



State of the Grid

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WELCOME TO OUR Q3 NEWSLETTER!

Now more than ever, we are all witnesses to the transformative changes in the way electricity is produced, transmitted, managed, transacted and used. It's an exciting time and essential for all of us to understand and evaluate the emerging trends that could transform the grid further.

My hope is that our newsletter highlights some of the trends - like decarbonization, digitalization and decentralization - and provides a bit of intellectual stimulation along the way.

Thank you for reading!
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.*



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INDUSTRY ITEMS

Upcoming Industry Events

- [Distributech 2020](#) is being held at the Henry B. Gonzalez Convention Center in San Antonio, TX, January 28 - 30, 2020. If you're interested in scheduling time to meet Dr. Vadari from Modern Grid Solutions there, please send an email to: mani.vadari@moderngridsolutions.com
- [WEI's Operation's Conference](#) is being held in Boise, ID, April 14-17, 2020.
- [PLMA Load Management Leadership's 40th Conference](#) is happening November 4-6 in St. Petersburg, FL.
- [BECC \(Behavior, Energy & Climate Change\) 2019 Conference](#) is taking place November 17-20 at the Hyatt Regency in Sacramento, CA.

You May be Interested in...

We're all following the unfortunate situation at PG&E in California as it plays out. We've found these outlets to provide some of the best (and ungated/free) coverage and hope you will too.

- [Greentech Media](#)
- [T&D World](#)
- [Utility Dive](#)
- [USA Today](#)
- [PBS](#)
- [LA Times](#)



MERGERS AND ACQUISITIONS

Avangrid and PPL Corporation are in \$67 billion-plus merger talks

In what could be the largest US utility business deal this year, Iberdrola would be the largest outstanding shareholder of this potential Avangrid-PPL merger, owning 81.5% of Avangrid. Spain's Iberdrola entered the US market with acquisitions of Energy East more than a decade ago and merged with UIL Holdings to create Avangrid in 2015. Avangrid owns Connecticut Natural Gas, Central Maine Power, New York State Electric & Gas and several other utilities within New England and the East Coast. It has more than three million customers. PPL provides electric power to more than 10 million customers in Pennsylvania, Kentucky and the United Kingdom. Currently, Exelon's six utilities deliver electricity and natural gas to approximately 10 million customers in Delaware, the District of Columbia, Illinois, Maryland, New Jersey and Pennsylvania through its Atlantic City Electric, BGE, ComEd, Delmarva Power, PECO and Pepco subsidiaries.

Landis+Gyr teams with Utilidata to put machine learning software on edge devices

The integrated solution is planned initially for the North American market. The solution will enable utilities to gather, analyze, and synthesize data from a multitude of grid endpoints. In an energy climate of shifting consumer expectations, DERs, and aggressive clean energy mandates, creating the grid of the future is essential, Landis+Gyr said via a company press release. Landis+Gyr's AMI solution is built on Gridstream Connect, an IoT platform designed specifically for utilities, which enables edge applications to utilize the sensing and analysis capabilities of advanced meters. Combining these technologies will illuminate both consumer behavior and grid operations, leveraging innovative grid-edge hardware to create a complete, holistic picture of electric distribution and demand.

Vistra Energy agrees to acquire Ambit Energy

Vistra Energy has entered into an agreement to acquire Ambit Energy for \$475 million plus net working capital in an all-cash transaction. Following the closing of the transaction, Vistra's share of the ERCOT residential market will grow from approximately 25% to approximately 32% and an industry-leading 26% in all U.S. competitive markets. This detail is raising fear among some consumer advocacy groups of potentially higher electricity prices in Texas with two providers – Vistra and NRG Energy – controlling nearly two-thirds of the market. Ambit is headquartered in Dallas, Texas and serves approximately 1.1 million residential customer equivalents in 17 states. Per a company press release, pending the receipt of all necessary approvals and the fulfillment of all other customary closing conditions, the parties expect the transaction to close by year end 2019.

SJW acquires Connecticut Water, beating out New Hampshire's biggest electric utility

Eversource is New England's largest energy provider with over 3.6 million electric and natural gas customers in CT, MA and NH. In 2017, Eversource bought Aquarion making them the first and only US electric

company to also own a water company. Eversource recently offered and ultimately lost its bid to acquire New England's Connecticut Water who serves customers in its home state and in Maine. They lost to California-based SJW Group. The company's merger with Connecticut Water creates the third-biggest investor-owned pure-play water and wastewater utility based on rate base in the United States serving nearly 1.5 million people across California, Connecticut, Maine and Texas. In connection with the closing of the transaction, Connecticut Water is now a wholly owned subsidiary of SJW Group.

Esdec acquires IronRidge and Quick Mount PV creating largest solar racking group in the US

Private equity firm Energy Capital Partners has bought the energy storage development business with Convergent Energy + Power. New York-based Convergent develops, owns and operates large-scale storage for industrial customers and utilities. It distinguished itself as a rare startup that chose to self-fund its projects, raising \$70 million to do so. Convergent also took the title for largest commercial and industrial storage project, with a 10-megawatt/20-megawatt-hour system in Ontario, Canada. Energy Capital Partners owns and invests in a wide portfolio of energy companies, including gas generator Calpine and residential solar company Sunnova, but this marks its first storage acquisition. The sale price was not released.



Frontier Energy expands its energy efficiency portfolio with acquisition of Energy Insight

Frontier Energy, Inc. has acquired Energy Insight, Inc., an energy efficiency consulting company based in Chanhassen, Minnesota. Founded in 2013, Energy Insight designs, implements, and administers energy conservation programs on behalf of utilities that empower their commercial,

industrial, agricultural and institutional customers to reduce energy usage. Energy Insight represents the sixth company to join Frontier Energy, a wholly owned subsidiary of GTI International, Inc. ("GTI"). Frontier Energy was formed via the combination of five GTI subsidiaries focused on energy efficiency. With the addition of Energy Insight, the Frontier Energy enterprise now has eight U.S. offices across four states and more than 140 employees providing professional services to help clients reduce energy use and increase alternative transportation.

EnerSys buys competitor NorthStar Battery Company

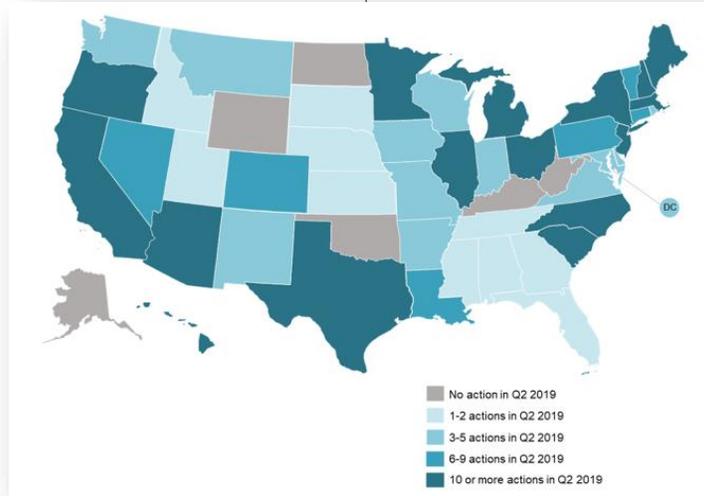
EnerSys, the global leader in stored energy solutions for industrial applications, is acquiring all issued and outstanding shares of N Holding AB, the parent company of NorthStar, from Altor Fund II. With two production facilities in Springfield, Missouri, NorthStar manufactures and distributes lead-acid batteries and battery cabinets. NorthStar's products are used in Telecom Power Systems, Uninterruptible Power Supplies and Engine Start applications. NorthStar was set up in 2000 and headquartered in Sweden. The company installed a 1MWh battery storage facility in Springfield to provide back-up power for the City Utilities grid, using its Blue+ thin plate lead batteries. It will install a high-speed production line at one of NorthStar's two factories in Springfield, adding \$175 million of production capacity with a production rate three times that of existing lines. NorthStar produces batteries nearest in design and performance to EnerSys TPPL products. The EnerSys acquisition means it is the only major company to make TPPL batteries.



KEY HIGHLIGHTS

Q2 rise in utility grid modernization activities in the US

Utility grid modernization activity in the second quarter of 2019 rose 43% from the second quarter of 2018, with energy storage leading as the most common action, according to a [new report](#) from the N.C. Clean Energy Technology Center. The report found that 44 states, as well as the District of Columbia and Puerto Rico, took actions related to grid modernization during the second quarter of 2019. (See map below.) There was a total of 433 grid modernization actions taken during this quarter. In comparison, 302 grid modernization actions were taken in the second quarter of 2018 and 181 grid modernization actions were taken in the second quarter of 2019. The report discusses three trends in grid modernization actions taken in Q2 2019: (1) states developing criteria for evaluating non-wires alternatives, (2) policymakers and regulators considering next generation renewable portfolio standards, and (3) states analyzing the costs and benefits of battery storage.



Q2 2019 Legislative and Regulatory Action on Grid Modernization
(Image credit: NC Clean Energy Technology Center)

Clean Energy Ventures launches \$110 million fund

Clean Energy Ventures, an investor in early-stage advanced energy start-ups, announced the close – and “significant oversubscription” - of its first fund which is focused on investments that address climate risks. The \$110 million Clean Energy Venture Fund targets the current capital gap for seed and early-stage investments in promising advanced energy innovations. CEV will focus on technologies and business model innovations in the U.S. and Canada that are ready to be scaled and commercialized, and that have the potential to significantly mitigate global greenhouse gas emissions. The fund has already made seven investments in sectors that include grid-edge connectivity and advanced metering, innovative materials and manufacturing processes applicable to carbon fiber composites and silicon-based solar wafers, residential and industrial energy efficiency, and smart grid sensors and software. Additional areas of interest include energy storage, grid connectivity, renewable energy production, clean transportation and the water/energy nexus.

Brazil's Copel to invest \$700 million to modernize power grids by 2025

As part of a recent securities filing, Brazil's state-run power firm Copel said it will invest 2.9 billion reais (\$700.03 million) to modernize its distribution network by 2025. Copel added its modernization projects include building approximately 25,000 kilometers (15,534 miles) of new power lines and also investments in smart grids and automation in Southern-state of Parana. The state-run company also emphasized investments are aimed at improving its electric infrastructure, especially in the rural area of Parana.

Con Ed marks megawatt milestone in solar energy

Con Edison is marking a 250-megawatt (MW) milestone in solar energy production thanks to more than 26,000 New York City and Westchester County homeowners and businesses with panel installations. Another 3,300 customers have 100 MW of solar projects in progress. Residential customers account for more than 90% of the projects and 50% of the overall capacity. “When the first solar panels were installed in Westchester in 2001, the dynamic between the utility and the customer changed forever. It required a new business model and spurred ideas that informed the grid of future,” said Matthew Ketschke, senior vice president of Customer Energy Solutions, as part of a Con Ed press release in July. The change is comprehensive. It includes continued upgrades to infrastructure to create a smarter, modernized grid able to accommodate a two-way flow of electricity. Con Edison also plans to install panels on the roofs of its buildings and make the power available to low-income customers.

Ameren Missouri installing solar generation across the state

Utility Ameren Missouri is planning three grid-scale solar facilities with energy storage, marking what is claimed will be the first ever instance of an energy company in the US Mid-West state powering its customers' homes with batteries. In a release from the

utility Ameren said that it filed plans with the Missouri Public Service Commission for the building of three power plants, for which Ameren Missouri said it will invest around \$68 million.

The company just launched its first ever community solar facility, allowing customers to sign up to buy solar energy generated in 100kWh blocks at Ameren Missouri Lambert Community Solar Center. Meanwhile, it has also launched a Smart Energy Plan. In addition to beefing up energy security with upgrades on transmission networks to cope with severe weather, the plan includes a reduction of carbon dioxide emissions by 80% from 2005 levels by 2050, with interim targets for 2030 (35%) and 2040 (50%). More than half of Ameren Missouri's coal power plants would be retired over the next 20 years. Meanwhile, an ambitious wind energy target for the utility to own at least 700MW of new wind generation by the end of next year is paired with a more modest solar PV target - adding 50MW of solar generation by 2025 and then rapidly climbing to 100MW installed in the following two years.

Duke Energy aims to achieve net-zero carbon emissions by 2050

Duke Energy recently announced its new goal of net-zero carbon emission from electric generation by 2050, and cutting emissions in half by 2030. According to its press release, the utility says it is the largest power generator to announce a 100% carbon free goal and plans to double its renewable energy portfolio by 2025, up 10% from its previous goal. The utility's subsidiary, Duke Energy Progress, which serves North and South Carolina, last week filed an [integrated resource plan](#) that called for its additional 2.2 GW of projected load to be almost entirely met by natural gas, drawing criticism from clean energy advocates. But the utility, which generates 54 GW across six states, is making modifications to its current resource plans on a state-by-state basis. Per its press release, the company has retired 49 coal-fired units totaling 6,190 megawatts since 2010, replacing those with flexible natural gas and growing renewables.

Amazon announced 2040 goal and backs it up with order of 100k electric delivery vans

Two years ago, Tesla announced it would produce a long-haul electric truck with a 200-300-mile range and PepsiCo, Walmart and UPS promptly committed to buying a few hundred. That hardly compares to the recent announcement from Amazon CEO Jeff Bezos that his company will be net carbon neutral by 2040 and that it's purchasing 100,000 electric delivery vans over the next five years to bolster their efforts. Yes, that's right: 100,000. Amazon is buying the vans from Rivian, a decade-old start-up that has yet to put a vehicle into production. The scope of Amazon's purchase is unprecedented considering that FedEx's motorized fleet is 85,000 and they only have around 2,500 EVs. And at UPS, about 9,000 of its roughly 112,000 vehicles already have some environmental advantage (most are powered by natural gas, but 1,000 are electric hybrids or pure electric). Amazon and Ford Motor Co are among the investors in Rivian. Bezos said the first electric delivery vans for Amazon will be on the road by 2021, and all 100,000 will be deployed by 2024. A Rivian spokeswoman said 10,000 of the vehicles for Amazon will be on the road by late 2022. Amazon currently has 30,000 vehicles delivering customer orders in the United States. That excludes vans from UPS and the US Postal Service, which are also carrying non-Amazon parcels.

Electric cars outsold gas and diesel vehicles in Norway

In March, 2019, electric vehicles outsold gas and diesel models in Norway for the first time ever, accounting for 58.4% of all vehicle sales. Norway is a leader in the adoption of zero-emission vehicles and the government has set an ambitious goal to stop selling new gas and diesel passenger cars and vans by 2025. Tesla's mass market Model 3 was especially popular, accounting for nearly 30% of new passenger vehicle sales, the Norwegian Information Council for Road Traffic, or OFV, says. It was a record for a single car model in one month, the OFV says. In that same period, no other carmaker had more than 10% of sales. As Reuters reports, "In 2018, Norway's fully electric car sales rose to a record 31.2% market share from 20.8% in 2017, far ahead of any other nation, and buyers had to wait as producers struggled to keep up with demand." The Norwegian Electric Vehicle Association projects that electric vehicles will make up about 50% of the country's car sales in 2019.

Tesla Model 3 is 2019's Best Selling Vehicle in Dutch Lands

Normally Norway is the biggest Tesla market in Europe. Not to be outdone, the Dutch market absorbed nearly three times the Norwegian number of Model 3s. In fact, the Dutch plug-in electric vehicle market grew 281% in September compared to the same month in 2018. This memorable performance last month translated in a fully electric vehicle (BEV) share of 20% in September, placing the 2019 BEV share at a record 9.6%. After Norway, Iceland and Sweden, now the Netherlands is above the 10% mark of BEV sales. Also in September, the leading Tesla Model 3 had its best performance outside the US, with 5,768 units delivered, becoming not only the best-selling vehicle in this market, all fuels counted, but also smashing the almost six year old monthly plug-in record, which dated back to December 2013 (Mitsubishi Outlander PHEV — 4,957 units).

Ford announces its first all-electric vehicle to arrive next year and the launch of the largest EV charging network in the US

Ford recently announced it will begin next year selling an electric crossover SUV with styling based on the Ford Mustang. It's the first vehicle Ford as ever offered that was designed, from the outset, as an EV. An electric version of the Ford F-150 pickup is also being developed. It will also offer the largest North American network of EV chargers of any automaker, including Tesla. Working with EV charging companies Greenlots and Electrify America, Ford has created what it calls the FordPass Charging Network. When needed, users will be directed to one of the network's chargers using an app or in the vehicle's central touch screen. The FordPass network will include more than 12,000 charging stations with a total of 35,000 plugs in the United States and some parts of Canada. Tesla has 4,375 public charging stations with about 15,000 plugs in the United States, according to the Department of Energy. While Tesla's chargers can only be used by Tesla (TSLA) cars, the chargers in the FordPass network will work with most other electric cars. Ford also announced it is working with Amazon Home Services to install at-home chargers for customers who buy a Ford electric vehicle.



Renewables threaten to undercut gas, reports find

In the past decade, low natural gas prices have undercut coal costs, leading to a boom in natural gas buildouts in the electric sector and leaving some utilities with stranded coal assets. Some companies, such as Duke Energy above, are running their coal plants less and less and planning to instead build out natural gas infrastructure over the next decade or longer in order to meet peak capacity demand and some baseload generation. [Two new](#)

[reports](#) from Rocky Mountain Institute analyze the economics of over \$100 billion worth of planned investment in new gas-fired power plants and interstate gas pipelines in the United States, in the context of rapidly-declining costs for renewable energy and battery storage technologies. The reports find that the role of gas as a "bridge fuel" is behind us; there are both significant cost savings opportunities if US utilities prioritize clean energy over continuing their present rush to gas, as well as existential risks facing investors that continue spending on new gas infrastructure.

Three regional utilities announce decision to join SPP's Western Energy Imbalance Service market

Basin Electric Power Cooperative, Tri-State Generation and Transmission Association, and the Western Area Power Administration (WAPA) recently announced their decision to join Southwest Power Pool's (SPP) Western Energy Imbalance Service (WEIS) market. When SPP launches the WEIS in February 2021, it will become the market administrator for these and potentially other utilities in the west. The market will centrally dispatch energy from these participants throughout the region every five minutes, enhancing both the reliability and affordability of electricity delivery from utilities to their customers. SPP, which also plans to launch reliability coordinator services beginning in December, is developing its own market as an alternative to CAISO's EIM, which has been operating since 2014. The Western EIM has shown the kind of savings that efficient power integration can yield. It [has generated \\$736 million in benefits to nine participating entities and reduced 403,546 metric tons of carbon emissions](#) in the western states since its inception.



FEATURED ARTICLE



Is it “Smart Grid” or “Grid Modernization?”

By [Mani Vadari](#), President & Founder, Modern Grid Solutions

Spoiler alert: The answer is yes. It’s “Smart Grid” and it’s “Grid Modernization.”

If you ask four people to define what a smart grid is, you will get five answers. The smart grid is not simply about implementing technology. It is really a complete business transformation for electric utilities challenging the status quo and requiring changes to people and processes. If these changes are considered in totality, the implementation will be successful. If not, the benefits will be lower than expected.

Intelligence in the grid is generally associated with the ability to:

- Sense and understand the state of the network,
- Control devices in the field to alter the state of the network if necessary, and
- Use decision-support tools allowing the sensed information to be converted into controls.

There was no single, pivotal event that triggered the onset of the smart grid. Rather, it was a series of somewhat disconnected events and expectations that led to this revolution.

- **Modern customer expectations:** Customers who are more used to the iPhone era are expecting their utilities to provide quick feedback on status of outages, more choice on power use, and the ability to interact via smartphone apps.
- **Modern customer actions:** Electric utility customers are also enacting changes impacting the grid. They are installing wind farms, solar photovoltaics (PVs), buying electric cars, changing the delivery landscape, and the traditional utility/customer relationship.
- **More affordable information technologies:** For newer information technology (IT) that is smaller and consumes less power, it follows it should be more affordable. Sensors and controls are being designed that — thanks to cheaper access to ubiquitous communications — allow the utility operator to better control the flow of power at a lower cost of installation.



A rose by any other name
would smell as sweet.

- **IT and architecture advances:** Cloud computing, mobile computing, machine learning, big data analytics, and artificial intelligence (AI) are enabling companies to implement advanced solutions more easily and at a lower cost.
- **More options for solving the same problem:** Newer operations technology (OT) alternatives under a broad grouping called distributed energy resources (DERs) are providing increased possibilities for generation, transmission, and consumption of power.

The smart grid can be defined as a modernized electrical grid, a reliable and secure transmission and distribution infrastructure that can meet demand growth in the future, while intelligently responding to the behavior and actions of all electric power users connected to it — delivering power in a reliable, efficient, economic, and sustainable manner.

The key attributes of a modern grid are:

- Is intelligent in sensing system overloads and taking corrective action
- Can accommodate renewables and distributed energy
- Is sustainable by reducing dependence on fossil fuels and decreasing carbon emissions
- Is resilient to natural disasters and attacks
- Is efficient in meeting increased consumer demand without adding infrastructure
- Provides a safe environment for utility workforce and consumers
- Can deliver the power quality needed for a digital economy.

Much progress is being made in all the areas. Newer technologies are being developed, costs are falling, and more capabilities are available. These are all leading to more opportunities to support increased sensing, controls, and intelligence in the network. This perfect storm, being influenced by the changes identified above, is called, the “smart grid” and it is altering the entire utility power system landscape.

Now, does it really matter if we refer to the evolving grid as “smart” or “modern?” Probably not a lot. The point is that it’s moving in a positive trajectory, taking into account all of the grid’s stakeholders, innovations and business issues.

Believe it or not, this was the short answer! The longer, full version of this article was [published in T&D World](#) in September. Please check it out for the additional commentary, visual aids and reference notes included in the unabridged version.



WHAT's on MANI's MIND?

A growing number of cities, states, businesses and electric utilities are recognizing the risk presented by climate change and making pledges to reduce emissions. Last month, Duke Energy and DTE Energy both announced their ambitions toward becoming net zero by mid-century.

The timeframes and exact plan details change from entity to entity with many still to be answered questions, like...

- What happens when the sun and wind are not delivering power to the grid?
- What is the bridge mechanism to deliver power to the grid?
- Is gas included or not?
The time frame of 2040 (for many states) is only about 20 years away. This is not enough time to move from today's generation mix to one that is completely carbon free without a major increase in cost for customers.

- While Berkeley, CA was one of the first cities to ban gas to new homes, and Seattle city council considering the same, other cities are also looking at doing the same. What is the impact on customers and utilities going to be?

Company	Emissions Plan	Goal Year	Plan Released
Duke	Net zero	2050	Sep-19
DTE Energy	Net zero	2050	Sep-19
PSEG	80% from 2005 levels	2046	Jul-19
NextEra Energy	40% from 2005 levels	2025	Jun-19
Southern Co	Low to no carbon	2050	Apr-19
Entergy	50% from 2000 levels	2030	Apr-19
Dominion	80% from 2005 levels	2050	Dec-18
Xcel Energy	Net zero	2050	Dec-18
AEP	80% from 2000 levels	2050	Feb-18
Ameren	80% from 2005 levels	2050	Sep-17
First Energy	90% from 2005 levels	2045	Dec-15

Data Source: Energy and Policy Institute

- Several newer technologies are coming into play and one of the most promising ones is energy storage. While storage is still a little immature, what technology is going to move us beyond lithium-ion batteries toward energy storage at longer timescales, to the point where renewables and energy storage can handle the baseline load of electricity generation?

Utilities are experiencing an unprecedented period of disruption as a multitude of forces reshape the industry. Both utility planning and operating functions will be dramatically impacted by the growing call to decarbonize and will need to answer these questions for a successful transformation to meet the future ahead.



MEET THE EXPERTS

Gayle has spent the bulk of her 25-year career in the global energy industry within major publicly traded companies and small startup organizations. She's an experienced executive communicator and trusted C-suite advisor who is known for her sense of humor, ability to assimilate complex technical information and simplify messaging using her well-developed skill of understanding the ultimate audience and stakeholders.

Gayle is proficient in a broad spectrum of business communications vehicles, both internal and external and has directed functional areas of brand, events, media, marketing and internal communications. She is well experienced in crisis and change management having participated in several mergers and acquisitions from both sides, most recently as part of GE's largest-ever acquisition of Alstom's energy assets in 2015.



Gayle Wooster

Gayle is currently part of the MGS team of experts providing communications counsel to various energy industry clients related to modernizing grid operations and utility transformation planning. She specializes in change communication, helping organizations in transition adapt and transform to new, sustainable ways of working. She is also the editor of MGS's quarterly newsletter, "State of the Grid."

Gayle utilizes her public speaking skills as a frequent event emcee, facilitator and moderator. Beyond MGS, she supports various clients with copy writing, editing and proofing of their written work, achieving a more compelling, understandable and effective impact on their readers.



MORE ABOUT MODERN GRID SOLUTIONS

Modern Grid Solutions

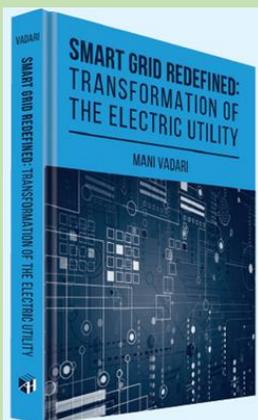
Modern Grid Solutions (MGS) is a cost-effective, global, supplier of deep expertise and board-experienced domestic resources. Our team members have been industry colleagues for over 25 years. Our approach focuses on delivering actionable guidance, direction and value, based on the depth of our team's expertise in North America, and around the world.

MGS has assembled a team of leading experts all having between 25 – 45 years of experience delivering complex, innovative technology, business, regulatory and finance solutions to electric utilities, corporate clients and policymakers. Our experts bring expansive breadth and tremendous depth in engineering, technology, economics, operations, and commercial areas directly applicable to utilities, suppliers, regulators and policymakers.

Ongoing Projects

- Assisting a major Northwest utility with transforming their planning capabilities to address the influx of Distributed Energy Renewables, Non-Wires Alternative solutions and to address the newly signed Washington State Clean Energy Act (SB 5116) to transition the state's electricity supply to 100 percent carbon-neutral by 2030, and 100 percent carbon-free by 2045.
- 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.

BUSINESS EXPERTISE AREAS	TECHNICAL EXPERTISE AREAS
<p>For Utilities and Policy Makers</p> <ul style="list-style-type: none"> Strategy, tactics, and process redesign Business, technical and enterprise architecture Transmission and distribution roadmaps Grid modernization plans Project and program management Strategic change management RPS Support <p>For Suppliers and Corporate Clients</p> <ul style="list-style-type: none"> Business model design and analysis Electricity market entry and go-to-market Market analysis, volumes, and trends Competitive landscape analysis Alliances, divestitures, and acquisitions M&A, Project finance, structured products 	<p>For Utilities and Policy Makers</p> <ul style="list-style-type: none"> T&D system operations – EMS, DMS, OMS Generation operations Energy markets – design and deployment Energy and REC tracking system T&D Automation and smart grid solutions GIS and asset management solutions Generation planning and renewables integration Big data management and analytics Solution and vendor selection <p>For Suppliers and Corporate Clients</p> <ul style="list-style-type: none"> Solutions design and implementation Portfolio review and analysis Adjacency analysis and technology management Energy, REC and emissions trading



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.

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. The final draft of the 2nd edition for all thirteen chapters have been delivered to the publishers [Artech House](#). The key chapters covering EMS, OMS, ADMS, and DERMS now include industry case studies to move the discussion from theoretical to evidentiary with real-world, relatable content. Stay tuned for more information as the publication date nears.

Smart Grid Redefined: Transformation of the Electric Utility 3.0

The book has been released and is now available in all leading bookstores and [online](#). The Chinese edition is (we believe) out now and available in China.



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.