State of the Grid

3ND QUARTER 2018

Certified Minority Business Enterprise MBE

WELCOME TO OUR Q3 NEWSLETTER!

The recent IPCC report setting a 2030 deadline to stop a climate disaster raises our awareness and should make us all more concerned about our own behaviors and motivations. But it's also a report of hope. There is still time to make a difference and the news this quarter highlights many investors, businesses and states who are making valuable contributions.

Dr. Mani Vadari
President

AT MODERN GRID SOLUTIONS, SMART GRIDS ARE BUSINESS AS USUAL

Differentiated services to utilities and their vendors focusing on Smart Grid and System Operations. Our team brings deep expertise in all aspects covering technology and management consulting.

IN THIS ISSUE

MGS NEWS

HOT OFF THE PRESS!

Q3 Featured Event

The 5th Annual ***Demand Response & Distributed Energy Resources World Forum***, October 16-17, 2018 in Costa Mesa, CA brings together stakeholders from across the DR / DER industry to examine the latest technology advances, case studies, and business strategies for optimizing demand response, energy efficiency, DER integration and control, and demand side management programs. The event will help utilities and large C&I end users realize the full economic benefits of incorporating these capabilities into their operations, and leveraging the next-generation smart grid to optimize performance. Expert industry speakers include Southern California Edison, PG&E, SDG&E, Entergy, EPRI, Lawrence Berkeley National Lab, Kitu Systems, MelRok, Skipping Stone, West Monroe Partners, and many more.

Modern Grid Solutions is an official Media Partner for this event – enter special code **MGS20** for 20% off when registering.

Visit http://www.drworldforum.com for full details.

You May be Interested in… Terra Nostra

Terra Nostra ("Our Earth"), composed by Chirsotphe Chagnard, is a 30-minute multimedia symphony about climate change designed to Engage, Educate, Inspire, and Empower people to move for personal and policy change to protect the earth. It is an evocative combination of orchestral music, poetry, and photography, intended to invite broad discourse and inspire concrete initiatives in audiences in ways science alone may not. Read more at www.terranostra.org.

MERGERS AND ACQUISITIONS

Aclara Technologies bought by Hubbell

Hubbell, which manufactures electrical and electronic products for construction and utility companies purchased Aclara for $1.1 billion to increase its own smart infrastructure capabilities. Aclara's smart technology includes advanced metering infrastructure, meters, software and installation services. Aclara provides data, analytics and technology to water, gas and electric utilities.

PowerTeam Services Being Acquired

Clayton, Dubilier & Rice announced in August that it is acquiring PowerTeam Services LLC, a provider of maintenance and construction services to the US utility industries for undisclosed terms. PowerTeam provides services to maintain, repair, upgrade, and install natural gas and electric distribution and transmission systems. PowerTeam's customer base includes leading regulated utilities in the southeastern and midwestern US, which it serves through a network of 42 locations in 21 states with approximately 4,200 employees. Approximately two-thirds of PowerTeam's revenue is related to natural gas systems, and more than 70% of revenue is derived from distribution infrastructure.

Vestas is Buying Utopus for $100 Million

Vestas, a global wind power company based in Denmark, made the deal to acquire US based Utopus in an effort to provide customers with better predictability, increased energy production and more operational efficiency through analytical technology and software. Utopus Insights spun out from IBM's Smart Energy Research Institute and has personnel with expertise in data science, energy, meteorology, software and utility operations.

E.ON to Own 86.2% of Innogy

Following a voluntary public takeover offer, E.ON will own a further 9.4% of RWE subsidiary Innogy on top of the 76.8% parent company's share. In late April 2018, E.ON launched a voluntary offer to buy the shares in Innogy, following a complex deal between RWE and E.ON in mid-March. Under the March agreement, E.ON will buy Innogy's grid and retail business. In return, RWE will take on Innogy's and E.ON's renewable energy assets. RWE will also own a 16.67% "effective participation" in E.ON. This will make RWE one of Germany's largest power generators, while E.ON will become one of the nation's premier utility and grid operators. The deal still requires regulatory approvals.

FERC Approves CenterPoint Energy and Vectren Merger

Though the definitive merger agreement between both companies already received approval from shareholders and the FERC, it is yet to receive mandatory regulatory approval from Federal Communications Commission. The acquisition of Vectren, a deal roughly worth $6 billion, will help in creating a new company that would eventually serve more than 7 million customers across nearly 40 states in the United States. The combined company is expected to have electric and natural gas delivery operations in eight states with assets totaling $29 billion and an enterprise value of $27 billion.

Nokia Teams up with Current by GE to bring smart city technology across Canada

This is not a merger or acquisition, but rather a commercial partnership agreement between Nokia and Current by GE where Nokia will be able to gain access to Current by GE's CityIQ platform technology. CityIQ will repurpose outdoor street lighting into digital infrastructure that collects data and distributes valuable insights to cities via Nokia's safe and secure communications networks. The combined digital solution is expected to benefit cities by providing new operational insights. This will address issues, such as parking and traffic management, public safety enhancements and weather and air quality monitoring.

KEY HIGHLIGHTS

Edge Computing and Distributed Intelligence for Grid Operations

According to a new report from Navigant Research, the global market for grid edge computing and distributed intelligence is expected to reach $6.5 billion by 2027. The report identifies key technologies such as advanced metering infrastructure (AMI), distribution automation (DA), Volt/VAR optimization (VVO), smart inverters, and DER integration, among others, that are poised to lead the grid edge into the digital age. The study examines the main market drivers and blockers, as well as the regional and global trends, affecting the deployment of grid edge computing solutions.

Global Market Analysis for Microgrids

According to another new report from Navigant Research, the global microgrid market is expected to grow from $6.3 billion in 2018 to $30.9 billion by 2027 under a base scenario at a CAGR of 19.7%. (The report examines three scenarios for future microgrid market growth; conservative, base and aggressive.) The report also shows that North America remains a strong market but is surpassed by Asia Pacific over time due to pure population growth and lack of traditional grid infrastructure, creating opportunities for remote microgrids in particular. And, among several customer types, Commercial & Industrial companies are implementing microgrids most quickly.

Smart City Grid Development to Bring Energy Savings

According to a recent report by Juniper Research, the development of smart grids linked to smart cities will result in global citizens saving $14 billion per annum in energy bills by 2022. This is up from the $3.4 billion saving estimated for 2017, resulting from smart meter roll-outs, energy-saving policies and sensing technology to improve grid reliability and efficiency. The report, called "Smart Cities: Strategies & Forecasts in Energy, Transport & Lighting 2017-2022", highlights how the market landscape has shifted over the past 18 months, from one that was primarily technology-driven, to one where policy plays an increasingly important role.

The Autonomous Grid: Machine Learning and IoT for Utilities

A recent survey published by SAS of 200 US utilities looks specifically at the use of industrial internet of things (IIoT) technologies and machine learning to aid the transition to a smart grid. The survey found that 43% of utilities are already using IoT for outage management. Another 24% plan to use it within the next three years. The survey also found that 55% of utilities already use IoT for metering/meter data management (MDM), and 31% are already using machine learning for this area too.

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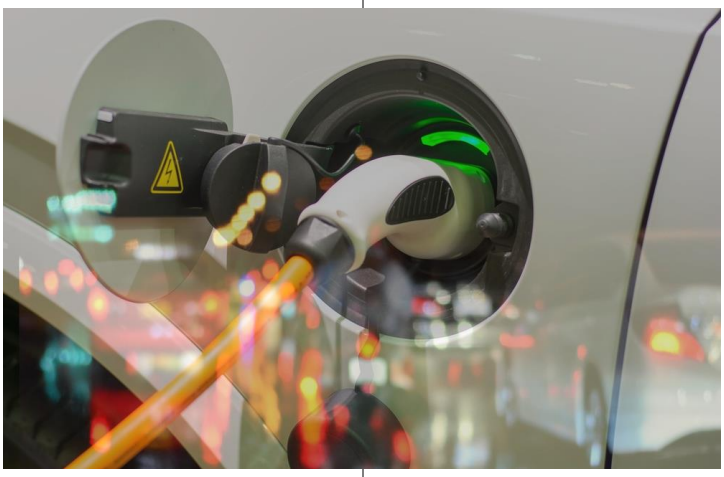


Investors Take Notice of Opportunities in Energy Storage Innovation

Ambri has secured a combined $50 million from Bill Gates and other investors, while VionX recently raised $26 million in financing to add to the $79 million in venture capital financing that it had already raised. Ice Energy entered into a long-term agreement in June 2018 for $40 million in funding after securing series C funding in 2010. Mercom Capital Group found that venture capital funding for battery storage, smart grid, and efficiency companies was 12% higher in the first half of 2018 than in the first half of 2017, rising from $480 million to $539 million. The recent increase in innovation and investment may indicate there are new opportunities in store for efficient storage technologies and cleantech as a whole.

Big NYC Buildings Agree to Make Dramatic Cuts in Energy Use by 2030

In New York City, buildings account for more than two-thirds of the city's greenhouse gas (GHG) emissions. Fossil fuels burned in NYC buildings for heat and hot water are the number one source of GHG emissions, accounting for 42% of the citywide total. In addition to NYC's Local Law 33 which mandates building energy efficiency grades to be posted in large buildings in 2020, and the city's 80x50 commitment (pledge to cut GHG by 80% by 2050), some major NYC real estate firms have signed on to reduce energy use by 20% by 2030. New York City's Real Estate Board agreed to a legally enforceable 2030 target in exchange for more flexibility on how to reach the 2050 goals.

Electric Vehicles and the California Grid

Currently, there are about 360,000 electric cars on California roads. Last year, California Governor Jerry Brown announced a target of getting 5 million zero emission vehicles on the road in his state by 2030. How would an increase of this magnitude affect the electricity grid? Much has been theorized, but most experts agree that with the trend of increasing PEVs and renewable energy happening at a time when utilities are adopting smart grid technologies allowing for real-time models of demand, the benefits outweigh the risks. A recent report by Next 10 titled *Electric Vehicles and the California Grid*, concludes that 3.9 million PEVs would suck up about 5% of the state's current power needs, adding 15,500 gigawatt-hours to charging demand.

NYC's Largest Solar System Installed in Staten Island

The New York State Energy Research and Development Authority (NYSERDA) recently announced the completion of what it claims to be the largest solar system installed in New York City. Located in Staten Island, the 3.1 MW solar array will offset a large portion of the electricity used by Fordham University and Fordham Preparatory School in the Bronx. It's made up of more than 9,000 solar panels and is expected to generate nearly 4 million kWh of solar energy each year – enough to offset 20% of Fordham University's electricity use and 37% of Fordham Preparatory School's use.

EEI Leads Industry Initiative Making Sustainability Reporting for IOUs Easier

The Edison Electric Institute's (EEI's) Environmental, Social, Governance and Sustainability-related (ESG/Sustainability) reporting template launched in August is a voluntary resource aimed at helping the trade group's investor-owned electric company members provide the financial sector with more uniform and consistent ESG/sustainability data and information. Investors, asset managers, and ratings agencies say that information is increasingly important in assessing corporate performance and risk. It stems from efforts by a broad working group the EEI assembled in 2016 to address growing requests by investors. Those companies included American Electric Power (AEP), Alliant Energy, Ameren, DTE Energy, Duke Energy, Edison International, Entergy, Eversource Energy, Great Plains Energy, NiSource, Pacific Gas and Electric, PSEG, UNS Energy, and WEC Energy Group.

HECO Plan 7 Solar+Storage Projects

Hawaiian Electric Companies (HECO) are in contract negotiations with developers of seven solar+storage projects that would represent a major addition to the renewable resources on Oahu, Maui and Hawaii Island. The negotiations are expected to result in contracts for approximately 260 MW of solar energy across the three islands, with each solar project connected to a storage system that will capture up to four hours of electricity that can further reduce fossil fuel use in the evening or other times when the sun isn't shining.

Duke Energy to Invest Half a Billion in Battery Storage

Over the next 15 years, Duke Energy plans to invest $500 million in its battery energy storage projects in both North and South Carolina that come with an electricity generation capacity of 300 MW. The investment is meant to strengthen the company's energy grid and customer reliability.

World Bank Offers $1 Billion for Batteries in Emerging Markets

The World Bank Group committed $1 billion to finance battery-storage systems in developing and middle-income countries, and expects its participation to attract another $4 billion in backing from investors as well as public and private funds. The effort also includes a global think tank to study battery technologies and deployment strategies.

Renewables to Supply 70-85% of Electricity by 2050

According to a recent report from the United Nations' Intergovernmental Panel on Climate Change (IPPC), limiting global warming to 1.5°C will require extreme changes, including markedly increasing the percentage of electricity from renewables by mid-century. According to the International Energy Agency, renewables accounted for just 23% of electricity in 2015. Increasing clean energy adoption at the rate the report calls for will require $2.4 trillion in investment every year. Bloomberg New Energy Finance logged clean energy investments at just $138.2 billion for the first half of 2018.

FEATURED ARTICLES

Smart Strategies Start with Centralizing Utility and Energy Information

According to the EPA, over 30% of all energy resources are wasted in the USA. This is because utility decisions and costs are often siloed and managed by different departments -- bill payment, capital purchasing, maintenance, facilities, operations -- to name a few. If your organization spends $1 million annually on utility bills, this wasted resources can be significant. Just imagine: if you had an additional $300,000, how would you be investing that in your mission?

A challenge most organizations face is a lack of transparency in what constitutes their utility budget. Bills may only be 1-3% of a company's operating budget, an often insignificant amount. Yet the total utility budget should also include lifecycle considerations such as equipment purchases, maintenance, operations, capital replacements, and other utility budget items. Frequently different departments are responsible for these other line items, resulting in double spending on some processes and underinvestment in others. Furthermore, external options -- such as incentives, grants, loans and rebates -- can take a lot of time to learn, understand the nuances and incorporate into internal processes. Executives may feel at a loss to take control of these costs because there lacks a cohesive way to understand tradeoffs and priorities. This opaqueness in budgets results in an inability for executives to evaluate and make clear choices.

One best practice to overcoming these challenges is to centralize your information that your entire team can use. Common shared information includes:

1. Utility costs and consumption for all monthly bills ($, kWh, gallons, etc.)
2. List of equipment with their make and model numbers
3. Regular maintenance schedule
4. List of vendors and other service providers that services the equipment
5. Prioritized list of future capital retrofit needs
6. List of external incentives and opportunities that support your future capital needs

Having this information in a centralized location supports decision-making across your organization. You can know that all departments are looking at the same set of data when deciding what is best for the organization. This can reduce duplicate efforts to gather and maintain the information while supporting multiple initiatives across your organization.

At the end of the day, eliminating 30% of wasted utilities helps keep your organization financially stable and keep you focused on building a stronger company.

Article submitted by: Jimmy Jia, CEO of Distributed Energy Management www.de-mgmt.comparticipation

MGS Editorial: New York Continues to Evolve its Electricity System

It started in 2014 with NY State's Reform the Energy Vision (REV) which lays out one of the most sweeping transformations of New York's electric industry. There was a need to revise the current regulatory structure and market design considering the expected trends such as minimal load growth, load volatility, the transition of traditional baseload resources to marginal resources and the impact of aging infrastructure.

Next in line was the Clean Energy Standard (CES) designed to fight climate change, reduce harmful air pollution, and ensure a diverse and reliable low carbon energy supply. CES requires that 50% of New York's electricity come from renewable energy sources such as solar and wind by 2030, with a progressive phase-in schedule starting in 2017.

While CES set aggressive targets for rapid change from today's electric supply and delivery system to a completely redesigned and transformed system by 2030, it was left to the REV team and the Market Design Platform Technology report which identified the roadmap defining how the state could move from tariff-based pricing to market-based pricing. This transition is novel because while wholesale markets which have been in existence in some form for over 40+ years, retail markets are new.

The movement has continued through successive administrations and NY PSC chairpersons. In September, several new actions related to promoting energy storage, renewables and EVs were announced by the PSC. Actions taken included expanding types of clean renewable energy systems eligible for compensation based upon the benefits they generate via the "value stack" method. They also approved Con Ed's plan for a shared solar project for low income customers and expanded the types of EVs eligible to participate in SmartCharge NY, Con Ed's off-peak EV charging program.

Most recently, Governor Cuomo announced that $40 million will be made available to support solar projects that integrate energy storage, accelerating progress toward New York's energy storage target of 1,500 MW by 2025.

The state appears to be resolute to ensure they will lead the nation and the world in advancing one of the most critical states in the country as the shining beacon for defining a sustainable energy future for all.

"New York has taken bold action to become a national leader in the clean energy economy and is taking concrete, cost-effective steps today to safeguard this state's environment for decades to come. This Clean Energy Standard shows you can generate the power necessary for supporting the modern economy while combatting climate change. Make no mistake, this is a very real threat that continues to grow by the day, and I urge all other states to join us in this fight for our very future".

- NY Gov. Cuomo

MEET THE EXPERTS

This quarter we spotlight Anne Cleary, a principal on the MGS team, who joined our team in 2016. Anne's current practice area focuses on advising on the technical integration, commercialization, and regulation of energy storage with renewables.

Anne's background runs the gamut of all areas within the electric utility industry, both in the U.S. and internationally. An electrical engineer by training, Anne is able to help clients bridge the technical aspects of the industry with the realities of the business and regulatory challenges it faces. She brings to clients a proven business track record which has included leading all aspects of the integration of two Fortune 500 energy company M&A transactions, successful development and commercialization of large capital power projects, and serving as the business unit president for over 6,000 MW of generation with annual EBITDA of over $125 million. Anne's experience from being a field distribution engineer to a C-suite executive of a Fortune 500 energy company, has provided her with a broad experience base to help provide value to MGS clients and industry partners.

From 1999 to 2014, Anne worked for NRG, a Fortune 500 Company (and predecessor companies GenOn and Mirant), last serving as Executive Vice President and Chief Integration Officer.

Earlier, Anne served in a variety of leadership roles in all aspects of operations and she served as Chief Risk Officer and Vice President of of US Regulatory Affairs.

From 1983 until 2000, Anne held positions of increased engineering and business responsibilities with various subsidiaries of the Southern Company, where she rose to Vice President of U.S. Business Development.

Currently Anne is a principal at Modern Grid Solutions. Her practice area focuses on advising on the technical integration, commercialization, and regulation of energy storage with renewables. Anne also serves as a member of the Board of The Ascendant Group Ltd. (BSX:AGL), which operates the Bermuda Electric Light Company, and Southwest Generation, a natural-gas fired independent power platform owned by the Infrastructure Investment Fund (IIF).

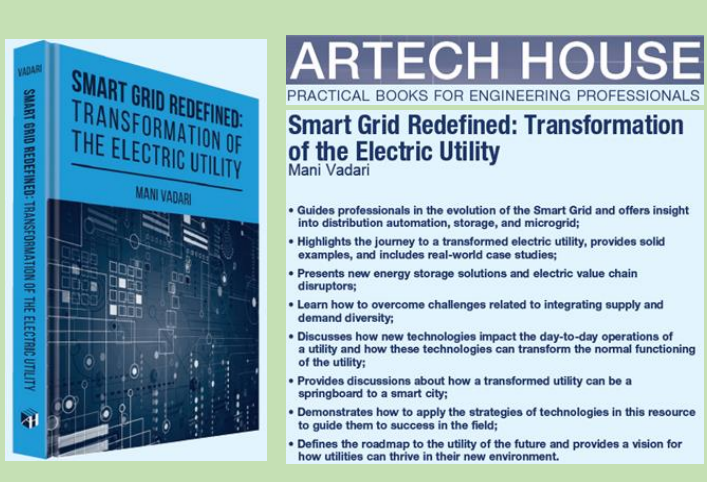
Anne M Cleary

NEWS FROM MODERN GRID SOLUTIONS

Ongoing Projects at Modern Grid Solutions

Our current work with clients includes:

- Assisting the Pacific Northwest National Laboratory on a DOE project - development of an OpenADMS application development platform (GridAPPS-D).
- Assisting with a major multi-OpCo distribution operations transformation – Control center consolidation, ADMS specification and procurement, and operations standardization.
- Assisting a major Northwest US utility with integrating DER planning into IRP processes.
- Defining a Smart Grid Roadmap for a major Northwest Municipal utility
- Assisting an international Transmission company with their North American expansion and worldwide technology roadmap
- Major Canadian utility Restoration processes update and improve



MGS team grows its team of experts

MGS has built a portfolio of experts with 25-40 years of experience in fields ranging from Grid Modernization, T&D Operations, Generation operations, Utility regulatory & economics, Energy Efficiency and Demand Response and T&D Planning. Give us a call!!

Smart Grid Redefined: Transformation of the Electric Utility

The book has been released and is now available in all leading bookstores and an online store near you.

Electric System Operations: Evolving to the Modern Grid

Dr. Vadari's book continues to receive rave reviews from readers. Buy them soon at a leading retailer.

ABOUT THIS NEWSLETTER

This quarterly newsletter is a production of Modern Grid Academy under the auspices of Modern Grid Solutions. Please send all comments and inquiries to info@moderngridsolutions.com