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Brave New Grid

A Discussion with Smart Grid Pioneer Ray Gogel

Germantown–based Current Group LLC and its President and Chief Operating Officer Ray Gogel have spent a good portion of the last decade pioneering Smart Grid developments across the United States and around the globe.

Since its inception in 2000, Current has devised hardware and software systems to conduct intelligent sensing and real-time analytics of electrical grids, boost grid reliability and efficiency, integrate renewable energy sources into existing grids, and support smart metering for utilities and their customers. With offices in Switzerland and Singapore and representation in Australia, Current has attracted marquee clients throughout Europe and Asia-Pacific, including Iberdola, one of the four largest utilities in the world and a leader in Smart Grid developments.

Meanwhile, Gogel, who joined Current just 10 months ago, spent much of the last decade serving in executive positions at Xcel Energy, a major Midwest electricity and natural gas utility with a driving interest in clean energy. As Xcel's chief administrative officer and vice president of customer and enterprise services, Gogel oversaw the creation of America's first fully integrated Smart Grid City in Boulder, Co.

We talked with Ray Gogel about the challenges facing America's electrical grid, the potential of Smart Grid technologies, the difficulties with changing consumer behavior, and the lessons learned by Smart Grid pioneers in Colorado.

"The distribution grid is relatively blind and certainly is not constructed today to adjust and heal itself," Gogel said.

"It was built on a couple of basic assumptions that no longer apply. Number one is a one-way flow of power. Water flows downhill. Electricity flows to the end point. That's how it has been for the last 100 years. Another assumption is that you had surplus. The 21st century is

not about surplus. It is all about scarcity. It is all about us throttling our hubris to figure out how in the world we can live within the limits of resources on this planet."

Developers of Current's Smart Grid systems have tackled those challenges in multiple ways, Gogel said.

By outfitting grids with sensor systems, Current has not only enabled utilities to monitor the grid and detect and correct problems rapidly, but also to determine how to distribute electricity more efficiently and evenly. Utilities, he explained, must deliver electricity to buildings at 114 to 124 volts. Utilities who are running conventional grids and can't see what voltage actually reaches a location, often run power at the high end of that range to ensure that line losses don't drop the voltage too low before it reaches a building at the end of a feeder.

"But if I run my grid at 124 volts, I have to use more energy," Gogel said. "Current puts sensors out on the grid so that we can see what is happening. Consequently, we can lower voltage and create less need for voltage without seeing any impact on the building at the end of the line."

Those sensor systems, he added, have typically generated 3-5 percent energy savings. "If you think of what a 3-5 percent increase in efficiency would be if you carried it across the country. Someone did a back-of-the-envelope study that concluded that was $10 billion worth of energy efficiency."

Current is now developing technologies to enable electricity grids to better utilize distributed, renewable sources of energy,

“At the end of the day, the Smart Grid in my mind is only really smart if it can put distributed generation into the grid. If you have a solar array on your rooftop or if a European city has their own wind turbine, those sources are relatively ad hoc, not the highest quality but increasingly part of the future of electricity and of paramount importance. That configuration, unfortunately, in our world and in Europe is very, very tricky because for the first time electrons will flow in two directions. If you are in a structure built for one-directional flow with no transparency and no control, and power starts to ebb and flow, you will start to see major reliability issues and safety issues.”

That challenge prompted Xcel Energy to begin building America’s first fully integrated Smart Grid City in Boulder, Co in 2008.

As the largest provider of wind energy in the country, the utility realized that “wind brings volatility to the grid,” Gogel said. “Xcel had the vision of being the greenest utility it could be and drive renewable portfolio standards. They brought a bunch of wind onto the system but discovered it was very hard to control and they would actually have to move technology significantly in the distribution grid.”

Xcel created Smart Grid City Boulder not to set an engineering standard, but to bring together leaders in the sector, push their though processes, and push the limits in Smart Grid technology, Gogel said.

“In a rather passionate opening speech for the project, I said if 30 percent of what we are dreaming about here doesn’t fail, then we haven’t dreamed big enough,” he said.

The Boulder project showed how Smart Grid could improve grid efficiency, improve service reliability and reduce or shorten outages. It also became a model for other utilities and

communities looking to build Smart Grids.

“Forty-five countries have visited the site,” Gogel said. “Not too many people come out to see a utility, so having people coming from all around the world is quite impressive.”

The Boulder project, however, also demonstrated how difficult it can be to change consumer behavior, he said. While many young adults embraced the technology, many other customers did not. The utility, he added, didn’t deliver enough information about Smart Grid to customers. It also didn’t initially realize that it needed to tailor different services and educational messages to different segments of the market.

“Not everyone has to have a smart meter and we should be coming up with different ways to accommodate segments of the populace who have different sets of needs,” Gogel said. “Eventually, we will figure this out, but it has been a long learning curve.”

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Smart Grid Maryland

Utilities Plan to Revolutionize Electric Service

Maryland utilities are poised to roll out Smart Grid technology to nearly two million homes and businesses across the state in an undertaking that is expected to cost nearly $800 million, take three years to implement, and transform the way most Marylanders use electricity.

Smart Grid holds the potential to lower peak demand on the electrical grid, improve service reliability, provide consumers with new ways to cut electricity consumption and costs, trim

overall energy expenses, and create improved opportunities to integrate renewable energy into the grid.

However, utility executives, technology leaders, government officials, consumer advocates and others stress that implementers of Maryland's Smart Grid will have to make shrewd decisions about energy pricing, cost recovery, education programs, security issues, technology choices, and other matters in order to realize full benefits from the retooled grid.

The business case for Smart Grid

Baltimore Gas and Electric Company and two subsidiaries of Pepco Holdings, Inc. – Pepco and Delmarva Power – have filed proposals with Maryland's Public Service Commission to outfit their customers with smart meters and implement new pricing rates and rebates to reflect the cost of electricity during peak and off-peak hours. The PSC has not yet ruled on those applications.

"The electricity sector has not upgraded to the new digital capability that we have today. Right now, you have meters on houses that look no different than meters that were on houses in the 1930s," said Stephen Sunderhauf, manager of program design and evaluation for PHI. "This is a huge opportunity for the electric system to basically join the modern world."

The U.S. Department of Energy awarded $200 million in stimulus funds to BGE and $105 million to PHI's Maryland operations to cover roughly half the cost of the Smart Grid projects. Those funds, utility executives say, bolstered an already-strong business case for Smart Grid. BGE, for example, estimates that its $500-million Smart Grid project will yield $2.6 billion in consumer savings over the 15-year life of the project.

Utilities expect to realize financial benefits from Smart Grid in several ways.

First, new electricity pricing programs will charge consumers different rates for peak and off-peak electricity, as well as paying consumers rebates for lowering their consumption during periods of “critical peak” demand. (For details about Smart Grid pricing programs, see “Watts and cents: How will Smart Grid impact Maryland consumers?”) Utilities project that arrangement will entice consumers to lower their peak electricity usage. That, in turn, would spare utilities from purchasing as much electricity during peak or critical peak hours, when prices can soar tenfold or more, and provide the utilities with a valuable, saleable commodity.

“If our customers reduce their peak usage by 20 percent just for a few days when it matters the most because the grid is most constrained, BGE can actually bid that load reduction in the PJM wholesale market,” said Mark Case, senior vice president of strategy and regulation for BGE. “That would produce a market stream back from PJM to BGE. You would earn the market value of that capacity reduction and that would amount to tens of millions of dollars per year.”

BGE ran a two-year pilot of its critical peak rebate program. On average, participants lowered their critical peak electricity consumption by 20-40 percent, Case said. Participants, he added, saved an average of $115 on their electricity bills over the course of each summer.

Second, utilities expect to realize large operational savings through Smart Grid. Smart meters, which collect data electronically and automatically, would eliminate the need for meter readers. They would also eliminate any need to generate estimated bills (when extreme weather or other conditions block physical access to a meter) and the labor of resolving disputes over estimated bills.

The Smart Grid would enable utilities to shut off or turn on power for customers who are moving, by flicking a switch rather than sending a crewman to the site.

Utilities also predict Smart Grid would enable them to identify, analyze and correct power outages more quickly, and use less labor in the process. That situation would provide customers with fewer or shorter outages, and lower revenue losses that utilities incur during outages.

Consumers, utilities say, will also realize financial benefits from Smart Grid.

Estimates vary on how much an individual consumer could save using Smart Grid technologies and prices. However, utility executives say just getting some customers to use Smart Grid to lower their electricity consumption during peak hours would drive down utilities' overall costs and produce savings for all customers.

"We don't need everyone to participate to have an impact on energy prices," Sunderhauf said. "We just need many people to do it. The fact that X percentage of people lower their peak use will have a benefit for all because it will mitigate electricity prices in the Mid-Atlantic region."

Challenges and uncertainties

"One thing that excites us about Smart Grid is it is the first time that there is a broadly based new technology that gives consumers a tool to manage their energy use," said Bob Howatt, director of planning for the Maryland Energy Administration (MEA).

However, Howatt cautions that utilities cannot assume that all consumers will embrace Smart Grid systems and use them to their maximum benefit.

The Smart Grid Maryland Project – a joint venture of the MEA, Energetics Incorporated, R. W. Beck and the American Council for an Energy Efficient Economy – last year released a

report about Smart Grid technologies, cost-benefit projections, and outcomes of other Smart Grid projects. It noted that studies of multiple Smart Grid projects have concluded that participants typically realize 5-15 percent in energy savings. However, impacts varied widely from project to project. In some cases, energy use jumped by as much as 25 percent.

Some customers, Howatt said, will embrace Smart Grid technologies and the opportunities to control the amount and price of electricity they use. “And some will be scared to death of it.”

Consequently, the success of Smart Grid programs will hinge heavily on excellent education programs, he said. It will also hinge on utilities providing consumers with multiple pricing options, such as a flat rate option versus peak and non-peak pricing, to accommodate different energy needs.

“There are more than a million households served by BGE and several hundred thousand served by the two PHI companies, and they have very different life circumstances,” said Paula Carmody, Maryland’s People’s Counsel.

Reducing peak demand isn’t necessarily an easy or even safe option for households with older residents, disabled individuals, small children or shift workers, Carmody said.

In PSC hearings, Carmody challenged the utilities’ cost-benefit analysis of the Smart Grid projects and questioned whether the projects would ultimately benefit consumers.

Utilities, she said, could face consumer backlash if they don’t deliver the promised financial benefits to consumers, and deftly handle pricing options, education and other key issues, such as securing consumer information gathered by smart meters and securing the Smart Grid from hackers who might attempt to disrupt service.

"One thing the utilities should be doing is under-promising and over-delivering," Howatt said. "This has got to be done right and it has got to be done effectively so consumers, early on, can see the benefits of what it happening with their energy prices."

Lessons from other jurisdictions

Meanwhile, utility executives say they are closely watching other Smart Grid initiatives around the country.

"There is a little bit that is good and a little bit that is bad about each Smart Grid project," Sunderhauf said.

He pointed to Pacific Gas and Electric's deployment of 2.3 million smart meters in California while simultaneously implementing a rate change. Coincidentally, the region was hit with a stretch of extreme weather at the same time. Consumers erupted with complaints about inordinately high or apparently inaccurate electricity bills. The utility was thrust into an investigation of whether flawed technology or inadequate consumer education had caused the problem, while state regulators began to reexamine PG&E's operations.

"Each time someone goes out there and does something, our effort is to make sure we learn as much as possible about how those processes worked and things we could do differently to make sure we work better," Sunderhauf said. "It's an evolution."

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Watts, Dollars, and Cents

How will Smart Grid Impact Maryland Consumers?

If Maryland's Public Service Commission approves their Smart Grid plans, BGE, Pepco and Delmarva Power will begin implementing Smart Grid technologies within months. Allegheny Power has not made plans to adopt Smart Grid.

Crews will replace existing meters with smart meters and utilities will start implementing new pricing systems.

So what will that mean for the average consumer? We asked utility executives and other industry experts.

How would my smart meter work?

Existing meters simply tally total electricity use in a household or business each month. Smart meters will track electricity use hourly and forward that information electronically to the utility and the customer. The utilities have proposed to create web portals to help customers track their energy use, analyze trends and obtain suggestions for cutting consumption.

Meters would also contain a chip capable of communicating with smart devises on the premises – such as smart thermostats, water heaters, air conditioners or other appliances. That technology could eventually provide customers with the ability to remotely instruct the system to cycle down select devices.

How would electricity pricing change under Smart Grid?

BGE, Pepco and Delmarva Power have proposed pricing systems that would charge different rates for peak power (typically electricity used from 2 pm to 7 pm) and off-peak power.

All three utilities have also proposed a system of offering rebates to customers who drop

their electricity use below average levels, during critical peak periods. Critical peaks, which occur about 10 times per summer, happen when demand approaches the grid's full capacity. Under that system, utilities would notify customers the day before an anticipated critical peak. Customers who cut their energy use during the critical hours, would receive rebates of $1.25 for every kilowatt hour they conserved.

When would smart meters be installed?

If the PSC rules on the Smart Grid proposals soon, Pepco and Delmarva Power anticipate beginning smart meter installations late this year and completing the process before the end of 2011. BGE, which expects to swap out two million meters, would begin installing new meters in 2011 and finish the installations in 2014.

How much would the Smart Grid system cost and who pays for it?

The total cost for Smart Grid implementation by Pepco, Delmarva and BGE is expected to near $800 million. Stimulus grants from the U.S. Department of Energy will cover about half the cost. Pepco, Delmarva and BGE have proposed differing methods of recovering the remaining expense, including a surcharge on customers' bills and consideration at a future rate review. The PSC has not yet ruled on what it considers to be an acceptable cost-recovery process.

What savings would Smart Grid produce for consumers?

The estimates vary. BGE estimates that the average customer would save $1,400 during the first 15 years that Smart Grid is active. That customer would also incur a total expense of $220 over the same period to cover the cost of the new technology. Pepco suggests customers could save $40-60 per year by using its dynamic pricing system, and secure additional savings through the critical peak rebates and other energy efficiency incentives.

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Smart Homes, Motivated Consumers Crucial to Success of Smart Grid

Is your house, your television or your refrigerator intelligent enough to talk to the Smart Grid? And do you have a compelling financial reason to spend time and money sparking that conversation?

Spokesmen for IEEE – the world's largest professional association for engineering, computing and other technical professionals – argue that Smart Grid will only reach its full potential when consumers can tap into truly smart electrical systems inside their homes and reap clear financial rewards for using them.

Mark Lively, an IEEE Smart Grid Technical Expert and Utility Economics Engineer based in Gaithersburg, said outfitting homes with systems that track energy use by different appliances may be even more important than putting a smart meter on the side of a house.

While smart meters can track a household's total electricity use in one-hour intervals, they don't break down that consumption by appliance and don't give homeowners explicit indications of how to cut their energy use.

Real-time energy tracking devices, which are already on the market, can do that. And they generate some surprising results.

Saifur Rahman, an IEEE Smart Grid Technical Expert and Director of the Advanced Research Institute at Virginia Tech, installed the devices in his home.

"I'm an electrical engineer, but I was still shocked by the results," Rahman said. "For

example, I leave the garage light on more than I should. I learned that the garage light consumes 1 kilowatt. I didn't know it was that inefficient. It's just tube lights."

Rahman also learned that his two flat-screen televisions each draw 100 watts of energy constantly when they are turned off. Like many modern TVs, Rahman's sets go into standby mode when switched 'off' so that they can turn on instantly.

"It's as if I left two 100-watt light bulbs on in my house for all of my life," he said.

Understanding the details of how electricity is used inside a home could motivate consumers to change some behaviors "and utilities will have to impact my consumption patterns in order for the utilities to save money," Lively said.

Just as governments and utilities have offered incentives for consumers to install solar panels, double-pane windows or added insulation, they should also consider offering incentives to consumers who make their homes Smart-Grid-capable by installing devices such as energy monitoring systems, Rahman said. His system cost about $600 and took an hour to hook up.

In order to maximize their benefits, Smart Grid developers will also need to provide consumers with strong pricing incentives to cut their peak energy use and ample education about the consumer benefits of Smart Grid, the IEEE spokesmen said.

For example, many consumers don't realize that simply allowing a smart meter to be installed on their homes enables utilities to more efficiently control voltage on power lines and realize an energy efficiency gain of 4 percent, Rahman said.

"Well, you'll save 4 percent a month on your electric bill. That adds up over time," he said.

Rahman is currently working on the Department of Energy's Smart Grid Clearinghouse project, which assesses Smart Grid technical standards, regulatory measures, cyber security systems and consumer education efforts in 50 states and the District of Columbia.

Meanwhile, IEEE has established a Smart Grid initiative to support research, conferences and a centralized bank of information about Smart Grid technologies, regulatory standards, and effective implementation. For more information, go to http://smartgrid.ieee.org.

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Partnership with Customers is Key to Smart Grid Success

Pepco Holdings, Inc. (PHI) and its Maryland utilities, Pepco and Delmarva Power, have been honored to serve Maryland for more than 100 years. During that time, the electric industry has faced many challenges, but none as potentially exciting as the transformation we are now making to the Smart Grid.

PHI's smart grid journey began about five years ago when we envisioned the "utility of the future." From the start, we took a holistic view and undertook a complete rethinking of our business and how we communicate with customers. Our vision was driven by what customers expect from us: more information, better service, and the tools to enable better decisions on how to use electricity. The issues of climate change, energy costs and energy efficiency, as well as the current economic challenges, have only made the need for a smart grid more urgent. In fact, Maryland has set aggressive energy consumption reduction goals, and the construction of a smart grid will be instrumental in helping to reach those goals.

PHI is a proud to have received $105 million in smart grid investment grants for its Pepco-

Maryland service territory to implement a smart grid, and $4.4 million to provide workers with 21st century skills training. With regulatory approval, we plan to put those funds to good use.

- We plan to install in homes and businesses 570,000 programmable smart meters in Pepco's Maryland service area, which will provide detailed energy information that will enable customers to better manage their energy use and costs.
- We're building a comprehensive digital-based communications infrastructure and an automated distribution system, which will enable us to isolate electrical problems, make automatic power adjustments and speed restoration efforts.
- We're offering demand response technologies for consumers interested in receiving credits for having their air conditioning equipment or thermostats cycled during critical load consumption periods.
- We're facilitating the integration and expansion of renewable energy and distributed generation, which includes electrification of transportation infrastructure onto the grid.
- And we plan to propose dynamic pricing programs to the Maryland Public Service Commission that will provide customers with the opportunity to save money by shifting their energy use to off peak periods.

A well-designed Smart Grid plan is just the beginning. Only through the active involvement of customers who purchase energy-efficient appliances, drive alternatively fueled vehicles and participate in energy management programs, will individual states' energy goals be achieved, reliability improved, energy independence gained and customer energy savings realized.

The bottom line is this: customer participation is the key to the success of our Smart Grid plan.

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CETI Affiliate Unveils Clean Energy Solution for Military, First Responders and Aid Agencies

Strategic Services International, an affiliate company with the Clean Energy Technology Incubator, is about open a manufacturing facility in Arbutus to produce a clean-powered, mobile communications center for deployment in disaster areas, war zones, developing countries and elsewhere.

The device was designed by former NASA engineers after they witnessed first-hand the chaos in New Orleans in the wake of Hurricane Katrina, said Lynn Hogg, vice president of Strategic Services International (SSI).

First responders, he said, were burning precious fuel in an often-futile search for stores of fuel. “They didn’t have enough fuel to power generators, communications went down and then the whole thing turned into hell in a hand basket.”

In response, the engineers designed the GSW 7000 – a mobile, self-sufficient, renewably powered communications facility. Equipped with a photovoltaic array and a 106-foot-high wind turbine, the unit generates enough electricity to power four 2000-square-foot houses. It supports all forms of electronic communications, including cellular, satellite and wi-fi. It is also built to survive extreme weather conditions, including Category 3 hurricane winds, Hogg said.

The company unveiled the clean energy technology at a May 21 demonstration outside the Clean Energy Technology Incubator (CETI) at bwtech@UMBC. CETI is a joint venture of the University of Maryland Baltimore County and the Maryland Clean Energy Center.

SSI, a service disabled veteran owned company headquartered in Halethorpe, had manufactured early models of the GSW 7000 at a facility in Mountainview, Ca.

However, the company is preparing to transfer those operations to Maryland and open a 30,000-square-foot manufacturing facility in Arbutus within the next 90 days, Hogg said. The facility would be capable of turning out one unit per day, and would eventually create 64 green collar jobs, mostly for manufacturing professionals, engineers, electricians and fabricators.

The device is already being used by NASA to charge new versions of the Mars rover while they undergo testing in the desert.

Telecommunications companies, international aid organizations, border security officials and several branches of the military are also considering adopting SSI's technology, Hogg said.

"For military applications, the ROI [return on investment] is extraordinary," he said. "In Northern Afghanistan, for instance, a gallon of diesel fuel for a generator, according to the Defense Logistics Agency, costs about $400 a gallon" when all the costs of acquiring, delivering and using it are tallied.

"So there, the ROI on one of our mobile units is about 30 days," he said "It will power a forward operating base with renewables. It has self-diagnostics and we have an application that literally will maintain and operate the equipment from an iPhone anywhere in the world."

For more information about Strategic Services International, go to www.ssiconnections.com.

For more information about CETI, please contact David Fink at 410-455-5856 or david.

fink@umbc.edu.

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Forum to Explore Clean Energy Options in Buildings and Clean Energy Business Opportunities in Asia

On June 15, the Maryland-Asia Environmental Partnership (MD-AEP) and the Maryland Clean Energy Center (MCEC) will host “Maximizing Efficiencies in the Built Environment,” the second forum in a four-part Energy Leadership Series.

The half-day event to be held at The Universities at Shady Grove in Rockville will feature presentations from industry leaders: Dr. Nandini Mouli, Energy and Environment Manager for DuPont; Robert Phinney, AIA, LEED AP BD+C, ID+C and a Director of Skanska USA Building; Neil Wester, General Manager of Oxford Instruments Group; and Wayne Pfisterer, President of Pfister Energy.

America’s built infrastructure uses 40 percent of all primary energy supplied in the United States, and more than 70 percent of all generated electricity. In total, America’s buildings consume enough energy to account for the production of more than one-third of the country’s coal-fired power plants.

Construction and energy systems, currently in development, could reduce buildings’ energy needs by 10-20 percent. At the June 15 forum, industry leaders will highlight opportunities for optimizing energy efficiency in new construction and retrofits of commercial buildings, industrial complexes and residential communities.

MD-AEP and MCEC created the 2010 energy series to provide insights from top energy experts on options for addressing growing energy needs and the viability of clean energy options. The first forum, held in April, focused on “Maryland’s Power Sector Delivery and Management Infrastructure Models,” including Smart Grid. Forums slated for this autumn will address renewable energy sources and biomass/biofuels.

Peter Gourlay, President of MD-AEP, said the forums bring together “the research and science coming out of universities, the technology and applications coming out of business, and some of the governance that is coming out of local and U.S. agencies.”

The forums, along with the ongoing work of the MD-AEP, also generate opportunities for Maryland companies to tap into huge markets in Asia, Gourlay said. The partnership, he explained, has developed extensive contacts in Asian businesses, governments and academic institutions. It has hosted trade delegations from Asia and, in May, organized its first trade mission to Vietnam.

Energy consumption levels in Asia’s developing countries, including China and India, are rising rapidly and projected to grow by more than 100 percent by 2025. That demand has created opportunities to export clean energy technology to Asia.

Asia’s rapid development is also creating opportunities for companies and agencies specializing in the built environment, Gourlay said.

“Many parts of Asia are still building their infrastructure, so we have the wonderful opportunity to influence how it is being built,” he said. “Will they use building practices from 10 or 15 years ago or will they use some of the cutting edge, sustainable practices in energy conservation? We are hoping to help Asia leap frog the technology continuum.”

Rapid growth and climate change are prompting many Asian leaders to focus on clean energy and energy efficiency, he added.

“The driver in Vietnam is an economic one,” Gourlay said. “The government is recognizing that if they don’t start thinking about how they are getting their water and energy, how they are dealing with climate change, extreme weather and sea-level rise, they are really going to pay the price in terms of their country’s prosperity.”

To obtain more information about or register for the June 15th forum on “Maximizing Efficiencies in the Built Environment,” go to www.regonline.com/builder/site/Default.aspx?eventid=863345.

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Frederick Firm Increases Value of Solar by Integrating Smart Grid Functionality

Our existing electrical transmission and distribution system is aging and not fully prepared to support future needs. As a result, utilities need to become smarter about how they manage the distribution of electricity. The term “smart grid” generally describes the products and technologies intended to increase the security, reliability and efficiency of electrical transmission and distribution. Frederick-based, TimberRock Energy Solutions, Inc. (www.TimberRockES.com) is advancing one of the newest smart grid technologies.

To understand TimberRock’s solution, an explanation of a long-standing utility challenge is required. When electricity is transmitted over long distances, the inductance of the power lines and transformers can cause a phase shift, requiring more current to deliver the same

amount of power. This means that the capacity of the transmission system is reduced because a watt of generated electricity does not result in a watt of billable electricity for the utility. VARs (Volt-Ampere Reactive) is the term used to describe this useless part of the AC power and is often described – in laymen's terms – as the foam on a beer. A lot of foam means less room for beer.

If the utilities' load characteristics are well understood, there are existing means of mitigating this problem – referred to as VAR compensation - that have been in use for years. However, increasingly more sophisticated appliances, solar systems and electric vehicles all create dynamic changes in load characteristics. These changes to the load mitigate the effectiveness of the existing VAR compensation tactics.

According to TimberRock CEO, Brent Hollenbeck, the challenge of VAR compensation and clean technologies are interconnected. "Distributed solar systems and electric vehicles are recognized as important methods of reducing emissions and increasing our energy security. What is less understood is how these technologies – and the changes they create in load characteristics – can negatively impact the utility. It is important to recognize that clean technologies have the greatest environmental and economic value if they are deployed in a manner that optimizes the existing base-load distribution. This achieves the proverbial win-win and will speed the transformation of our energy economy."

TimberRock is working to make sure clean technologies are utility-friendly. The company envisions a convergence of solar, electric vehicle (EV) charging and smart grid technologies. Their Oasis EVC™ (http://timberrockes.com/docs/oasisEVC.pdf) is an example. By partnering with Annapolis-based SemaConnect, TimberRock has integrated an electric vehicle charging meter with one of its turn-key solar systems.

The benefits are three-fold. First, rather then charging a clean car with coal-generated

electricity, a portion of the EV's charging needs can be provided with renewable, solar-generated electricity. Second, when coupled with TimerRock's smart-grid inverter, the combined solution offers new electrical generation capacity that helps the utility satisfy the new demand for electricity created by the EV. Finally, the capacitance of the inverter can be tapped to provide dynamic VAR compensation. This real-time compensation adjusts to changes in load characteristics, providing utilities the means of achieving higher efficiencies. Inclusion of storage will eventually allow peak shifting and demand response as well.

According to TimberRock CFO, Fred Ugast, the business' approach to product development is unique. "We're interested in the proliferation of solar and other clean technologies, but we also recognize that the value of these technologies must be increased to compete with relatively inexpensive carbon-based fuels. We believe that our products will help utilities achieve their renewable portfolio standard obligations while also running their existing transmission and distribution systems more efficiently."

TimberRock's position is that in time, the line between cleantech and smart grid technologies will blur. The business is hard at work making sure Maryland-based solutions are at the forefront.

~ Submitted by TimberRock Energy Solutions, Inc.

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