State of the Grid

1ST QUARTER 2019

Certified Minority Business Enterprise MBE

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.

WELCOME TO OUR Q1 NEWSLETTER!

The first few months of 2019 have been almost a blur with so much happening in our industry, our communities and throughout the world. At MGS, we would like to take time to express our gratitude for all our valued clients and the interesting work we're able to do at their request. Thank You!

We sincerely hope 2019 is off to a great start for all our readers.

Dr. Mani Vadari
President

IN THIS ISSUE

MGS NEWS

HOT OFF THE PRESS!

The second edition of Dr. Vadari's book, *Electric System Operations: Evolving to the Modern Grid* is being developed as we speak. Stay tuned for more details. If you have some information to contribute or think the new edition should highlight, please send me your thoughts.

Upcoming Events

- Western Energy Institute Operations Conference, April 23-26 in Vancouver, BC. – John (JD) Hammerly and Robert Young are attending.
- IEEE PES General Meeting, August 2019 in Atlanta, Georgia. The theme this time is "Expect Uncertainty – Prepare to Adapt
- 4th Annual Grid Modernization Forum May 20-22, 2019 | Chicago

You May be Interested in…

Greta Thunberg, Teen Climate Activist

If you missed this from the Annual Meeting of the World Economic Forum 2019 in Davos, you MUST take six minutes to watch this inspiring speech from 16-year-old Greta Thunberg. She is a schoolgirl from Sweden with a very simple message: "We have to stop the emissions of greenhouse gases." Unlike many adults at Davos, Greta took a train journey of 32 hours to speak at the event while as many as 1500 private jet flights carried others. Since this speech, and because of all she's done to raise awareness of climate change, she has been nominated as a candidate for the Nobel Peace Prize later this year.

MERGERS AND ACQUISITIONS

NextEra Energy completes acquisition of Gulf Power Company

In January, NextEra Energy headquartered in Juno Beach, Fl, with approximately 5 million customers in Florida, completed its acquisition of Gulf Power Company from Southern Company. Gulf Power serves approximately 450,000 customers in throughout northwest Florida. In a press release from NextEra Energy, Jim Robo, chairman and chief executive officer of NextEra Energy said, "The last few months have been among the most challenging periods in Gulf Power's rich history as the team worked tirelessly to restore power to those impacted by Hurricane Michael. We couldn't be more pleased by Gulf Power's performance and commitment to getting the lights back on during what were extremely dangerous and difficult conditions. As we turn to the future, we look forward to extending to Gulf Power's customers our best-in-class value proposition of low bills, clean energy, high reliability and outstanding customer service."

Dominion Energy Combines with SCANA Corporation

Also in January, Dominion Energy, Inc. and SCANA Corporation announced they have completed their merger, benefiting customers in Georgia, North Carolina and South Carolina. The deal expands Dominion Energy's operations in Georgia and the Carolinas, where the company had already operated an electric utility serving 120,000 customer accounts in northeastern North Carolina, a 1,500-mile interstate pipeline principally in South Carolina, and nearly 1,000 megawatts of gas, hydro and solar generating capacity in all three states. Dominion Energy now serves 3.3 million electric utility customers accounts in North Carolina, South Carolina and Virginia and 3.3 million natural gas utility customer accounts in Idaho, North Carolina, Ohio, South Carolina, Utah West Virginia and Wyoming.

Europe's biggest utility considering bid for Sempra's Latin America assets

Italy's Enel is considering making a bid for the Chilean and Peruvian assets that have been put up for sale by U.S.-based Sempra Energy as part of Enel's plan to expand further in South America, according to its chief executive, Francesco Starace via a MarketWatch article. Sempra, having embarked on a wider strategy to focus on its core domestic operations after activist investor Elliott Management and Bluescape Resources pushed for a sweeping overhaul of the San Diego–based company, kicked off the formal sale process in April. Analysts estimate the assets could be worth between $2.5 billion and $3 billion. Enel, which is 23.6% owned by the Italian government, is Europe's largest utility, with a market value of €58 billion ($65 billion). The group has earmarked €8.4 billion of its planned €27.5 billion total capital expenditure for 2019-21 for growth across all business segments in Brazil, Argentina, Chile, Columbia and Peru. Around 40% is to be spent on renewables.

Enel Green Power acquires Tradewind Energy

In other Enel news, Enel Green Power has completed the acquisition of Tradewind Energy, a Kansas company and its long-time development partner in the U.S. wind market. The deal is a further sign of the Italian utility group's commitment to U.S. renewable energy in spite of fading federal subsidies. Under the agreement, EGP purchased all of Tradewind's development platform comprising of 13 GW of wind, solar and storage projects located throughout the US. The acquisition will give Enel, already among the world's largest renewables operators, the ability to develop wind, solar and storage projects in-house through its Massachusetts-based Enel Green Power North America unit.

WEC Energy to add 450 MW solar energy in Wisconsin

Per a recent media release, WEC Energy Group, Inc. received approval from the Public Service Commission of Wisconsin for two solar projects with capacity of 450 megawatt (MW). The request was submitted in May 2018. The total cost of the projects is expected to be $390 million, of which Wisconsin Public Service Corp will invest $260 million. The projects are expected to initiate commercial service by the end of 2020. Notably, Solar projects in Manitowoc County will be developed by NextEra Energy's unit NextEra Energy Resources. Moreover, the Badger Hollow project in Iowa county will be developed by Invenergy. These projects are expected to produce enough renewable energy equivalent to the power consumed by 120,000 Wisconsin households in a year.

European Commission approves RWE's purchase of E.ON renewable assets

German utility RWE has won EU antitrust approval to buy the renewables businesses and nuclear electricity generation assets of E.ON, according to the European Commission via a Reuters news article. "The Commission concluded that the transaction would raise no competition concerns in the European Economic Area," the EU executive said in a statement. On completion, RWE, Germany's biggest electricity producer, will become Europe's third-largest renewable energy provider behind Spain's Iberdrola and Italy's Enel.

Keppel invests $67.76m in lithium-ion battery firm Envision AESC, recently acquired from Nissan

In April, Keppel's ventures arm KepVenture (Keppel), entered into an agreement with Envision Automotive Energy Supply Corporation (AESC) to invest $67.76m (US$50m) for a minority stake in lithium-ion battery company Envision AESC Group. According to the announcement, the co-investment with Envision is in line with Keppel's efforts to deploy concepts in its solutions for sustainable urbanization. "This investment in the EV battery business is part of our strategy to expand the Keppel Group's energy solutions with cleaner fuel sources and renewables," Loh Chin Hua, CEO of Keppel Corporation, said in a statement. Envision AESC Group recently completed the acquisition of AESC, a former venture between Nissan Motor Company (Nissan) and the NEC Group. It also acquired the entire share capital of NEC Energy Devices, a battery electrode manufacturing company owned by NEC Corporation. Both Keppel and Envision are working to introduce IoT-enabled storage devices that can help smart buildings and smart grids to become more energy efficient. IoT-enabled batteries can help buildings realize cost savings through accurate monitoring and forecasting of energy consumption and peak shavings.

KEY HIGHLIGHTS

Big corporations come together for Renewable Energy Buyers Alliance

Some of the largest companies in the United States, including Google, General Motors and Walmart, have teamed up on a clean energy buying initiative aimed at motivating more businesses to switch to renewable energy as part of efforts to drive down emissions. The group is called the Renewable Energy Buyers Alliance and they are bringing together buyers and sellers and ultimately to make the renewable energy-buying process easier for all involved. The ultimate goal is to expand renewable energy buying to tens of thousands of companies of all sizes and "catalyze 60 GW of new renewable energy by 2025." Just last year, the size of renewable electricity purchase deals was equal to generation capacity of 16 GW. By 2025, as REBA plans, it should grow to 60 GW. For context, the current installed wind power capacity in the United States is 94 GW, and solar capacity totaled 51 GW at the end of 2018, according to the Energy Information Administration.

Duke Energy proposes $76M electric transportation program in North Carolina

As part of its commitment to build a cleaner and smarter North Carolina, Duke Energy is proposing the largest investment in electric vehicle infrastructure ever in the Southeast – a $76 million initiative to spur EV adoption across the state. In a filing with the North Carolina Utilities Commission, Duke Energy outlined its program aimed at a statewide network of fast-charging stations to meet growing demand. The proposal will help fund the adoption of electric school buses, electric public transportation, and lead to almost 2,500 new charging stations in the state. Currently, North Carolina has over 10,000 plug-in hybrid and all-electric vehicles and about 600 public charging stations. The program would more than double that. The three-year program requires NCUC approval and comes after a similar $10.4 million program being considered by the South Carolina PSC, Duke Energy said.

FPL to replace aging gas power plants with world's largest solar-powered battery

Malta, a Boston-based start-up, raised $26 million toward building its FPL's plan to replace a pair of aging natural gas power generating units with clean and renewable energy, is expected to save FPL customers more than $100 million while eliminating more than 1 million tons of carbon dioxide emissions. The new Manatee Energy Storage Center's battery system is projected to have four times the capacity of the world's largest battery system currently in operation (the Hornsdale Power Reserve in Australia). Charged by an existing, co-located FPL solar power plant, the planned battery storage center will increase the predictability of solar, extending its benefits even when the sun is not shining..

United States Department of Agriculture invests in smart grid improvements

The USDA is investing $485 million to upgrade rural electric systems and reduce energy costs. The funding includes nearly $7.1 million for smart grid technologies that improve system operations and monitor grid security. The USDA is providing financing through the Electric Loan Program for 10 projects in Georgia, Illinois, Iowa, Michigan, Minnesota, Mississippi, Missouri, New Mexico, North Carolina, North Dakota, South Dakota, Texas and Wisconsin. These investments will help build or improve 2,635 miles of line.

Latest Data Book shows trends in US and global renewable energy growth

According to the recently released 2017 Renewable Energy Data Book by the DoE's National Renewable Energy Laboratory, US renewable electricity grew to 19.7% if total installed capacity and 17.7% of total electricity generation in 2017, compared to 18.3% and 15.6% in 2016. Installed global renewable electricity capacity also continued to increase in 2017, representing 32.2 percent of total capacity worldwide. In 2017, renewable electricity accounted for 60 percent of US electricity capacity additions, compared to 67 percent in 2016. US wind capacity increased by more than 8.3 percent (6.8 gigawatts) compared to 2016, accounting for more than 43 percent of renewable electricity capacity installed. Wind represented 7.5 percent of cumulative US installed electrical capacity in 2017. US solar electricity capacity increased by 26 percent (8.9 gigawatts) compared to 2016, accounting for more than 54 percent of newly installed renewable electricity capacity in 2017. Solar represented 3.7 percent of cumulative US installed electrical capacity in 2017. This edition of the Data Book offers global renewable statistics as well as data on US energy storage and US electric vehicles for 2017.

Scotland's Orkney Islands launches smart energy grid project

The Orkney Islands are an archipelago with a population of approximately 20,000 people off the north coast of Scotland, generating more than 100% of electricity demand by renewable energy and they already have an operational smart grid. This particular smart energy project intends to use domestic batteries and electric vehicles to balance the local power network. Orkney was chosen because of its high take-up of "micro-generation" with official figures showing that 10% of homes create their own electricity, compared with a UK average of 2.8%. It has 2kW of renewable energy capacity per property which is 900% more than the UK average. It also has almost four times more electric vehicles per home. The project is backed by £14.3m (nearly $19m USD) of UK government funding.

Green New Deal keeps climate change and economic equality conversation going

The Green New Deal is a congressional resolution that sets goals for some drastic measures to cut carbon emissions across the U.S.. Introduced by Democrats Representative Alexandria Ocasio-Cortez of New York and Senator Edward J. Markey of Massachusetts in early February, the proposal calls on the federal government to deter the United States from fossil fuels and limit planet-warming greenhouse gas emissions across the economy, from electricity generation to transportation to agriculture. It also aims to guarantee new high-paying jobs in clean energy industries. The 14-page resolution includes many

ideas, with this specific language related to modernizing the electricity grid: "building or upgrading to energy-efficient, distributed, and 'smart' power grids, and working to ensure affordable access to electricity."
The ultimate goal of the Green New Deal is to stop using fossil fuels entirely and meet 100% of the U.S. power demand through clean, renewable and zero-emission energy sources. The resolution is nonbinding, so even if Congress approves it, it wouldn't itself create any new programs, but keeps the conversation going.

New York announces $30m for grid projects

While there is certainly plenty of progress left to be made by US utilities Following NY Governor Cuomo's aim to generate 70% of renewable electricity by 2030 and have a carbon-free power grid by 2040 as part of the **Green New Deal**, the state announced funding of up to $30 million for projects that can improve the resiliency and flexibility of the electricity grid. The New York State Energy Research and Development Authority (NYSERDA) is seeking proposals from electricity grid technology companies, utilities and universities to help diversify the supply of clean energy generation resources and enhance the overall grid performance while helping customers to reduce their energy costs, consumption and environmental impacts. Proposals are expected to include solutions that facilitate connecting clean energy resources to the grid, develop innovative data analytics, advanced planning, operations and forecasting tools or develop cybersecurity solutions for the grid.

Hormel Foods commits to 50% renewable energy

Hormel Foods Corporation, maker of SKIPPY®, SPAM®, Hormel® Natural Choice®, Hormel® Black Label®, Columbus® and many other branded food products, has announced a virtual power purchase agreement (VPPA) for wind energy. Through this and other initiatives, the company will be supplied by almost 50 percent renewable wind power. In addition, the project will result in a reduction of approximately 197,000 metric tons of greenhouse gas emissions. The new wind farm will be located near Milligan, Nebraska. Construction is expected to be completed in 2020. The farm will be capable of 74 MW of power and an estimated 349,000 MWh of electricity each year. Hormel Foods partnered with Kinect Energy Group to assess the project and negotiate the agreement.

New report says renewable energy accounts for one-third of global power capacity

The decade-long trend of strong growth in renewable energy capacity continued in 2018 with global additions of 171 gigawatts, according to new data released by the International Renewable Energy Agency (IRENA). The annual increase of 7.9% was bolstered by new additions from solar and wind energy, which accounted for 84% of the growth.

NERC sanctions and names utilities for energy security violations

In NERC's **Notice of Penalty filed Jan. 25**, it cited 127 security violations made by Duke companies between 2015 and 2018. In early April, regulators brought cases against Detroit utility DTE, San Francisco-based PG&E and City Utilities of Springfield, Mo, for issues between 2014-2016 related to breaking rules designed to protect the country's electric system from cyber and physical attacks. Although about 250 penalty cases have been lodged against U.S. utilities in the past decade for CIP violations, most identities remain confidential in a system designed to encourage self-disclosure. The $10m fine to Duke - one of the biggest utility holding companies in the U.S. with commercial operations in six states for over 7 million electricity customers - is more than triple the previous record for NERC security violations, a $2.7m penalty to Pacific Gas & Electric Company last year. Since this NERC filing, Duke Energy filed a request for approval with FERC in which it seeks to recover $137.4 million in capital investments from ratepayers for its cybersecurity program.

Annual investment in off-grid energy access surpassed $500 million in 2018, report says

With 3 billion people worldwide lacking access to reliable electricity, the IEA estimates that by 2030 more than 71% of new electricity connections will be via off-grid or mini-grid connections. In a recent report by Wood Mackenzie Power & Renewables, nearly $1.7 billion in cumulative disclosed investment has been deployed into energy access markets through the end of 2018, and investments in pay-as-you-go (PAYG) home solar companies and other players are accelerating. Recent advancements in technology are causing a drop in off-grid power system costs. According to MIT, the cost of solar photovoltaic modules has fallen by 99% since 1980.

Hawaii continues its quest toward 100% zero-carbon electricity

Hawaii was the first state to commit to moving to 100% zero-carbon electricity via a 100% by 2045 renewable portfolio standard. Looking back, utility Hawaiian Electric, whose subsidiaries include Maui Electric and Hawaii Electric Light, says progress on renewable energy continued to help drive the transformation of the Hawaiian Electric companies in 2018. In the 10 years since the creation of the state's Hawaii Clean Energy Initiative, the companies have reduced fossil fuel use by 26%, representing 48 million fewer gallons of imported oil per year to generate electricity. By 2022, fossil fuel use will have dropped by about 60% as more than a dozen wind, solar and battery storage projects now planned or under construction come online in the Hawaiian Electric, Maui Electric and Hawaii Electric Light service territory. Carbon dioxide emissions will be reduced by 1.2 million tons, the utility estimates. Hawaiian Electric Companies recently announced its latest draft of a new solicitation for 295 gigawatt-hours (GWh) of renewable energy and energy storage by 2022, in addition to 503 GWh of energy storage. The utility estimates that this can be met with a total of 135 MW of solar (plus storage) and 1,378 megawatt-hours (MWh) of energy storage.

RGS Energy goes all-in on in-roof solar shingles

Colorado-based US Solar installer RGS Energy announced its intention to exit its mainland residential solar business to focus on the market for its Powerhouse in-roof solar shingles. The company is the exclusive worldwide manufacturer of the solar shingles that use technology developed by The Dow Chemical Company. It believes there is a substantial opportunity for the Powerhouse product because of California's recent mandate that all new homes built starting in 2020 include a solar system. In its latest release of the solar tiles, RGS has made improvements to up the capacity to 55 volts at 15.6% efficiency. The previous version delivered 40 watts per shingle at 10.6 % efficiency — well below the efficiency of a typical crystalline silicon solar panel.

AutoGrid Wins ISGF Innovation Award for Best Smart Grid Project in India

AutoGrid has won the 2019 Innovation Award for the Best Industry Smart Grid Project in India from the India Smart Grid Forum (ISGF). AutoGrid received the Platinum Award from ISGF's Innovation Awards 2019 for Best Smart Grid Project in India by Industry at the India Smart Utility Week conference in March, which is hosted annually by the ISGF. The ISGF Innovation Awards honor industry leaders, innovative organizations and groundbreaking projects that have set new benchmarks in smart grids and smart cities. The award recognizes AutoGrid for its joint demand-side management (DSM) initiative with the government of Andhra Pradesh (AP) in India and the AP Southern Power Distribution Company Limited (APSPDCL). The project deployed Smart Grid and Internet of Things-based solutions aimed at improving utility financial health and consumer experiences. AutoGrid worked with APSPDCL on automated DSM programs covering several major segments, including agricultural pump-sets, residential/commercial air conditioning systems and industrial non-critical loads.

FEATURED ARTICLES

Outage Customer Experience

The Weather Channel has identified the 2017 Atlantic hurricane season as among the top-ten most active in recorded history. 2018 was only worse. They also predict these storms are becoming more regular and increasing in intensity year after year.

As these storms are making their way into our normal way of life, these three requirements are at the top of every utility CEO's mind:

- Do we know reliably when a customer's power is off?
- Do we have a good estimate of when their power is coming back on?
- Do we know reliably when a customer's power is back on?

The utility is responsible for bringing the power back on as soon as possible and all aspects of every utility swing into action to do JUST THAT. In fact, they have always been doing that.

As a function of societal reliance on electricity to support an expected lifestyle, customers' expectations are changing dramatically. They now expect the utility to know the answers to the three questions above and provide them to each customer in a timely manner.

Why has this suddenly become so important?

This is because customers' dependence on electric power has been so significant that with an extended loss of power – as often happens with extreme storms - customers need to re-organize their lives around the availability of power in their homes, offices, schools, etc. Let's think of this from a customer's perspective.

- If we know the power is going to come back on in 2-3 hours, then we stay put and wait it out.
- If we know the power is not going to come back in 10-12 hours or more, then we will make other plans for ourselves, our families and/or our employees/customers. Also, we will plan to address food storage and, more recently, charging of electric vehicles.

If the information provided is wrong, it can cause significant hardship to electric utility customers and in turn, to utilities themselves. Ensuring the best possible customer experience, especially during unplanned outages, is more important now than ever before. And while no utility is exempt from the possibility of an outage, having a clear system in place to quickly answer and communicate the critical questions, utilities can minimize damage to their reputation and keep customers as satisfied as possible, even during the worst storms.

Dr. Mani Vadari, President & Founder, Modern Grid Solutions

The Race to a 200 kWh Car Battery, Part 2

Shortly after the last MGS Newsletter went to press, Ford announced that it was at work on both all-electric and hybrid versions of its iconic F-150 pickup truck, which is the largest-selling model in the largest-selling segment of the American motor vehicle market the light truck class. While a launch date was not mentioned, several auto blogs posted pictures and a video of an all-electric F-150 prototype on the streets. Following Ford's announcement, GMC announced that it was considering an all-electric pickup. Over the last two years, Elon Musk tweeted several times about a Tesla pickup, and announced recently that its electric pickup truck could be unveiled later this year. Most likely, it will be a concept vehicle with a "really futuristic-like cyberpunk Blade Runner" design according to Musk. Rivian, a startup, plans to introduce an all-electric pickup with a 180 kWh battery as an option, sometime in 2021. While projected launch dates for the Rivian and Tesla trucks can be taken with a grain of salt given the hyperbole that is printed in the DNA of almost all startups, and Elon Musk in particular, we can say safely that EVs will finally be available to customers in the largest segment of the US auto market.

This is important to both consumers and electric utilities because to date, the focus of EVs by auto manufacturers was on passenger cars, due primarily to battery limitations. Tesla's main advantage over its competitors is its battery capacity offerings - up to 100 kWh - which allows its vehicles to have a range comparable to gas and diesel engines. With Ford, GMC, Tesla and newcomers Rivian all pushing to launch all-electric pickups, vehicles with 200 kWh batteries are on the way.

If these manufacturers and others launch pickups in addition to medium to large SUVs with batteries in the 200 kWh range, that could signal a significant increase in electricity consumption. With US average monthly residential electricity use about 850 kWh per month, a 200 kWh battery may average around 80 kWh per day to charge. That works out to about 2,400 kWh per month for EV charging, or about 3 times monthly average use per customer. Utilities will need to monitor the all-electric light truck segment closely.

Robert Young, Managing Director, Economists.com
Principal, Modern Grid Solutions

MEET THE EXPERTS

Susan practices the science of change management by collaborating with her clients to distill complex challenges into implementable experiences and opportunities. Disruption and opportunity is occurring at a pace previously unseen. Susan's passion is guiding businesses and individuals to see and action their potential given the changing workplace and world. Her expertise is understanding how and where to leverage change management, leadership, culture and organizational talent / capability to shape, sequence, and pace transformation and change given these opportunities. Her focus has been on companies both large and small seeking to sustain or improve market share and agility. She has researched the implications of the future of work and how businesses, institutions, and individuals can leverage technological advancements for productivity and growth as well as to advance human potential.

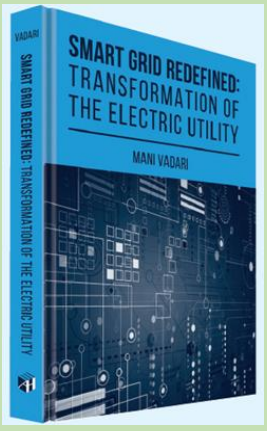
With over 25 years of experience, Susan has worked across industry with companies such as Ameren, Constellation Energy / Exelon, Duke Energy, Hydro One, Owens-Illinois, Pacific Gas and Electric, Portland General Electric, Salesforce and Rio Tinto to deliver successful change programs. She has also collaborated with cross-industry collectives, such as the American Chemistry Council, Bay Area Council, and the World Economic Forum, to advance thinking on change and the future of work. In recognition of opportunity during disruptive times, Susan is uniquely poised to work with leaders and agents of change to help establish and navigate their journeys.

Susan Christensen Wimer

NEWS FROM MODERN GRID SOLUTIONS

Ongoing Projects at Modern Grid Solutions

- 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 multi-Opco utility with identifying improvements to their Outage Customer Experience – People, Process and Technology
- Assisting a major international storage company with their North American expansion plans and strategies
- Assisting multiple startup companies in the areas of IoT, Blockchain, and Voltage regulator



ARTECH HOUSE

PRACTICAL BOOKS FOR ENGINEERING PROFESSIONALS

Smart Grid Redefined: Transformation of the Electric Utility

Mani Vadari

- Guides professionals in the evolution of the Smart Grid and offers insight into distribution automation, storage, and microgrid;
- Highlights the journey to a transformed electric utility, provides solid examples, and includes real-world case studies;
- Presents new energy storage solutions and electric value chain disruptors;
- Learn how to overcome challenges related to integrating supply and demand diversity;
- Discusses how new technologies impact the day-to-day operations of a utility and how these technologies can transform the normal functioning of the utility;
- Provides discussions about how a transformed utility can be a springboard to a smart city;
- Demonstrates how to apply the strategies of technologies in this resource to guide them to success in the field;
- Defines the roadmap to the utility of the future and provides a vision for how utilities can thrive in their new environment.

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. **Check us out!**

Electric System Operations: Evolving to the Modern Grid

Dr. Vadari's book "**Electric System Operations – Evolving to the Modern Grid**" continues to receive rave reviews from readers. Buy them soon at a leading retailer. The second edition of this book will come out at the end of this year.

Smart Grid Redefined: Transformation of the Electric Utility 3.0

The book has been released and is now available in all leading bookstores and an online store near you. A Chinese edition will be available soon.

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.