



State of the Grid

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1ST QUARTER 2020



WELCOME TO OUR Q1 2020 NEWSLETTER!

2020 is a new year with new opportunities, new challenges and as always new information to share.

During the COVID-19 pandemic we at MSG are inspired by our industry's leaders implementing steps to protect their customers and employees while continuing to deliver reliable service across their territories, across nations, and across our world.

We can all pitch in. By working from home if possible, social distancing, and washing our hands more, we can make a difference.

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

Exclusive 25% Discount!

The 2nd edition of Mani Vadari's book, "[Electric System Operations: Evolution to the Modern Grid](#)" is available now. You can save 25percent, plus FREE standard shipping with promo code: **VAD25**. This discount cannot be combined with other discounts. Offer expires 1/31/21. Order now at <http://www.ArtechHouse.com>.

Dr. Vadari's books as textbooks

- "Smart Grid Redefined: Transformation of the Electric Utility" is being used as a textbook for a UMass course given by Prof. Kishore Nudurupati on Smart Grids for undergraduate and graduate students.
- "Electric System Operations – Evolving to the Modern Grid, Second Edition" is being used as a textbook for a Seattle University course given by Dr. Anil Jampala on Electric System Operations for undergraduate and graduate students.

You May Be Interested in...

As COVID-19 news floods our inboxes and social media, here is some of the more useful and relevant coverage for utilities we've seen so far. Also, check out our topical 'Featured Articles' on pages 5-6.

- [To keep the lights on during COVID-19 emergency, power company workers sequester in the office](#), ABC News
- [Utilities act rapidly to support overflow hospitals](#), T&D World
- ['We have never seen this before.' Inside N.Y.'s grid lockdown](#), E&E News
- [Utilities beginning to see the load impacts of COVID-19](#), UtilityDive
- [Utilities that have suspended disconnects amid COVID-19](#), Clean Energy
- [EMEA Utilities Should Withstand COVID-19 Better Than Most Sectors](#), S&P Global Ratings
- [U.S.: FERC, NERC lessen compliance regulations as COVID-19 worsens](#), Smart Energy International



READER FEEDBACK

"Thank you!! I do enjoy reading your newsletters. Thanks so much Mani!"
Jon Thompson (Retired, Intel)

"Great newsletter, Mani. Really liked the NC Clean Energy Technology Center summary. Kudos to you and your team."
Kevin Peterson, PMP

"Congratulations on the five-year milestone of your newsletter. It has provided some very provocative insights into the frontier of Grid Modernization."
Aston Shaw



MERGERS AND ACQUISITIONS

Brookfield and TerraForm to fully Merge

In January, Brookfield Renewable Partners offered to purchase the minority stake of TerraForm Power Inc. that it didn't already own. In March, these plans moved forward with the [announcement](#) that the companies had entered into a merger agreement for Brookfield Renewable to acquire the remaining 38 percent of TerraForm. TerraForm Power owns and operates a best-in-class renewable power portfolio of solar and wind assets located primarily in the U.S. and E.U., totaling more than 4,200 MW of installed capacity. The combined company will have more than \$50 billion in assets and over 36 GW of existing and forthcoming renewable projects. The deal is expected to close in Q3 2020.

Octopus Renewables acquires UK PV parks

Octopus Renewables Infrastructure Trust (ORIT) [finalized the acquisition](#) of a 123 MW portfolio of solar parks in the UK for an initial cash amount of GBP 144 million. This follows ORIT's announcement of its intent to purchase a construction-ready wind project in South Sweden with a capacity of 48 MW for \$77 million. Octopus Renewables – which launched its IPO in London in December 2019 - invests in operating or shovel-ready renewable energy assets in Europe, including the UK, and Australia, with a focus on onshore wind farms and solar photovoltaic (PV) plants.

ABB buys majority stake in Chinese EV charging company

ABB [announced](#) it has bought a majority stake in Shanghai Chargedot New Energy Technology Co. Ltd, a Chinese electric vehicle charging company with 185 employees. ABB has been working with BYD and Daimler in China on electric vehicle charging infrastructure, while Chargedot has been working with car manufacturer SAIC. ABB has bought a 67 percent stake in Chargedot with an option to increase its stake. The price of the acquisition was not disclosed.

Total ups its investment in renewable power with two recent acquisitions

French energy group Total [announced](#) it has agreed to buy Global Wind Power France for an undisclosed sum, as it steps up investment in the renewable energy sector. Total said that Global Wind Power France had a 1,000 MW portfolio of onshore wind projects, including 250 MW scheduled to come on stream by 2025. Total also announced it has reached agreement with Simply Blue Energy to acquire 80 percent of the Erebus floating wind project in the Celtic Sea. Total has said it plans to invest about \$2 billion annually in low-carbon energy and increase its generation capacity to about 25 gigawatts (GW) by 2025, from around 3 GW currently.

Blackstone Acquires NRStor C&I

Blackstone announced it has completed the acquisition of NRStor C&I L.P. , a Toronto-based developer of battery storage solutions, targeting scale storage deployment opportunities in North America. Terms of the transaction were not disclosed.

Marubeni acquires Chenya Energy

General trading company Marubeni [announced](#) it has acquired Taiwanese solar power developer and operator, Chenya Energy, from private equity firm I Squared Capital. As part of the share purchase agreement, Marubeni will purchase Chenya and its solar power generation assets, including a floating solar power plant with an output capacity of 180MW. The addition of Chenya's solar power generation assets will give Marubeni a stake in more than 950MW of power generation assets within the country. Upon completion of the deal, Chenya will become a wholly-owned subsidiary of Marubeni and will enable the latter to expand the floating solar power business in Taiwan as well as in other regions. Other deal details were not disclosed. The acquisition will give the company expertise in the floating solar power business and continue to improve its renewable energy development capabilities.

Westinghouse acquires Rolls-Royce nuclear assets

U.S.-based Westinghouse Electric Company has [announced](#) it has completed the acquisition of UK-based Rolls-Royce's Civil Nuclear Systems and Services business. Through the transaction, Westinghouse will acquire 11 locations in Canada, France, the United Kingdom and the United States. These sites support plant automation and monitoring systems, field services, manufacturing and engineering services as well as digital engineering services.

Power Grid Components buys Royal Switchgear Manufacturing Company

Power Grid Components [announced](#) Monday that it completed the acquisition of Royal Switchgear

Manufacturing Company. The transaction closed in December 2019 and represents Power Grid's fourth acquisition. Power Grid is a supplier of high-quality mission critical products used in the North American electric power grid. The Royal acquisition broadens the Power Grid product offering to include high voltage switchgear and power connectors. In addition to Royal, Power Grid includes Newell Porcelain, a supplier of high-quality porcelain and glass insulators, and Instrument Transformer Equipment Corporation, a manufacturer of instrument transformers for revenue metering and protective relaying. The Power Grid companies serve electric utilities, original equipment manufacturers and other customers supporting the electric grid.

RedT energy and Avalon Battery join to form Invinity Energy Systems

UK-based redT energy and U.S.-based Avalon Battery Corporation have [announced](#) that they will merge, subject to shareholder approval, to become a global leader in vanadium flow batteries. They aim to become key competitors to existing lithium-ion technology in the rapidly growing global energy storage market. The merger unites the companies under a new name, Invinity Energy Systems (Invinity), and combines the existing strengths of both companies with the scale and market presence to compete with the major players in a global energy storage market, forecast for £55bn (\$67bn) of new investment by 2024.





KEY HIGHLIGHTS

Report highlights record amount of wind turbine capacity ordered globally in 2019

2019 saw nearly 100GW of global wind turbine order capacity, shattering the previous record set in 2018, according to new analysis from Wood Mackenzie. As noted in the Wood Mackenzie report, '[Global Wind Turbine Order Analysis: Q1 2020](#)', this record demand resulted in an estimated \$78bn in wind turbine order capacity in 2019. \$25bn of that total is attributed to Q4 2019. Global wind turbine order intake increased by 8.4GW in Q4 2019 and 39GW for the full year, says Wood Mackenzie. China is integral to this growth, both onshore and offshore, with developers in the country ordering 50GW of wind turbine capacity in 2019. Global offshore order intake reached 17GW last year, with orders in China accounting for 76 percent of total demand. Danish wind turbine manufacturer Vestas dominated in 2019. The company won the most wind turbine order capacity in every quarter, averaging 4.5GW per quarter and nearly 18GW for the year.

Spain sets sights on 22GW of new wind by 2030

According to a WindEurope [press release](#), the Spanish government has submitted its 2030 National Energy and Climate Plan (NECP), raising the country's ambitions on greenhouse gas emission reduction to 23 percent compared to 1990 level. The presented NECP foresees renewables to account for 42 percent of the country's energy mix and to generate 74 percent of its electricity. The government in Madrid plans an annual installation of 22 GW of wind energy by 2030. "Spain has long been a leader in renewables: wind is 20 percent of their electricity and they create more export revenues from wind energy than from wine. It's great to see they're now planning a significant further expansion of renewables," says WindEurope CEO Giles Dickson. Spain currently has 25.7GW of installed capacity onshore and was Europe's leading market for onshore wind last year, adding new projects totaling just over 1.6GW.

Ameren Missouri boosts its Smart Energy Plan

In February, Ameren Missouri filed an updated Smart Energy Plan with the Missouri Public Service Commission. This five-year plan increases investments to \$7.6 billion in continued grid modernization while leveraging the successes from the first year. Ameren Missouri [reported](#) it expects to acquire two wind facilities this year and add more solar energy and battery storage on the system to boost reliability in rural areas. Ameren Missouri will install 120,000 smart electric meters this year starting in St. Charles. The smart meter rollout extends through 2025 when all Ameren Missouri customers are expected to have been upgraded to smart meters that can provide two-way system communication. Last year, Ameren Missouri completed more than 900 projects across the state to bring smart technology and modern infrastructure to the electric grid. Learn more about Ameren Missouri's [Smart Energy Plan here](#).

Atom Power announces two US patents for its digital circuit breaker

Atom Power, inventor of the world's first and only digital circuit breaker, [announced](#) the United States Patent and Trademark Office issued two patents for its solid-state circuit protection technology. Patent No. 10,541,530, titled "Hybrid Air-Gap / Solid State Circuit Breaker," outlines the unique design features of the Atom Switch, including an air gap to enable galvanic isolation, microcontrollers to automate functionality, specific hardware for the rapid detection of short circuits and a programmable time curve characteristic. These features maximize safety by minimizing voltage transients, allowing the Atom Switch to be used even as a motor soft starter. Patent No. 10,276,321, "Dynamic Coordination of Protection Devices in Electrical Distribution Systems," highlights the unique ability of the Atom OS software to maximize available current protection. Fueled by real-time current measurement and operational conditions, the Atom OS allows for adjustment of various overload trip curves thus optimizing the distribution system for unparalleled safety. This is the first patent allowed for Atom Power focused on dynamic coordination with two divisional patents still under review.

E.ON to build deep geothermal power plant in Sweden

E.ON, an international, privately owned energy supplier based in Essen, Germany, [plans](#) to build a geothermal deep-heat power plant in Malmö, Sweden. The pilot project is one of Europe's first geothermal

power plants to extract geothermal energy from depths of several kilometers on an industrial scale. The boreholes will be drilled five to seven kilometers deep into the ground and the expected maximum temperature of 160 degrees Celsius (320 degrees Fahrenheit) will be sufficient to feed the heat directly into Malmö's district heating network. E.ON is currently investigating the geological conditions through test boreholes. If all goes according to plan, the plant will supply renewable and resource-efficient heat to district heating customers from 2022. E.ON hopes to have built five geothermal power plants in Malmö by 2028, each with an installed capacity of 50 MWth (thermal megawatt). The heat will replace biofuels and biogas for heat generation. The total budget for the project is €5.4m (\$6m). The Swedish Energy Agency is supporting the pilot project with €1.2m (\$1.3).

Itron to deploy intelligent streetlights for Stockholm

Itron, Inc., an American technology company offering products and services on energy and water resource management, [announced](#) it has signed a contract with the City of Stockholm to deploy its smart city central management software, Streetlight.Vision (SLV). With the goal of becoming the world's smartest city in 2040, the City of Stockholm developed a strategy for a smart and connected city, and one of its first use cases is streetlight management. To meet this use case and achieve its goals, Stockholm's traffic department will utilize SLV to manage streetlights, improve energy efficiency and optimize system performance. Delivering advanced asset management, analytics and control capabilities, SLV has been chosen by more than 500 communities to control more than 3 million intelligent devices worldwide.



ERCOT prepares for record electricity use this summer

ERCOT released its final [Seasonal Assessment of Resource Adequacy](#) for the upcoming spring season (March – May) and its [preliminary assessment for the summer season](#) (June – September). In a [press release](#), ERCOT President and CEO Bill Magness said, "ERCOT has added new electric supply resources, and strong economic growth continues to push up demand in ERCOT. We expect grid operations to be very similar to last summer." As in 2019, the need to declare an energy emergency will depend on a combination of factors, including demand, wind output and the number of generators on outage on any given day. ERCOT and its market participants are taking steps to ensure system reliability can be maintained during tight conditions.

Department Of Energy Announces \$6.7 Million for IoT Integration Research

The U.S. Department of Energy's (DOE) Office of Electricity (OE) [announced](#) \$6.7 million in funding for four university-led research projects to design and develop approaches to integrate Internet of Things (IoT) technologies. Specifically, these projects aim to provide the energy infrastructure community with robust, scalable methods to interface with advanced IoT technologies. The university-led research teams (in partnership with industry, National Laboratories, or research consortia) will focus their research on methods to enhance coordination between these networks of devices to extend operational performance, including maintaining energy supply to critical defense facilities, regardless of whether they are distribution or transmission connected. The four projects include Stanford University's, "TrustDER: Trusted, Private and Scalable Coordination of Distributed Energy Resources," Purdue University's "Communication-Constrained Robust Control and Learning of Grid-Connected IoT," Portland State University's "Development of Energy Services Interface for the EGoT," and Massachusetts Institute of Technology's "Efficient Ultra Endpoint IoT-enabled Coordinated Architecture."

Lithium ion batteries expected to account for 85% of newly installed energy storage capacity

A new [report](#) from Navigant Research provides a database of global energy storage projects along with a regional analysis of technology choice, capacity, and market share for deployed projects and projects in the pipeline. According to the report, "Although pumped hydro storage (PHS) still accounts for 96 percent of installed energy storage capacity worldwide, Li-ion is the fastest growing, estimated to reach more than 28 GW by 2028. In addition to the growth of Li-ion, three types of storage projects typified deployments across the globe in 4Q 2019: commercial and industrial applications located behind-the-meter (BTM), utility-scale battery storage projects that replace gas peaker plants, and utility-scale storage projects collocated at large solar PV or wind generation facilities."

PSE&G marks National Battery Day by powering up a new solar storage system

Public Service Electric and Gas Co. (PSE&G)'s Highland Park Solar Storage System that was put in service in February combines solar panels and batteries to convert



two acres of dormant space to productive use. The project also incorporates streetscaping to enhance the neighborhood. The Highland Park Solar Storage System is the 35th overall project and the fifth solar storage system that PSE&G has built as part of its Solar 4 All® program. The Highland Park Solar Storage System combines a 1,764-panel, 605-kilowatt-dc solar farm with 2,000-kilowatt-hour Tesla batteries. Both the solar panels and batteries are connected directly to the PSE&G electric grid. The solar panels are expected to provide enough electricity to power about 100 homes annually and also charge the batteries, which are used to reduce voltage fluctuations inherent to grid-

connected solar systems, due primarily to issues like intermittent cloud cover. The Highland Park Solar Storage System is part of a 3-megawatt-dc carve-out in the Solar 4 All program, dedicated to developing projects that integrate solar with other technologies to reduce the impact of solar on the grid or to increase reliability and grid resiliency for critical facilities during prolonged power outages.



England launches "Electric Avenue" featuring EV charging points

Over a half-mile long, Sutherland Avenue is the UK's first residential avenue fully converted to provide lamppost EV charging points. The project, coined "Electric Avenue, W9", has converted 24 lampposts into EV charge points using existing city infrastructure. The launch follows research conducted by Siemens showing over 36 percent of British motorists planned to buy a hybrid or EV as their next car, with 40 percent saying that a lack of charging points stopped them from doing so sooner.

This makes it the biggest factor deterring motorists from purchasing an electric or hybrid vehicle. Data shows 80 percent of motorists in central London believe it is 'very important' that air quality is improved, and 83 percent have become more concerned about their carbon footprint in the past five years. Westminster has seen a 40 percent growth in EVs charged in the borough during 2019.



FEATURED ARTICLE



COVID-19 – Utility Operations Are Changing Forever

By Sridhar Chandrashekar, Jake Varghese and Mani Vadari
As published in T&D World, with permission

History has shown us - although it took a crisis of such proportions as COVID-19 to evoke change - that each crisis has served as a pivot point wherein businesses and industries that have adapted and adopted innovative solutions and processes have set themselves up for long term success.

COVID-19 is changing the world and our lives

The last few months and weeks especially, have been momentous in our collective history as a species and has resulted in a humanitarian crisis that has fundamentally altered our daily lives and gravely impacted the global economy. Every worst-case scenario previously forecast has failed to grasp the reality and the new normal precipitated by COVID-19. This ever-changing situation doesn't lend itself well to previously tried-and-tested approaches. The scale, speed, and impact of issues continues to intensify as the situation continues to evolve rapidly. Business Leaders around the globe have experienced large-scale business disruptions in the past, although the magnitude and breadth of the present crisis is testing the limits of our collective ability. Using reactive, replacement-based, manual approaches to manage this situation has resulted in an untenable situation for even the most seasoned of business operators.

The Utilities Industry is Impacted for Several Reasons

- Transmission and distribution assets are spread across a large geographic area.
- System-dependent sensing devices are attached throughout the network. Systems such as SCADA deliver the data into the control centers. However, not much sensing is available at the feeder level beyond the substation even though this is also increasing.
- Utilities are also facing serious threats related to outdated grid infrastructure exacerbated by the integration of renewable energy sources.
- Utilities have an aging workforce with replacement talent not easily available.

The COVID-19 situation is further exacerbated because manual intervention in the field is still required. Utility field crews cannot stay at home and work from home.

Many times, knowing in a timely matter a problem exists is itself an issue. Once the problem is identified, technicians need to go to the field, locate the problem device or problem location, diagnose the problem, fix the problem and restore the system back to normal.

What Should the Utility Do?

Discussions with utilities business leaders are taking on a heightened sense of urgency. Eliminating or reducing the manual intervention efforts involved in one or more of the aforementioned steps will help utility field crew reduce their exposure to the elements as well as to other people who could be either

symptomatic of the virus or carriers. The benefits of this reduction to personnel would only compliment the savings.

On top of the urgency created by the virus, the discussions has quickly and markedly shifted to intelligent asset management using mobile, cloud-based remote operations solutions performed by a mobile connected worker who can use a combination of remote asset tracking, monitoring, analytics and real-time insights to perform decisive actions to keep the grid reliable and resilient.

What Does the New Normal Look Like?

- *Remote monitoring, alerting and notification:* A platform designed and built to remotely discover, collect data, and continuously monitor the health of devices/sensors/equipment. Why send people to do this when you do not have to? At least send people only when absolutely necessary based on actual data and monitoring. And, more importantly send the right people with the right capability, the right tools and the right spare parts to fix the problem correctly the first time.
- *Remote service and control:* Where possible, service a piece of equipment by securely controlling it remotely without using manual labor.
- *Predictive and preventative maintenance:* Use pattern recognition and anomaly detection based on real-time and historical data and AI to predict and prevent potential failures.
- *Intelligent servicing:* Use actual equipment usage, seasonality, cyclicity, population density, equipment age, equipment failure patterns and a host of signals to determine when and how to service equipment. No more servicing simple based on static schedule.
- *Compliance:* Auto-map data into compliance insights and reports.

Key Takeaways

Operational Leaders are finding that resorting to just-in-time, reactive approaches to maintain operations is no longer enough. They must rely on proactive decision-making using real-time data and insights to drive decisions about how to run their businesses while keeping their employees safe and healthy.

Utility operators need the ability to function and collaborate in a decentralized manner with access to real-time information and insights. This will require an increased number of sensors in the distribution system beyond the substation. In addition, remote access to data will enable efficient and effective decision making, which will be a systemic and seismic shift in the way operations are managed. Access to timely, trustworthy information from all operational assets in a manner that is easy to analyze and take decisive action.

Utilities may need to look for service providers to build solutions architecture to help operators make critical decisions effectively, efficiently that meet your very specific needs.

Authors:

- Jake Varghese is the CTO of Optio3
- Dr. Mani Vadari is the President of Modern Grid Solutions
- Sridhar Chandrashekar is the CEO of Optio3



FEATURED ARTICLE



COVID-19: Giving New Meaning to “Cascading Event”

By Alex Boyd, PSC Group President & CEO

[Original article on PSC web site](#). Edited here with permission.

As experts in the energy industry, we are familiar with the cascading events caused by unexpected disturbances on the grid that trigger almost every blackout. Unfortunately, we are becoming more familiar with a different kind of cascading event: Natural disasters such as wildfires, droughts, and hurricanes that provoke flooding, heatwaves, and landslides that often affect electricity service.

Now, in addition to events that have a direct impact on the physical infrastructure of the grid or the cybersecurity of its networks, we must reckon with a virus that can impact the welfare of the mission-critical workers in the field and control rooms around the world. We're depending on these people to continue working around the clock to help keep further cascading of this virus at bay.

Preparing together

COVID-19 is a [novel virus](#), but the situation facing utilities is anything but new. Our electric utility clients around the world are prepared for disasters. It's in the DNA of any mission-critical service provider.

When it comes to our electricity service, we traditionally have mostly thought of storm-centric planning. But utilities have matured their emergency practices to endure any 'storm.' From weather to cyberattacks to earthquakes, utilities have documented Emergency Preparedness & Response and Business Continuity Plans to respond to such emergencies.

Additionally, there are national and regional bodies that help the electric power industry coordinate their efforts to prepare for, and respond to, national-level disasters or threats to critical infrastructure. In the U.S., for example, the Electricity Subsector Coordinating Council ([ESCC](#)) – working with the North American Electric Reliability Corporation ([NERC](#)) - acts as a liaison between the federal government and electric utilities to be ready for and mitigate such events. These entities are helping operators of the U.S. bulk electric system to focus their resources on keeping people safe and the lights on during this unprecedented COVID-19 emergency.

Keeping safety first

Safety is also in the DNA of every electric utility. That's why many have isolated their grid operators during this pandemic from all support staff. They continue to regularly disinfect their control rooms. Some have moved to longer shifts to help minimize contact. In some of the more hard-hit areas of the U.S., many are also preparing now in case they are called to shelter in place later by bringing in cots and stocking up on essentials. Others have gone a step further with workers now [living at grid control centers](#) as part of a voluntary sequestration.

In response to COVID-19, utility software vendors are also showing support. [ABB](#) is offering its digital solutions free-of-charge through 2020. [GE](#) has announced free remote-access licenses for its utility EMS and SCADA customers.



We're all pitching in

As a society, we're following our governments' mandates and guidelines, we're pitching in as we can to keep our families and communities safe, and we're taking action to help lessen negative consequences during this difficult time. Utilities, vendors and consultants – all of us in and around the electric utility industry - are working to ensure this pandemic doesn't cascade from a public health crisis to an electric service emergency.

[Alex Boyd](#), PSC Group President & CEO



WHAT'S ON MANI'S MIND?

Every year I - and about 15,000 others - attend [DISTRIBUTECH International](#). Over time, this event has evolved from its early days as DA/DSM (Distribution Automation/Demand Side Management) to become the pre-eminent transmission and distribution event bringing together utilities, vendors, national labs, and universities from all over the world. This year was no different, with the tradeshow and conference held in San Antonio, TX, in January before the COVID confinement began. This year's theme was "Utilities and...the future of energy."

I attend DISTRIBUTECH for a broad variety of reasons: to meet up with old friends, make new ones, check out the vendor booths and products, and generally to see what's new this time around. I usually just get the floor pass, and I believe what I learn from walking and talking around the show floor far exceeds what I would have otherwise gained at the conference sessions. This year, my focus - like the overall event theme - was solely on where the utility industry is going and what the new future will look like.

My colleague [John \(JD\) Hammerly](#) and I checked out the vendors with solutions pertaining to Distribution Automation (DA), Advanced Distribution Management Systems (ADMS), Distributed Energy Resource Management Systems (DERMS), Internet of Things (IoT), and Blockchain.

We picked these vendors and these technologies specifically to maintain our future focus. We needed to concentrate on the automation (the eyes, ears, and arms) of the utility; the systems that analyze the information coming in and assist the operator in making decisions both for traditional components and distributed energy resources (DERs)

IoT and Blockchain were the last two components to round out our list. These technologies are positioned to allow utilities to go beyond the grid-edge to provide access and control to new sources of information and flexibility.

What I perceived from talking with DISTRIBUTECH attendees was a combination of optimism with the aggressive direction set by some companies, tempered by the disappointment in some vendors who appear to be well on their way to completely missing the boat in delivering to the next-generation needs of the utility of the future. When interacting with one vendor about DER dispatching, we were told, "Tell us what you want and we can build it." We interpreted this to mean they had not even started to process a utilities' distinct DER needs.

On the other hand, when it comes to IoT and Blockchain, I think more action is taking place outside events like DISTRIBUTECH and the utility sector in general. This is an area where the utility industry may miss the boat, or catch it too late. If they don't start piloting this technology now when the number of devices at the grid-edge and beyond are small, they may find "that ship has sailed" when the number of devices has increased exponentially in the future.



MEET THE EXPERTS

Dr. Mani Vadari is a well-recognized electric industry leader and visionary, with over 30 years of experience delivering business and technical solutions for transmission, distribution, and generation operations, wholesale markets, Smart Grid, Cyber security/threat assessment, and Smart Cities. As the CEO of a successful consulting company, and as an advisor and member of the board for start-up companies, industry groups and non-profits, Mani has a multi-year track record of delivering value on a wide range of technology and business solutions.

Mani currently serves as a board advisor and equity participant in [WhyGreene](#) and is a strategic board advisor of [Optio3](#). In addition, he is a sought-after industry speaker and a member of a number of industry boards, such [T&D World Executive Insights Board](#), [Institution of Engineering and Technology \(UK\)](#), and the [Microgrid Systems Lab](#). Mani is a member of the [National Association of Corporate Directors](#) (NACD), and is active in continuing board education with the NACD Northwest Chapter. Lastly, Mani is a founder and board member of Seattle's Hindu Temple, and founded non-profit companies [Girls Rock in Science & Math](#), and [SPARK](#).



Mani has led numerous business transformation initiatives which have delivered tens of millions of dollars of value to clients. He has also created several businesses: At Battelle, he founded their Energy Infrastructure business anchored by an industry leading demand response product. At Accenture, he was a lead partner in the T&D practice and established the worldwide System Operations and Smart Grid practice. Early in his career at ESCA (now GE Grid Solutions), he drove their Dispatcher Training Simulator product, creating a successful niche business and helped launch ESCA towards its market dominance in wholesale markets.

Mani serves as President of [Modern Grid Solutions](#), a successful consulting firm he founded in 2011, where he leads a team of experts who deliver complex and innovative technology, business, regulatory, and financial solutions to electric utilities, suppliers, regulators, corporate boards, and policymakers worldwide.

As an Affiliate Professor at the [University of Washington](#), Mani has published two popular books, "Smart Grid Redefined: Transformation of the Electric Utility" now in its second edition, and "Electric System Operations - Evolving to the Modern Grid", and has authored over 100 industry papers, articles and blogs.

Lastly, Mani is a Technical Consultant to the [New York State Smart Grid Consortium](#) where he participates on an architecture role in the core REV ([Reform the Energy Vision](#)) team.



MORE ABOUT MODERN GRID SOLUTIONS

Modern Grid Solutions

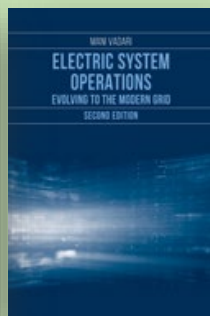
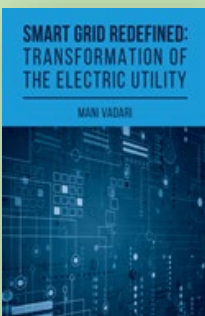
Modern Grid Solutions (MGS) is a cost-effective, global, supplier of deep expertise and board-experienced domestic resources. Our team members have been industry colleagues for over 25 years. Our approach focuses on delivering actionable guidance, direction and value, based on the depth of our team's 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 multi-Opco utility with defining a strategy for dispatching the DERs in their footprint by focusing on – People, Process and Technology aspects of the full implementation.
- Assisting multiple startup companies in the areas of IoT, Blockchain, and Voltage regulation devices.

BUSINESS EXPERTISE AREAS	TECHNICAL EXPERTISE AREAS
For Utilities and Policy Makers <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 For Suppliers and Corporate Clients <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 	For Utilities and Policy Makers <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 For Suppliers and Corporate Clients <ul style="list-style-type: none"> Solutions design and implementation Portfolio review and analysis Adjacency analysis and technology management Energy, REC and emissions trading



Smart Grid Redefined: Transformation of the Electric Utility

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

Electric System Operations – Evolving to the Modern Grid, Second Edition

Dr. Vadari's book "[Electric System Operations – Evolving to the Modern Grid, Second Edition](#)" is available now. 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. Save 25 percent, plus FREE standard shipping with promo code: **VAD25**. *This discount cannot be combined with other discounts. Offer expires 1/31/21.*



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