafer says, but the program relies on people's consistency.

"It's the daily nature of it," says Shafer. "We like people to do it at 7:00 in the morning" – not ideal for elementary school classes, but exceptions can be made if the commitment is there – "and in winter you often need to melt down the snow in the gauge to get a reading, and also check the depth of the snow."

Ice is a whole 'nother kettle of fish – harder to capture, and sometimes harder to quantify. But that's important information, too, and Shafer communicates with the volunteers to explain how it's done.

"This information is available to the whole weather community," he says, and is provided to the National Weather Service in Burlington.

"Our volunteer weather observers have helped to move the science forward tremendously, to see where rain and snow are falling and how storms produce an impact on society. Weather is always changing. There's never a dull moment in the Northeast and Vermont. And the *climate is* changing. It's normal for the weather to behave abnormally."

CoCoRaHS and the Lyndon College team are looking for more participants, because Vermont is a challenging terrain and the whole idea is to improve our ability to micro-predict. More information is available at <http://cocorahs.org>. The Atmospheric Sciences page on Lyndon State College's website provides information and explains how to sign up. Here's the address: meteorology.lyndonstate.edu/weather-data/cocorahs/.

See you at the rain gauge. 



Weather Analytics

continued from page 6

What VELCO and the utilities are providing, Powell says, is a management tool that incorporates:

- **weather analytics:** deciphering data to know with greater certainty what the weather is going to do and where and when it will do it;
- **load forecasting:** anticipating how much power utilities and the region will need (which is already a strength of ISO-New England);
- **renewable energy forecasting:** how much power will be generated by intermittent sources; where and what kind of sources they are; and how long they'll be available.

Overall, the project acts as an "umbrella system" to collect those inputs, analyze them, and issue forecasts that are accurate and dependable.

"Weather affects all our lives," Powell observes. "And as a utility, it affects our ability to serve our members. The more we know about bad weather in a timely fashion, the better we can deploy our resources."

That makes for faster response to storm-caused power outages. And it's not just the Co-op that wants that. Eleven thousand WEC members want the same thing.

'Higher resolution, greater granularity'

Weather forecasting is already a refined science. In central Vermont people tune in regularly to local stalwarts like Roger Hill, Bob Minsengerber, and Mark Breen, and plan their days accordingly. Roger Hill, a Washington Electric member from Worcester, also provides more-focused services for WEC and other clients such as town recreation and outdoor-

concert organizations, to help them deal with weather uncertainties.

What VELCO is after through its partnership with IBM, Kerrick Johnson explains, is forecasting that is "hyper-accurate" and "hyper-local," fully three days (72 hours) before it happens. To picture what that means, imagine the Vermont map diced into 16-square-mile blocks. That's the standard for conventional weather predictions.

"A hyper-local and hyper-accurate forecast," says Johnson, "brings that focus to one square kilometer. I believe that our program and IBM research have created the most powerful and accurate wind and solar forecast tool there is."

Yet he concedes that it's not fully operational. Originally developed through computer modeling at IBM's Thomas J. Watson Research Center near Poughkeepsie, New York,

Johnson says the plan is to install two high-performance clusters in Vermont and move the local forecasting to home turf. Lyndon State College's Department of Atmospheric Sciences, and its CoCoRaHS volunteers are integral to the full deployment of the VWAC project. "That on-the-ground verification and data information is a critical link," Johnson says.

"We know that the grid is evolving," he says. "It's changing, and that rate of change is accelerating. We need to continue to evolve, too."

Weather disruptions and distributed generation present challenges, but technology and backyard weather observers represent an opportunity to manage the grid with greater reliability.

"For Washington Electric Co-op and all our Vermont utilities," Johnson says, "reliability is the name of the game." 

Tier III

continued from page 1

could end up increasing, rather than decreasing, the operational costs of their homes.

"Let's look at an example," says the coach, WEC's Products & Services Director Bill Powell.

"Houses come in different sizes, of course, and have different configurations for their rooms, and different levels of insulation, weather stripping, and other variables. In this example, we'll use a house with a fairly average heating requirement of 75 MMBtu a year (75 million British thermal units) for thermal heat. To provide that heat, the homeowners use fuel oil, and consume 640 gallons a year. At a price of \$2.50 per gallon, they're paying \$1,600 a year for heating fuel."

Powell continues: "They decide to take advantage of the Tier III opportunity to buy a cold climate heat pump, and that turns out to be pretty effective, reducing their oil consumption by 80 percent. Now they're paying \$320 for heating fuel, with the rest of their heat coming from the heat pump."

"But they've added 7,050 kilowatt-hours of electricity to run the heat pump. At 23 cents per kWh, which is what most would pay when adding a heat pump, that electricity will cost them \$1,622. Add that to their lower oil cost of \$320, and you get an annual cost of \$1,942 for heat. That's *almost* \$350 more than they were paying when they were just heating with oil.

"That is definitely not the point of the Tier III program. Yet it is a possible outcome."

If fuel oil prices should increase, the addition of heat pumps would become more cost-effective – but only because the overall costs of heating the home had gone up.

Powell's very strong recommendation is this:

"Start with that 75MMBtu that it takes to heat the home. Cut that, and then start talking about changing your heating equipment."

SOLUTION! WEC has emphasized, in its Tier III promotion and in articles in *Co-op Currents*, that the best way for members to gain the maximum benefit of the improvements they wish to make is to start by tightening up the home. Step One is a Home Performance with ENERGY STAR home energy audit. There are a number of resources in the central Vermont area for this service, and the Energy Coach can help guide you to them. The incentives included in the Tier III program can mitigate the cost of the audit and the weatherization projects that ensue. For people who qualify under the state's income guidelines, the CAPSTONE team at Capstone Community Action in Barre, Bradford, and Waitsfield will provide the audit at no cost to the member.

"There is no requirement that people start with the home energy audit," Powell explains, "but that's largely because Act 56, the 2015 state law that requires Vermont's electric utilities to offer programs like this, is focused on helping people reduce their use of fossil fuels. So the emphasis is on substituting other means for things like home heating and hot water."

But WEC believes that a home energy audit is the best place to start. Efficiency will help no matter what fuel source is being used.

Powell has fielded calls from Co-op members who are eager to embrace newer technologies like cold climate heat pumps. Even in the above example, it must be noted that there would be an environmental benefit in reducing the homeowner's oil usage by three-quarters. WEC's electricity, after all, is 100 percent from renewable resources.

"But no one wants to accomplish that on the backs of people dramatically increasing their energy costs," says the Coach.

Vermont vulnerable

Vermont has the second-oldest housing stock in the U.S., exceeded only by Maine. This is especially the case in rural area – precisely the territory that Washington Electric Cooperative

serves. That means the chance of discovering inefficiencies in your home, if you haven't had an energy audit in the past and acted on its recommendations, is relatively high. These can take the form of poor insulation – or old-style insulation added so long ago that it has sagged and left portions of the walls, attic, or basement unprotected – or poorly fitted joints that create channels for air infiltration.

These are only some of the problems found in many, many Vermont homes.

"Too often," says Powell, "people want to use electricity for heating a building that's not in good enough condition, from a weatherization perspective, to warrant that investment or make the best use of it."

The science of weatherization can get technical. It involves identifying a "thermal number" – the Btus required to warm a building – and then identifying the utility costs for oil, propane, electricity, and even wood to respond to that load. You want that number to go down, no matter what fuel you use or how much it might cost at any given time. That's another reason for consulting experts and advisors before plunging into a supposedly cost- and energy-saving retrofit or adaptation.

The goals of Act 56 are important ones: reducing both air pollution and

greenhouse gas emissions from fossil fuels. But let's take the right steps, and do this in the most cost-effective and energy-effective way.

Tier III synopsis

At least one Co-op member who called the Energy Coach was eager to get help through the Tier III program to replace his windows with newer ones that seal the warmth in. Powell had to point out that, while it makes sense to replace windows if they are single pane (in most cases replacing double-pane windows is not a truly cost-effective measure to reduce air loss), replacing windows is not one of the improvements covered by the program. So it's worth restating what those improvements are.

WEC's and EVT's goals for 2017, within the Co-op's 41-town service territory, are to:

- Assist homeowners to undertake weatherization projects (the Coach or WEC Member Services Representatives can explain what's included, since window replacement is not on the list);
- Provide funding help for ENERGY STAR heat-pump water heater installations;
- Help pay for solar hot water systems;
- Support pellet boiler installations for home heating;
- Assist Co-op members to incorporate cold climate heat pumps to reduce their dependence on fossil fuel systems. But let's repeat that 1) in a climate like Vermont's CCHP can augment, but not replace, other heating systems, which will be needed when the temperature drops; and 2) CCHP installations should be preceded by an energy audit followed by home-performance improvements to make sure this change doesn't backfire and cost the owner additional money to heat and cool the house.

We'll keep you posted on the progress that Washington Electric and its members are making in 2017 under the Tier III program. 



WEC's Bill Powell, with Co-op member Judy Cyprian, of Plainfield. Judy was kind enough to host an open house for people curious about home energy audits and weatherization.

Safety For Co-op Members: A Particular Concern In Winter

Washington Electric Cooperative is a rural electric co-op. Most of the Co-op's members are rural residents, and know from experience that, especially in winter, an electric system constructed across rugged, hilly, often-forested and remote terrain is more susceptible to damage than the poles and wires in suburbs, villages, and housing developments. Winds, snow, and ice can bring trees and branches into contact with the wires, causing a short in the circuit that blows a fuse and takes out the power. In more extreme circumstances they can bring a power line down, and even break poles.

WEC members know all that. And many of them know that the Co-op encourages people to call or e-mail WEC if they notice potential hazards. Maybe it's a tree that seems to be looming over and threatening the wires. Maybe it's a power pole that's not straight anymore, or has aged to the point that it has become bent, or crooked, at the top. Washington Electric monitors and tests its poles, but there are nearly 25,000 of them in the Co-op's 1,250-mile distribution system and it's impossible for the Co-op to know the condition of all of them.

Calls, questions, and concerns are always welcome, because electricity is dangerous and everyone's safety is at stake.

However, says WEC Engineering & Operations Director Dan Weston, there are other, less-obvious risks and dangers that people may not be so aware of. And winter is the best time to call these to attention.

Many, but not all of them, are associated with the intersection where Washington Electric's wires and equipment interface with the homeowner's electric system. People don't always know where that is, or who (the member or the Cooperative) is responsible for the safe maintenance of exactly what parts of that interface.

"For an overhead connection, which is what the majority of our members have, we own what's called the service wire," Weston says. "That's the wire that connects on one end to the transformer, and at the other end to the house. The transformer," he explains, "is the metal cylinder mounted near the top of the utility pole – probably the nearest pole to the house – and it reduces the voltage to 24/120, which is what's appropriate for household use.

"At the other end," he says, "the service connects to what's known as the weatherhead. The weatherhead, which is usually attached to the house, is where the Co-op's and the homeowner's electrical systems meet. The weatherhead is usually coated with a kind of putty that's hardened and protects that connection from moisture, which could expand in cold weather



The owner of this home had recently shoveled 18 inches of snow off the porch roof shown here. Note the proximity of the aluminum extension ladder to the home's electric service entrance (circled), as well as other wires and cables. Homeowners need to be very mindful and cautious in circumstances like this.

and eventually crack open and lead to the exposure of the connection. If undetected, that could eventually cause an outage."

From the weatherhead on, the wires and contacts belong to the Co-op member – with the important exception of the electric meter (often connected to the weatherhead by a short length of electrical cable). The meter belongs to the Co-op.

There are a few reasons why that distinction in ownership is important. One is that people may not realize that anything electrical on the outside of the house is theirs, which often means they're not aware that these connections even exist. By midwinter, people may begin to worry about the weight of the snow on their roofs, or their porch roofs, or garages or sheds, and take a long-handled rake, or climb up on a ladder with a shovel, to remove it. If that metal instrument strikes the wires attached to the house, the person could be electrocuted.

Another example of why it's important to know who (the Co-op or

the member) owns what was recently pointed out by System Maintenance Technician Dan Couture during a drivearound in WEC's service territory. He stopped his WEC truck on a dirt road and pointed to a place where an overhead wire passed through a patch of saplings and connected to a shed about 15 feet from the road. One of the saplings was actually resting upon the wire.

"We got a call about this," Dan said. "Somebody noticed it and thought we'd better come and remove it (the tree)."

WEC sent a team to look at the situation, but they discovered that even though it looked like it would be a Co-op service wire to the shed, in fact it was a wire that ran from the owner's house, diagonally across the road. The employees would need the owner's permission to enter the property, disconnect the power for safety reasons, and remove the tree. But no one was home, and the Co-op hasn't successfully made contact with the owner to remedy the situation.

Too close

Unattended conductors (wires) like that one, or wires too close to people's roofs or outbuildings are a cause of concern to Operations Director Weston.

"By OSHA standards (the Occupational Safety & Health Administration) primary wires have to be at least 10 feet away from a building," he says, "whether that's vertical or horizontal distance away. But if a wire goes over a roof, even if it's higher than that, I don't want it there, period! There's always the danger that something could bring it down onto the house."

WEC never constructs the system that way, but not uncommonly people add outbuildings or additions to their homes without paying heed to wires that might be in the air above. If you have a home or building with this situation, regardless how it came about, please contact the Co-op so our linemen can devise an alternative. It's a very serious safety concern.

WEC has an excellent safety record and diligently maintains its electric distribution system. But things can happen, especially in winter when snow conceals the landscape. If you have underground service (rather than overhead connections) the fellow who plows your driveway might accidentally strike the pedestal and cause damage – maybe without being aware of it. The list of potential problems is long: "danger trees" leaning over the wires, branches coming into contact with them, kids playing King of the Mountain on snow piles that have grown too near the wires above...

It's up to all of us to have a safe, snowy winter. Please be mindful. 

DINNER RESERVATION WEC'S 78th Annual Meeting May 4, 2017, Union 32 High School

Your Choice of One Entrée:

- A. Chicken Piccata
- B. Beef Sirloin with a mushroom demi-glace
- C. Roasted Pork with apple mustard demi-glace
- D. Portabella Mushroom stuffed (vegetarian)

Dinner is free by RESERVATION ONLY

To make your reservation, **return this form no later than Wednesday, April 19, 2017** to WEC, P.O. Box 8, East Montpelier, VT 05651. Walk-ins on 5/4 will be charged \$20 per meal if available. No charge for members and guests attending meeting only.

Please indicate your meal choice:							
	A	B	C	D	Member	Guest	Child/Age
Name: _____ <small>(Please print clearly)</small>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name: _____ <small>(Please print clearly)</small>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Map/Account # _____	Tele. # _____						

(Please do not return in ballot envelope.)

