



# State of the Grid

Certified Minority  
Business Enterprise  
**MBE**

1<sup>ST</sup> QUARTER 2021



**WELCOME TO OUR  
Q1 2021 NEWSLETTER!**

**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.*



Spring has finally sprung and we're optimistic that our lives will start to get back to some kind of 'new normal' as more of us are able to be vaccinated.

This spring also marks the 10<sup>th</sup> anniversary of MGS. Back then, Nissan had just launched the LEAF, the first modern all-electric hatchback for the mass market. Today, 42 companies produce EVs around the world. Now, that's progress!

MGS is progressing too, thanks to our great clients and expert consultants. You can read more about our ten-year journey on page 7.

**Dr. Mani Vadari, President**



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## INDUSTRY EVENTS

### **Electric Systems Operations Course Spring semester 2021 at B.V. Raju Institute of Technology and Shri Vishnu Engineering College for Women in India**

Course coordinators are Dr. Anil Jampala, Dr. Mani Vadari and Dr. NDR Sarma. The course is based on the curriculum offered by Dr. Jampala at Seattle University in 2020. The course is based on Dr. Vadari's book, "[Electric System Operations – Evolving to the Modern Grid, Second Edition.](#)"

### **SAVE-THE-DATE: 2021 PES Virtual General Meeting**

July 25-29, 2021. Registration will open soon for this now virtual conference, "Managing Energy Business During a Pandemic." Find more information [here](#).

### **CONFERENCE: 10<sup>th</sup> National Conference on Microgrids** April 13-14, 2021 in Boston, MA

The two-day event will consist of several informative presentations followed by interactive Q&A sessions and panel discussions, bringing together key industry stakeholders, including utility companies, microgrid owners, and project developers. [Click through for more info and to register.](#)

### **WEBINAR: How to Improve Security and Reduce NERC CIP Compliance Costs Using Smart Identification**

April 15, 2021 2:00 PM EST

The government uses smart identification cards for civilians to secure everything from buildings to computer networks. Hear three experts explain what these cards are, how they are being deployed, and how they can benefit electric utilities. [Click through for more info and to register.](#)

### **WEBINAR: Hydrogen and the New Era for Clean Energy**

April 21, 2021 2:00 PM BST/9:00 AM EST

During this free webinar from the Energy Institute, you will hear from industry experts debating the future of hydrogen and its position in a net-zero economy. [Click through for more info and to register.](#)

### **ONLINE TRAINING: Evolution of DR to DER: Fundamentals and the Path Forward**

April 21-22, 2021 12:30 – 4:30 PM EST

This two-day live online class offered by PLMA explains how today's demand response initiatives are evolving to interact with an emerging future with distributed energy resources for peak load management, and much more. [Click through for more info and to register.](#)



## MERGERS AND ACQUISITIONS

### National Grid makes \$11B deal in move to green future

National Grid will buy England's largest electricity distribution business, WPD, from U.S.-based PPL for 7.8 billion pounds (\$10.9 billion) as it positions itself for a climate-driven transition from gas to electric power. The biggest UK utilities transaction in a decade highlights how crucial grids have become as nations figure out how to navigate the shift to electricity from fossil fuels. In a separate deal, PPL is picking up Narragansett Electric Co. from National Grid for an equity value of \$3.8 billion. The transactions mean PPL will shed its international unit and can focus on running US utilities. The Allentown, Pennsylvania-based company said in August it was pursuing such a move to increase shareholder value.

Read more [here](#).

### Exelon to separate its utility and competitive energy businesses

Exelon Corp. announced its Board of Directors had approved a plan to separate Exelon Utilities (RemainCo), comprised of the company's six regulated electric and gas utilities, and Exelon Generation (SpinCo), its competitive power generation and customer-facing energy businesses into two publicly traded companies with the resources necessary to best serve customers and sustain long-term investment and operating excellence. The separation gives each company the financial and strategic independence to focus on its specific customer needs while executing its core business strategy. Read more [here](#).



### NextEra Energy Transmission acquires GridLiance

NextEra Energy Transmission, LLC, a subsidiary of NextEra Energy, Inc., has entered into definitive agreements with Blackstone's affiliates to acquire GridLiance Holdco, LP, and GridLiance GP, LLC, for approximately US\$660 million, including the assumption of debt. A portion of the net proceeds from NextEra Energy's recent equity units issuance will be used to finance the transaction. GridLiance owns approximately 700 miles of high-voltage transmission lines and related equipment with utility rates set by the Federal Energy Regulatory Commission (FERC). The company's assets span three regional transmission organizations and six states.

### ReNew Power announce public listing on NASDAQ

ReNew Power Private Limited, India's leading pure-play renewable energy producer, and RMG Acquisition Corporation II [announced](#) (PDF) the execution of a definitive agreement for a business combination that would result in ReNew becoming a publicly listed company on the NASDAQ. Upon closing the transaction, the combined company would be named ReNew Energy Global PLC and would be publicly listed under the symbol "RNW." The transaction would further bolster ReNew's leading position in solar and wind energy generation for the Indian market by funding medium-term growth opportunities and paying down debt.

### PNM Resources shareholders approve merger with Avangrid

PNM Resources, Inc. shareholders voted overwhelmingly to approve the merger agreement with AVANGRID, Inc. Under the terms of the proposed merger, PNM Resources shareholders will receive \$50.30 in cash for each share of PNM Resources common stock held at closing. PNM Resources continues to anticipate that the

merger will close in the second half of 2021, subject to the satisfaction or waiver of the remaining customary conditions to closing, including, among other things, receipt of other required state and federal regulatory approvals. More information from Avangrid [here](#).

### Direct Energy acquired by NRG Energy Inc.

Direct Energy [was acquired](#) by NRG Energy Inc., adding over three million customers across North America to NRG's leading retail portfolio, growing the company's reach and size. NRG now features a larger customer footprint, serving all 50 US states and parts of Canada, with capabilities across residential and small & large business segments.

### Accenture acquires Infinity Works to expand cloud and engineering services in the UK

Accenture [announced](#) its acquisition of cloud and digital transformation consultancy Infinity Works. The acquisition strengthens and expands the cloud delivery and engineering capabilities of Accenture Cloud First in the UK. Terms of the purchase were not disclosed. Infinity Works provides a range of value-adding services, including cloud, data, design and research, mobile, and full-stack engineering. Headquartered in Leeds, Infinity Works has offices across the UK, including Manchester, Edinburgh and London.

### Energy and Resource Solutions Inc. acquired by DNV GL

US-based engineering consultancy Energy and Resource Solutions Inc. (ERS) was acquired by DNV GL, a global energy adviser, assurance and risk management specialist, operational in over 100 countries, supporting a range of sectors to decarbonize faster. ERS helps organizations to manage and reduce energy costs through program design, outreach, implementation and evaluation services, working with utilities, governments and large commercial and industrial end-users to solve complex energy and resource problems. Read more [here](#).

### Eaton acquires Green Motion SA, expanding EV charging capabilities

Power management company Eaton [announced](#) it had acquired Green Motion SA, a leading designer and manufacturer of electric vehicle charging hardware and related software. Green Motion is based in Switzerland. "Energy transition around the world is rapidly gathering momentum, and Eaton is well-positioned to contribute to society and benefit from this important trend," said Uday Yadav, president and chief operating officer, Electrical Sector, Eaton. More from Green Motion [here](#).

### HydroLand acquires assets from Enel Green Energy

HydroLand, a national renewable energy company, [announced](#) it acquired a 25-megawatt portfolio of hydroelectric facilities from Enel Green Power North America, Inc. Hydropower is the oldest and still the largest source of renewable energy, limited only by finding suitable locations. The portfolio acquired from Enel comprises 13 "run-of-river" environmentally friendly facilities located throughout the Mid-Atlantic, South, and Western US.



## KEY HIGHLIGHTS

### FPL to build the world's largest solar-powered battery

Florida Power & Light Company [announced](#) a plan to build the world's largest solar-powered battery system – four times the capacity of the largest battery system in operation – as part of an innovative modernization plan that will accelerate the retirement of two fossil fuel generation units. The future FPL Manatee Energy Storage Center will have 409 megawatts of capacity – the equivalent of approximately 100 million iPhone batteries – when it begins serving customers in late 2021 and will be charged by an existing FPL solar power plant in Manatee County. By deploying energy from the batteries when there is higher electricity demand, FPL will offset the need to run other power plants – further reducing emissions and saving customers money through avoided fuel costs.

### First floating wind farm in continental Europe fully powered up

WindFloat Atlantic, which has total installed capacity of 25 MW is the world's first semi-submersible floating wind farm and will generate enough energy to supply the equivalent of 60,000 users per year, saving almost 1.1 million tons of CO<sub>2</sub>, is now fully operational and supplying clean energy to Portugal's electrical grid. This milestone cements the success of a decade-long project by the Windplus joint venture, ensuring access to the best wind resources in water depths that have previously been inaccessible. The project is led by the Windplus consortium, comprising EDP Renewables (54.4%), ENGIE (25%), Repsol (19.4%) and Principle Power Inc. (1.2%). The platforms have been built jointly by the two Iberian countries: two of them were manufactured at the shipyards in Setúbal (Portugal), while the third was constructed in Avilés and Fene (Spain).



### Beijing 2022 Olympics to be powered by 100% renewable energy

All of the 26 venues will be powered with 100% renewable energy. Chinese utilities, including new energy providers China Huadian Corporation Ltd. and Beijing Jingneng Power Co and the State Grid Beijing Electric Power have signed agreements with Olympic venues to deploy renewable energy and other electrification projects. Deals signed have enabled the implementation of the Smart Grid Planning for Low-Carbon Olympics. The program will ensure the installation of new and the use of existing smart grid technologies and renewable energy generation, transmission and distribution infrastructure in three competition zones of Beijing, Yanqing, and Zhangjiakou. The State Grid Beijing Electric Power Company will also leverage many digital technologies such as smart robots to inspect the Winter Olympics' power equipment.

### China close to overtaking the UK in offshore wind capacity

China installed a record 3,060 MW of new offshore wind capacity in 2020, corresponding to over half of the offshore wind capacity added globally last year, according to the latest data released by [GWEC Market Intelligence](#). Overall, China had 9,898 MW of installed offshore wind capacity at the end of 2020 and was just 308 MW shy of taking the top spot from the UK, which had 10,206 MW of installed offshore wind capacity the end of last year. This was the third year in a row that China led the world in new annual offshore wind capacity, GWEC said.

### Six major utilities add EV fast chargers creating Electric Highway Coalition

Six major utilities announced a plan to ensure that electric vehicle (EV) drivers have access to a seamless network of charging stations connecting major highway systems from the Atlantic Coast, the Midwest and South, and into the Gulf and Central Plains regions. The Electric Highway Coalition – made up of American Electric Power, Dominion Energy, Duke Energy, Entergy Corporation, Southern Co., and the Tennessee Valley Authority – announced a plan to enable EV drivers seamless travel across major regions of the country through a network of DC fast chargers for EVs. The companies are each taking steps to provide EV charging solutions within their service territories. This represents an unprecedented effort to offer convenient EV charging options across different company territories and allow EV travel without interruption. Read more from TVA [here](#).

### Ameren welcomes more energy companies to EV charging group

Last year, Ameren announced a first-of-its-kind collaboration among energy companies that committed in good faith to build an extensive network of electric vehicle (EV) charging stations across the Midwest. Today, Duke Energy, MidAmerican, Liberty and Midwest Energy are joining the existing six utilities to support the growing use of electric vehicles. With this network of stations, EV drivers will be able to travel 1,200 miles from Detroit to Colorado – and points in between – with confidence there will be ample locations to recharge along the way. Read more [here](#).

### Offshore 'wind-to-whisky' project launches in Scotland

A multi-partner plan involving the Port of Cromarty Firth has been launched to establish a green hydrogen hub in the Highlands that will see Scotland lead the world in hydrogen technology. The North of Scotland Hydrogen Program aims to develop a state-of-the-art hub in the Cromarty Firth to produce, store and distribute hydrogen to the region, Scotland, other parts of the UK and Europe. One of its projects will provide distilleries in the area with hydrogen. A feasibility study into this kick-starter Distilleries Project began in March and is due to be completed in June. It is being privately funded by partners including ScottishPower, drinks giants Glenmorangie, Whyte and Mackay and Diageo and Pale Blue Dot Energy who are also leading the project. Read more and watch a neat video [here](#).

### Fukushima's lessons for a safer nuclear future, ten years later

When a 9.0 magnitude earthquake struck Japan on March 11 2011, a tsunami was triggered that devastated the Fukushima Daiichi Nuclear Power Plant, causing one of the worst nuclear disasters since Chernobyl. To mark the anniversary of the event, the Nuclear Energy Association (NEA) has released a report that surveys the aftermath of the disaster and analyses the lessons learned over the past decade. [Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On: Progress, Lessons and Challenges](#) analyzes the current challenges stemming from the accident and makes policy recommendations to the international nuclear community in nine different areas.



## SPP launches Western Energy Imbalance Market

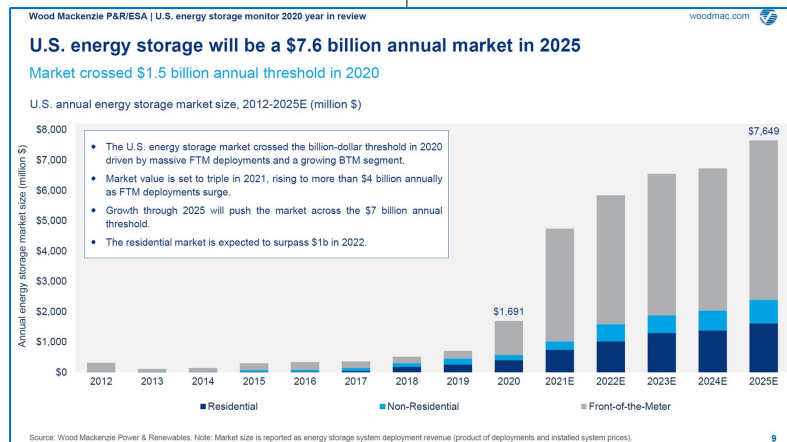
Regional transmission organization (RTO) Southwest Power Pool (SPP) launched its Western Energy Imbalance Service (WEIS) on February 1st. The WEIS includes parts of Arizona, Colorado, Montana, Nebraska, South Dakota, and Wyoming. The real-time balancing market is expected to decrease wholesale electricity costs, increase price transparency, and reduce transmission system congestion for market participants. Several regional utilities are participating in the market. Basin Electric Power Cooperative, Deseret Power Electric Cooperative, the Municipal Energy Agency of Nebraska (MEAN), Tri-State Generation and Transmission Association, the Western Area Power Administration (WAPA), and the Wyoming Municipal Power Agency announced in 2019 their intent to join the WEIS. Read more [here](#).

## Study found wind energy output increases when heat needed most

Using the latest climate and energy models, Mark Jacobson a professor of civil and environmental engineering at Stanford University and senior fellow at the Stanford Woods Institute for the Environment, who is author of a new study appearing in the journal *Smart Energy* looking at the future of smart grids, shows that wind energy production increases during the coldest spells when heat demand is highest and can help prevent cold weather-related blackouts. Applying his findings to the real world, Jacobson thinks that, had all of the wind turbines in Texas been properly winterized, or protected from extreme cold, during the February 2021 freeze, they would have provided critical power to Texans throughout the cold snap and helped to prevent blackouts from occurring. Read more [here](#).

## New energy storage deployment topped record 3,500 MWh in 2020

According to the most recent US Energy Storage Monitor report, the US energy storage market crossed the billion-dollar threshold in 2020, driven by massive front-of-meter deployments and a growing behind-the-meter segment. Energy storage installation grew nearly 200 percent and totaled an all-time operational record in the fourth quarter 2020, according to the report released by analytics and research firm Wood MacKenzie and the US Energy Storage Association's (ESA) latest US Monitor report. According to the ESA, The US energy storage market is forecast to add five times more storage—or close to 7,000 MW—in 2025. Download the free executive summary [here](#).



## AES Ohio to create digital map of power lines using drones

Ohio-based energy provider AES Ohio (formerly Dayton Power & Light), in partnership with Sinclair College's National UAS Training and Certification Center, is employing a fleet of senseFly eBee X fixed-wing drones to improve its large-scale data collection and mapping capacity. Over 9 months, uncrewed aerial systems (UAS) will be used to inspect 4,000 miles of power transmission lines, supporting electricity delivery for the 1.25 million residents of the Dayton, Ohio region.

## Alberta gets a boost to invest in smart grid projects

The Canadian government is investing in two smart grid demonstration projects in Alberta. The first investment of CA\$495,000 is for FortisAlberta Inc. - Alberta's largest distribution utility - to support the Waterton Energy Storage Project by showcasing how using a battery energy storage system and advanced distribution control systems can provide reliable access to the grid with economic and social benefits for the community. The second investment of CA\$413,250 is for Lethbridge Electric Utility to enhance its distribution network by using Conservation Voltage Reduction

software technology in its metering system to conserve energy and reduce demand on the energy grid, providing financial benefits to over 40,000 customers who rely on the network. Read more [here](#).

## US jumpstarts offshore wind, targets 30 GW by 2030

The US has set a national target of 30 GW of installed offshore wind capacity by 2030 as a centerpiece of a newly introduced plan by the Biden Administration to jumpstart offshore wind energy and create tens of thousands of jobs in the sector over the next decade. The ambitious offshore wind target will support around 77,000 direct and indirect jobs and trigger more than USD 12 billion (around EUR 10.2 billion) per year in capital investment in projects on both US coasts. More than 44,000 people are expected to be employed in offshore wind by 2030, with nearly 33,000 additional jobs in communities supported by offshore wind activity. The 2030 target would also unlock a pathway to deploy 110 GW or more of offshore wind capacity by 2050, which would support a total of 135,000 jobs by that time. Read more [here](#).

## Floating wind bill introduced in Oregon

A new bill outlining a plan to develop 3 GW of floating offshore wind capacity in Oregon by 2030 has been introduced in the state's House of Representatives. If enacted, the bill would establish a task force on floating wind energy and enable planning the development of 3 GW of commercial-scale floating wind projects within federal waters off Oregon's coast by 2030. The task force would be required to develop a strategic development plan and to submit the plan to interim committees of the Legislative Assembly related to energy no later than September 15 2022. Read more [here](#).

## NERC report highlights storage reliability benefits

"Energy Storage Impacts of Electrochemical Utility-Scale Battery Energy Storage Systems on the Bulk Power System" is a new report issued by NERC who recently conducted a joint study with WECC that underscored some of the potential benefits battery energy storage systems (BESS) can provide for fast frequency response to avert using under frequency load shedding in response to generation losses.

Additionally, this assessment confirms projections that BESS will grow significantly across the North American footprint over the next twenty years. Read the key findings and full report [here](#).

## Ameren Missouri files updated Smart Energy Plan

Ameren Missouri, a subsidiary of Ameren Corp., has filed an updated Smart Energy Plan and budget with the Missouri Public Service Commission. Currently, in its third year of implementation, the Smart Energy Plan progress includes smart technology that can rapidly detect outages and restore service in seconds – as well as new storm-resilient utility poles, power lines and underground cables designed to protect customers from outages during severe weather. The \$8.4 billion plan supports grid modernization efforts over the next five years, including installing more than 1 million smart meters, more renewable generation, programs to stimulate economic growth for communities across Missouri and infrastructure upgrades that bolster reliability while enabling clean energy generation. Ameren Missouri recently completed the purchase of its first two wind facilities and is now the largest wind generation operator in the state. The company has plans to significantly expand its wind and solar generation over the coming years. Read more [here](#).



## FEATURED ARTICLE



### Storage Primer Second of a five-part series

By [John \(JD\) Hammerly](#), CEO, The Glarus Group

*In this, the second article in the five-part electricity storage series, the author addresses Li-NMC technology. This series is a primer on stationary storage and its long-term importance to supply reliable, inexpensive, and environmentally attractive electricity for a viable society. Overall, the author provides context and exposes the considerations to understand and evaluate tactical and strategic actions being taken by utilities, developers, and regulators to provide the storage solutions needed for the future.*

### LI-NMC

Lithium nickel manganese cobalt oxides (Li-NMC) is today's dominant battery chemistry. Although other chemistries competed, Li-NMC emerged as the default and superior choice because of its mobile suitability. Li-NMC dominated the market in less than a decade after it achieved commercial viability. As with most industrial solution ascendancy, Li-NMC dominance resulted from compromises rather than clear technological supremacy. Li-NMC's commercial viability also coincided with the emergence of initial transportation electrification companies.

### Other chemistries in competition with Li-NMC

Of the rechargeable and commercially viable battery chemistries, Lithium- and Zinc-based ones bring higher energy density than Nickel Cadmium and Lead Acid. With both Lithium- and Zinc-based batteries as viable mobile solutions, other factors propelled Li-NMC to its leadership position. Longevity (charge/discharge cycles), reliability, recyclability, thermal flexibility, and safety were the other important considerations. Li-NMC mobile solutions have already reached or surpassed the equivalent longevity of internal combustion engines. Li-NMC battery components have greater elasticity, tolerating vibration better than other chemistries.

Zinc-Air battery production focuses on the dry-cell battery market because it is cost-competitive, rechargeable, and recyclable, the latter a clear advantage. Further, Zinc-Air batteries possess greater energy density than Li-NMC. Zinc-Air battery components cost substantially less due to Zinc's abundance. Once produced at scale, Zinc-Air batteries will be a major competitor for stationary energy storage applications.

Flow batteries represent another storage technology competing for energy, not power, stationary applications. Flow batteries store energy via a liquid electrolyte; thus, storage-scaling requires expanding the electrolyte amount and increasing liquid throughput. The most common electrolyte, Vanadium Redox,

raises environmental concerns, while others, such as Iron-Saltwater, do not. Flow batteries' lower energy density is mitigated by increasing the volume of electrolyte available, and the charge/discharge speed increased with higher volume pumps. Lastly, flow batteries cost substantially less than Li-NMC and bring unlimited recharging cycles at a lower cost.

Although there are multiple Lithium-based battery technologies emerging in addition to Li-NMC, Lithium Iron Phosphate (Li-LFP) received serious consideration for mobile energy storage applications. Still, Li-NMC's reliability and energy density proved superior. Li-LFP will compete aggressively for stationary storage applications because it uses abundant materials with existing supply chains (e.g., iron) and is produced through processes like Li-NMC, resulting in lower cost. Further, Li-LFP delivers nearly 90% of Li-NMC's energy density in a slightly larger (10%) footprint.

### Key considerations

Battery energy density measured by weight as watt-hours per kilogram (Wh/kg) and volume watt-hours per liter (Wh/l) remains the most significant consideration for mobile energy storage applications because larger and heavier batteries impact the vehicle's efficiency and design. Aside from larger ferries and ships, transportation electrification, including aircraft, faces battery size and weight restrictions regardless of the stored energy.

### And, in conclusion

Battery market forecasts for the current decade show mobile energy storage consuming 90% of worldwide battery production into the near-term future. Meeting forecasted market demand would require rapidly scaling the battery supply chain. Battery component manufacturing mirrors semi-conductor production. Like semi-conductor fabrication, battery component manufacturing requires massive factory investments, long lead times to production, and resists changing chemistries and production processes, all of which complicate the supply chain's efficiency.

Although based on compromises, Li-NMC represents the best overall solution for today's dominant mobile battery needs, and mobile solutions drive the marketplace. Li-NMC addresses stationary applications' more

demanding longevity requirements through monitoring and periodic component replacement. Although Li-NMC brings market volume, stationary applications - which are less focused on size and weight - the stationary market will select solutions based on lower cost and the number of charge/discharge cycles. Lastly, if Li-NMC demand exceeds supply, anticipated volume and competition-related price declines will not appear, creating an opportunity for non-Li-NMC solutions in the stationary energy storage marketplace.

### Next in the series

Next in this five-part series, the author will identify emerging, possibly competitor technologies for stationary storage. Then, the fourth article examines the necessary scale and practical applications of stationary storage in a transformed electrical landscape. The final will provide insight into the future, identifying possible opportunities and threats.





## FEATURED ARTICLE



### What's Next for Texas

By John Hammerly

By [John \(JD\) Hammerly](#), CEO, The Glarus Group

Over a four-day cold snap, a winter storm struck Texas, sending temperatures down and wholesale market electricity prices up to \$9,000/MWH for several hours. Rolling blackouts, driven by surging demand, ensured the ERCOT grid did not collapse. Although ERCOT experienced a record peak demand, demand could have been met if all generation had been available. Some natural gas and renewable generation, however, were also impacted by the weather. Natural gas plants were not sufficiently winterized, wind turbines iced over, and as the front passed, the wind died down. Further, due to inadequate winterizing, one of the two generating units in the South Texas Nuclear Project disconnected from the grid.

The gas supply for electricity generation was limited because residential gas consumption has priority, which resulted in a reduction in electricity. Further, wholesale gas markets schedule pipeline capacity a month in advance, making alignment with weather events challenging. Fortunately, coal-fired generation increased to its maximum capacity burning coal stored at the plants.

The storm impacted the south-central US, spiking demand and wholesale prices in Southwest Power Pool and Midcontinent ISO. Yet, both imported electricity from areas less impacted by the storm. Whereas, Texas, an electrical island only connected to North America by limited capacity DC lines, had to rely on in-state generation.

Energy markets are zero-sum games; all gains result in equivalent losses. The four-day price spike's economic impact was 16 billion dollars. Texas's governor failed to force ERCOT to reprice based on a low cap to reduce this impact. The Texas Senate passed legislation requiring ERCOT to reprice all transactions, but it failed in the Texas House. Subsequently, ERCOT's CEO was fired, many ERCOT Board of Directors resigned, and the governor replaced the Texas PUC head.

The \$16B exposure impacted all buyers in the market. Some distribution entities, such as public utilities, have filed bankruptcy or sued ERCOT for damages. Some residential customers chose rates indexed to wholesale prices and enjoyed historically lower rates than their neighbors. These customers received monthly bills thousands of times over expectations.

Renewable developers funded construction with bank hedges. Banks offer favorable interest rate loans. In return, banks received a guaranteed volume of electricity at a fixed price from the developers. The banks then sell the electricity through the market.

When the wind does not blow, developers must fulfill their commitments through market purchases. If the market price is lower than the contract price, the developer makes a profit. If the market price is higher, the developers sell at a loss. Many developers lost millions during the ERCOT price spike, buying at or near \$9,000/MWH and selling below \$100/MWH.

What's next? Some impacted parties will seek bankruptcy protection and restructure. Others will sell, facing loan default. Similar to the early 2000s, when gas-fired generation developers failed financially, banks will become generators.

Renewable developers will become risk-averse, perhaps limited renewable growth to those with financial backing to avoid hedging. The storm, the most severe in decades, may reshape ERCOT's market, paying more daily for services to mitigate a recurrence or implement a lower maximum MWH price.

The current and future reliance on natural gas and renewables resulting from ongoing coal-fired generation retirements will have lasting impacts on Texas.

Storage investment will expand, but short-term energy storage offers little relief during a multi-day event. Long-term storage, days or weeks, could mitigate wholesale price volatility. Similarly, closely aligning the timeframes used in gas and electric markets could enable electricity generation to acquire sufficient gas.

In retrospect, the market, driven by supply and unusually high demand, produced a dramatic but not surprising or unexpected result. Regardless, the courts will have a central role in the final resolution of winners and losers.





## WHAT'S ON MANI'S MIND?

May 2, 2020, marks the tenth anniversary of MGS. Recognizing this put me in a reflective mood and I asked myself, "Ten years ago, did I expect us to be where we are today? Did I even expect to survive this long?"

The short answer is that starting out, I wasn't sure what to expect, but over time my expectations have been exceeded in so many positive ways.

From the beginning, MGS has had a simple philosophy. The utility world needs strong domain experts who can do a lot of the deeper thinking that a utility doesn't always have the time or the people to do on their own. We do this constantly so that when a client asks us a question, we've been pondering it ourselves or have already come up with a potential solution – based on real-world knowledge and experience, not on hypotheticals. Ten years ago we often said, "If you have a problem, someone from our team has solved it three times." Today, what it really boils down to is that all of our consultants are seasoned experts, and all of our clients get our undivided attention.

Over the last ten years, the makeup of MGS has changed completely. We have grown from one individual contributor (me), to over 20 subject matter experts with a common focus on solving our clients' problems. Our team is comprised of people who have worked together previously at Accenture, ESCA, and other places. Because of our long working relationship, we melded together as a team so easily due to the existing trust between us. And over the years we've become friends, not just colleagues. We share our life experiences and look to each other for advice and support.

Now our team is growing again! We're adding new people to the team who may not yet have the deep expertise of us long-timers but all have the hunger to learn and the curiosity to ask interesting questions that get us all thinking differently – and that is a really good thing! I'm proud to report we've recently hired our first MGS intern!

The biggest impact on our growth over the last decade has been our amazing clients. From our first small project with GE, we've continued to help solve interesting challenges for over 60 clients, representing some of our global industry's biggest names. We couldn't be prouder of our growing client list, including utilities, vendors, solution providers, DoE labs and smart cities.

As we emerge from the life-changing experiences of a global pandemic, we are faced with the realization that many challenges that may have taken a back seat to allow the broader utility world to focus on its basic service of keeping the lights on, are still here and they are even more important now than they were before.

Looking forward to the next ten years, I see us (MGS, our clients, and the greater industry) focusing on strategic issues like DER dispatch, ADMS implementations, green hydrogen, micogrids, sustainable electrification or remote parts of Africa, expanding university education around the world, and others.



While the nuances of our philosophy have evolved and our team has grown over the last ten years, our fundamentals have stayed constant. We remain grounded in our strong work ethic and our obsessive passion for mastering the details and connecting the dots to help make the modern grid possible for our clients and our communities.

And, finally, all of us at MGS are grateful for our families who have supported our ambitions over these last ten years. You've made it possible for us to be super busy when we needed to be and provided us with emotional support when we needed it too. We couldn't have achieved a fraction of what we have without you!

**THANK YOU!**



## MEET THE TEAM

Jayanth is an Undergraduate Sophomore at the University of Washington, studying Electrical Engineering. He has a passion for robotics and coding. Currently, he is part of the controls systems team with Advanced Robotics at the University of Washington, creating subsystem tests and researching new motor systems for competition robots. In High School, Jayanth joined the Net-Zero Home Game Team. Under the guidance of Dr. Mani Vadari and Arvind Ranasaria, he was part of building a net-zero home simulation, which sparked his interest in energy efficiency. In his spare time, Jayanth enjoys sketching, reading and making 3D models.



**Sai Jayanth Kalisi**

During his internship, Jayanth will work with the entire MGS team to help define and work on specific business and technical solutions aimed at the utility industry. At first, his primary role will be to assist, learn, and grow via various tasks, like analyzing data and researching. We'll then identify specific projects where Jayanth can contribute his knowledge of software programming and MS Office experience while at the same time exposing him to real-world challenges and rewarding experiences.





# 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 worldwide.

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 regulator.

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



**Electric System Operations: Evolution to the Modern Grid, Second Edition**  
Mani Vadari

- This completely updated second edition includes case studies and a focus on the business of system operations;
- Explores the broad range of actions under system operations from transmission to distribution are explored;
- Highlights the underpinnings of electric systems operations, with an introduction to utilities and power systems;
- Offers a thorough definition of system operations, identifying and explaining the various systems that support this function and how they integrate into the utility;
- Presents a thorough definition of system operations, identifying and explaining the various systems that support this function and how they integrate into the utility;
- Details the business perspective on electric systems operation, and how critical this area is to a utility's ability to provide reliable power to customers;
- Explains how a utility's network operation is a key contributor to the viable sustainability of its business.

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This book is also being used as a textbook for a UMass course given by Prof. Kishore Nudurupati on Smart Grids for undergraduate and graduate students. (ECE 687/597 SG, Smart Grids)



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