



State of the Grid

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2ND QUARTER 2022



**WELCOME TO OUR
Q2 2022 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.*



Our industry equates 'resiliency' with the grid's ability to recover quickly from a disruptive event. In the last couple of years, it's getting more important to personalize the term to remind ourselves that we as people are resilient too. The constant barrage of bad news can feel overwhelming. But our species is wired to adapt. We can find ways to recover quickly and keep going too. In the spirit of sharing some good news, wind and solar generated 10% of global electricity in 2021. That's a world first! And, global investment in low-carbon energy hit a new record of \$755b in 2021, up by 27% from 2020. Let's celebrate these milestones on our way to net-zero!
Dr. Mani Vadari, President



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INDUSTRY EVENTS

CONFERENCE: T&D World Conference and Exhibition
October 5-12, in Charlotte, North Carolina

CONFERENCE: Fall 2022 TDM&MA Conference
October 9-12, in Bellevue, Washington

FORUM: UAI Accelerated Learning Forum
Various online webinars hosted by Utility Analytics Institute and T&D World.



CHECK IT OUT!

REPORT: The future of energy storage

The MIT Energy Initiative (MITEI) has just released a significant new research report, The Future of Energy Storage—the culmination of a three-year study exploring the long-term outlook and recommendations for energy storage technology and policy. Download the report [here](#) (PDF).

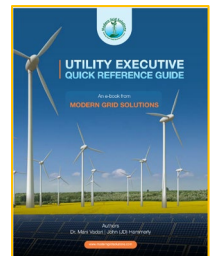


Bladeless Wind Energy!

Click on the image to go to a video about [Vortex Bladeless](#) technology for wind generation. Pretty cool concept!

Dr. Vadari and John (JD) Hammerly of Modern Grid Solutions have recently published an e-book called, "[Utility Quick Reference Guide](#)." Its content covers critically important topics for this audience, enabling executives to navigate our industry's challenges as it transforms to deliver a 21st-century, decarbonized energy system.

Stay tuned for another Modern Grid Solution e-book – a primer on Energy Storage. Look for it in a future newsletter, or follow us on [LinkedIn](#).





MERGERS AND ACQUISITIONS

Norwegian Equinor acquires US-based energy storage developer

Equinor has signed an agreement to buy a 100% stake in the US-based battery storage developer East Point Energy LLC. The acquisition supports Equinor's ambition to be a leading company in the energy transition and provides a platform for broadening our energy offerings in the US. The privately owned East Point Energy is headquartered in Charlottesville, Virginia and has a 4.1 GW current pipeline of early to mid-stage battery storage projects focused on the US East Coast. Additional growth potential beyond the current pipeline has been identified. Read more [here](#).

Power Factors acquires Inaccess

Renewable energy software company Power Factors has acquired Inaccess, linking the companies' management platforms. California-based Power Factor's asset performance management platform will be combined with Inaccess' SCADA, power plant and battery control and market trading offering. "The vision of linking plant insights to trading and real-time controls is among the most exciting area of the renewables market today. Open, smart, and autonomous tightly integrated tools will be required with the ever-increasing penetration of renewables onto the grid," said Gary Meyers, CEO of Power Factors. Read more [here](#).

Mainstream and Aker Offshore Wind Combine

Mainstream Renewable Power is set to merge with Aker Offshore Wind to create a company with a 27GW portfolio across onshore wind, bottom-fixed and floating offshore wind projects and solar. Aker Horizons entered into an agreement with Aker Mainstream Renewables, a holding company co-owned by Aker Horizons, Mitsui & Co and Irish minority shareholders, to integrate Aker Offshore Wind into the Mainstream group. On completion of the transaction, Aker Horizons' ownership in Mainstream will be approximately 58.6%. Read more [here](#).

Entergy completes sale of Palisades Power Plant, exits nuclear merchant power business

Entergy completed the sale of the subsidiary that owns the Palisades Power Plant to Holtec International to ensure a safe and timely decommissioning of the nuclear site. Palisades was permanently shut down May 20, 2022, after generating safe, secure and reliable electricity for more than 50 years. The transaction will also transfer ownership of the decommissioned Big Rock Point site in Charlevoix, Michigan from Entergy to Holtec. The sale of the Palisades plant completes Entergy's planned exit from the nuclear merchant power business, and follows the closure and sale of the Vermont Yankee, Pilgrim and Indian Point plants and the sale of the operating James A. Fitzpatrick plant. Read more [here](#).

Warren Buffet makes play in Australian renewables market

Berkshire Hathaway's CalEnergy has purchased two large solar farms, Suntop and Gunedah, totaling 345 MWp in New South Wales, Australia, from Canadian Solar Inc. The two projects have long-term offtake agreements with a global leading technology company and will help support corporate decarbonization efforts. The projects have reached substantial completion and are expected to generate over

700,000 MWh of green electricity annually. This is equivalent to avoiding more than 450,000 tons of CO₂-equivalent emissions annually or taking approximately 100,000 cars off the road each year. Read more [here](#).

bp acquires stake in Asian Renewable Energy Hub

Oil and gas firm bp is buying a 40.5% equity stake in the Asian Renewable Energy Hub in the Pilbara region of Western Australia. It will operate the Hub, which is located on a 6,500 square kilometer site, with access to an abundant supply of solar and wind resources with a consistent output to power green hydrogen or ammonia production. AREH will develop onshore wind and solar power generation in phases to achieve a total generating capacity of up to 26 GW. This is equivalent to an estimated 90 terawatt hours per year, which will cover about one-third of all electricity generated in the country in 2020. At full capacity AREH will be able to produce 1.6 million tons of green hydrogen or 9 million tons of green ammonia, per annum and abate approximately 17 million tons of carbon in the domestic and carbon markets each year. Read more [here](#).



TotalEnergies buys stake in Adani aiming to create the world's largest green hydrogen ecosystem

TotalEnergies has entered into an agreement with Adani Enterprises Limited (AEL) to acquire a 25% interest in Adani New Industries Limited (ANIL). ANIL will be the exclusive platform of AEL and TotalEnergies for the production and commercialization of green hydrogen in India. ANIL will target a production of one million metric tons of green hydrogen per year (Mtpa) by 2030, underpinned by around 30 gigawatts (GW) of new renewable power generation capacity, as its first milestone. Read more [here](#).

CPower to acquire Centrica's U.S. demand response business

National energy solutions provider CPower Energy Management ("CPower") announced it has entered into a definitive agreement to acquire the U.S. demand response division of Centrica Business Solutions, LLC ("Centrica"). Centrica is an integrated energy solutions company that is a leading provider of commercial and industrial load management with customers in PJM, ISO-NE, NYISO, and ERCOT. The acquisition will position CPower as the U.S. leader in providing grid flexibility and reliability through customer-powered distributed energy resources (DER), with nearly 6.3 GW capacity at more than 17,000 sites available to be dispatched to the grid when it's needed most. In return, CPower helps participating DER owners keep energy costs low, enhance resiliency, and avoid carbon emissions by being available to use less electricity during peak periods. Read more [here](#).

PPL acquires Narragansett Electric

PPL Corporation announced it has completed its acquisition of The Narragansett Electric Company from National Grid for approximately \$3.8 billion, net of purchase price adjustments, following receipt of all necessary approvals. The Narragansett Electric Company, Rhode Island's primary electric and gas utility, will now be known as "Rhode Island Energy," reflecting both the company's commitment to Rhode Island and its pursuit of a cleaner energy future in line with the state's renewable energy and net-zero goals. Read more [here](#).



KEY HIGHLIGHTS

CAISO welcomes BPA and Tucson Electric Power to the WEIM

The Bonneville Power Administration (BPA) and Tucson Electric Power (TEP) have become the newest participants in the Western Energy Imbalance Market (WEIM), with both utilities formally joining today. Using diverse and flexible energy resources from WEIM participants, the real-time energy market's sophisticated technology finds and delivers the lowest-cost energy to its members. Operated by the ISO since late 2014, the WEIM now has 19 participants serving 77% of the demand for electricity in the Western United States. Read full CAISO's press release [here](#) (PDF). See map to right.

CAISO hits all-time peak of more than 97% renewables

In another sign of progress toward a carbon-free power grid, the California Independent System Operator (ISO) set a new record on April 3, when 97.6 percent of electricity on the grid came from clean, renewable energy. The peak, which occurred briefly at 3:39 p.m., broke the previous record of 96.4 percent set on March 27, 2022. Before that, the grid's record for clean power was 94.5 percent, set on April 21, 2021. The new milestone comes as the ISO integrates growing amounts of renewable energy onto the grid in support of the state's clean energy goals. Read full CAISO press release [here](#) (PDF).

Biden administration launches bipartisan infrastructure law initiative to connect more clean energy to the grid

The Biden Administration through the U.S. Department of Energy (DOE) launched the [Interconnection Innovation e-Xchange \(i2X\)](#) – a new partnership funded by President Biden's Bipartisan Infrastructure Law that brings together grid operators, utilities, state and tribal governments, clean energy developers, energy justice organizations, and other stakeholders to connect more clean energy to America's power grid by solving challenges facing the power industry. The partnership will help reduce wait times for clean energy sources in interconnection queues and lower costs to connect to the grid. As the Biden Administration ramps up expansion of new renewable energy to reach the President's goal of 100% clean electricity by 2035, i2X partners will develop solutions for faster, simpler, and fairer interconnection of clean energy resources through better data, roadmap development, and technical assistance. Read the full press release [here](#).

Renewables setting records in the U.S.

Driven by strong solar and wind power growth, electrical generation by renewable energy sources accounted for almost 30% of total U.S. electrical generation in April and over a quarter during the first four months of 2022, according to a SUN DAY Campaign analysis of newly released EIA data. For the first third of the year, renewables outpaced coal and nuclear power by 26.13% and 37.80% respectively. In fact, electrical generation by coal declined by 3.94% compared to the same period in 2021 while nuclear dropped by 1.80%. Moreover, for the first time ever - and probably a harbinger of things to come, the combination of just wind and solar produced more

electricity in April than did the nation's nuclear power plants – 17.96% more. More from SUN DAY [here](#).

California's first 100% renewable multi-customer microgrid now operational

California's first 100% renewable energy, front-of-the-meter, multi-customer microgrid is now fully operational. Located in Humboldt County, California, the microgrid provides energy resilience for the regional airport and U.S. Coast Guard Air Station. The [Redwood Coast Airport Microgrid](#) features a 2.2-megawatt solar photovoltaic array that is DC-coupled to a 2 megawatt (9 megawatt-hour) battery energy storage system, comprised of three Tesla Megapacks. During standard blue-sky operations, RCAM generates clean and renewable energy for the North Coast, and participates in the California Independent System Operator (CAISO) wholesale energy markets, including the day-ahead, real-time, and ancillary services markets. By storing solar energy during the day and releasing it onto the grid as needed in the evening and during heavy demand periods, RCAM enables greater utilization of solar, supports grid reliability, and creates an economic model for future microgrids. Read more [here](#).



DoE releases strategy for building cyber-resilient energy systems

The U.S. Department of Energy (DOE) today released the congressionally-directed National Cyber-Informed Engineering (CIE) Strategy to provide a

framework for enhancing engineering training, tools, and practices to build resilient clean energy systems designed to withstand cyber threats. The Strategy encourages the incorporation of cybersecurity technology early in the design lifecycle of engineered systems to reduce cyber risks and vulnerabilities including threats by foreign actors. Securing a strong and reliable clean energy grid is a key component of achieving President Biden's goal of a net-zero carbon economy by 2050. Read more [here](#).

PG&E and Tesla launch VPP program

Pacific Gas and Electric Company (PG&E) and Tesla Inc. have launched a pilot program that creates a virtual power plant (VPP) to help support electric grid reliability and save customers money. Through this collaboration, Tesla is participating in PG&E's [Emergency Load Reduction Program \(ELRP\)](#) pilot by enrolling and combining residential Powerwall home battery systems into a virtual power plant to discharge power back to the grid in California during times of high electricity demand. Participating customers will receive compensation for the energy their Powerwall's discharge. The new program comes nearly a month after Tesla invited up to 25,000 PG&E customers with Powerwalls to join the VPP and help form the world's largest distributed battery. In the first two weeks of the new program, more than 3,000 customers expressed interest in enrolling, with more than 1,500 customers officially participating. Read more [here](#). On a related note, read about how Honeywell and Google Nest smart thermostats are to form virtual power plants to deliver power to PJM Interconnection [here](#).

Consumers Energy making \$100m in upgrades to improve reliability of Michigan’s power grid

Consumers Energy announced plans for \$100 million of investment in 2022 to reduce both the number and length of power outages. The energy provider will make significant upgrades to its high voltage distribution (HVD) system in an effort to make the power grid more reliable for Consumers Energy’s electric customers. Read full press release [here](#).

Report shows 10x increase in solar in 15 major U.S. metros since 2014

Several major cities across the United States are playing a key role in the massive growth of solar energy we’ve experienced over recent years. According to the [Top 2022 Shining Cities report](#), 34 cities have earned the status of “Solar Stars.” This designation means they have more than 50 watts of solar energy generation capacity for every resident. The U.S. has 121.4 GW of solar PV capacity installed, which is sufficient to power over 23 million homes.

U.S. energy storage capacity tripled in 2021

According to the early release of the [2021 EIA-860 data](#), battery storage capacity more than tripled in 2021, from 1,438 megawatts (MW) in 2020 to 4,631 MW in 2021. The increase was driven by the addition of 106 utility-scale batteries with 3,202 MW of capacity that went into commercial operation. About 78% of the battery storage capacity added in 2021 was built in regional transmission organization (RTOs) service territories, which is consistent with historical averages.

Electricity demand growth slowing significantly in 2022

The world’s electricity demand growth is slowing sharply in 2022 from its strong recovery the previous year as economic growth weakens and energy prices soar following Russia’s invasion of Ukraine, according to the IEA’s latest [Electricity Market Report](#). Global electricity demand is expected to grow by 2.4% in 2022 after last year’s 6% increase, bringing it in line with its average growth rate over the five years prior to the Covid-19 pandemic, the new report says. While electricity demand is currently expected to continue on a similar growth path into 2023, the outlook is clouded by economic turbulence and uncertainty over how fuel prices could impact the generation mix. Read more [here](#). See chart to right.



Ofgem injects £20.9bn into UK’s energy grid upgrade

Ofgem has today set out [a landmark five-year vision](#) to transform local energy grids to support the transition to a cleaner, affordable, home-grown low-carbon energy system, as part of its draft plans for the next electricity distribution price control (known as RIIO-ED2). Consumers will not see any additional costs as result of this investment as efficiency savings and reduced investor returns deliver the cash needed. Over the next five years, consumers will see a more secure and reliable electricity network less at risk of power cuts; a grid that allows for new innovations

to give more control to consumers through better data and more regularly updated prices for peak and off-peak demand creating efficiencies and saving money; support and guidance for vulnerable and low-income households ensuring no one misses out on the benefits of a net zero energy system. Read full press release [here](#).

EDF’s return to nationalization to cost €5bn

Électricité de France (EDF), the Paris-based multinational electric utility and generation owner that has, at times, been the world’s largest producer of electricity, is moving back to 100% nationalized ownership. The company, which has an operating income of about 18 billion Euros, was already under about 84.5% ownership by the French government. EDF operates about 100,000 kilometers of transmission lines and about 1.3 million kilometers of low and medium voltage distribution lines. It also owns and operates 56 nuclear reactors. At current market prices, buying out the stake the government does not already own would cost around 5 billion euros (\$5.09 billion). Read more [here](#).

EirGrid achieves 75% variable renewable energy generation trial on Ireland power system

EirGrid, the grid system operator for Ireland, alongside its partner SONI, the system operator for Northern Ireland, recently achieved a major decarbonization milestone by successfully operating Ireland’s electricity grid at between 70% and 75% variable renewable energy (VRE) for a total of 232 hours across an 11-month trial period. This trial demonstrates that up to three quarters of the electricity flowing on the Irish electricity grid at any point in time can now come from VRE sources. EirGrid had

previously imposed a cap of 70% on the amount of variable renewable generation on the grid at a given time. Following this successful trial, the cap has now been raised to 75%. This trial also marks the culmination of EirGrid and SONI’s 11-year work program focused on progressively increasing the limits of VRE on the Irish grid. Work will now begin on increasing the figure to 95% by 2030 to achieve the government’s

renewable energy targets. Read more [here](#).

National Grid to unlock £45bn investment in GB network infrastructure

National Grid ESO has published [Pathway to 2030 and the Holistic Network Design](#) (HND), aiming to deliver up to £54bn (\$64.8bn) investment in GB network infrastructure and create up to 168,000 jobs by 2030. Touted by the electricity system operator (ESO) as one of the largest investment plans in critical electricity transmission networks since the 1950s and 60s, the plan is designed to coordinate transmission infrastructure to transport 23GW of offshore energy. The ESO’s HND is described as a single, integrated approach to support large scale delivery of electricity from offshore wind for the nation. Read more [here](#).



FEATURED ARTICLE



Unpacking FERC's Interconnection NOPR

By [John \(J.D.\) Hammerly, CEO, The Glarus Group](#)

The U.S. Federal Energy Regulatory Commission (FERC) recently issued a proposed rule for expediting the current process for connecting new electric generation facilities to the grid. The notice of proposed rulemaking (NOPR) standardizes third-party transmission interconnections aiming to reduce interconnection delays and queue backlogs, and improve certainty while expediting – and preventing undue discrimination against – new generation deployment.

FRFS

The [258-page NOPR](#) includes several areas of reform. The NOPR alters its 20-year-old interconnection request approach aligning with “first-ready, first-served” (FRFS) methods used by the RTO/ISOs.

The proposed FRFS cluster study process is one of the key areas. This replaces sequential review of individual interconnection requests with analyzing a group of requests to determine grid impacts and investment options.

This FRFS approach requires cluster study processes to be more transparent and fair. The idea is to have a “waiting room” where potential interconnection customers can access all necessary public information (e.g., available capacity). The process should enable interconnection location assessment before submitting an interconnection request and allow customers access to studies for evaluation of interconnection costs. No interconnection queue priority is assigned by accessing the waiting room.

The NOPR reforms are also geared at ensuring interconnection customers can get through the process in a timely manner. Today, projects face an average timeline of more than three years to get connected to the grid. The FRFS approach is geared to increase the efficiency of the process and minimize delays.

To make sure that customers are getting access to new, low-cost generation, standardized processes and fees across all transmission providers is proposed in this NOPR. This means that customers do not incur costs beyond a small fee for study access, and all customers in a single cluster study period have equal queue priority and are studied as a group to identify required grid upgrades. The NOPR proposes to upgrade depreciated capital cost allocation to customers connecting to and benefiting from upgrades in service for less than five years.

The FRFS journey

The NOPR increases financial commitments and readiness requirements to enter and proceed through the interconnection queue. This includes that customers must show 100% site control (e.g., acreage appropriate for the generating or storage technology proposed). They must make study deposits using the following scale:

- \$35,000 + \$1,000/MW for projects > 20 MW, but < 80 MW
- \$150,000 for projects > 80MW, but < 200 MW
- \$250,000 for projects > 200 MW

Commercial readiness requirements have also been bolstered to include an executed term sheet for the sale of the constructed facility, the facility's energy or capacity, and the facility's ancillary services. Other requirements are that the project is identified in a load-serving entities' (LSE) resource plan or solicitation, it is LSE developed, or is developed for

a large end-use consumer. It must have a FERC-filed provisional large generator interconnection agreement (LGIA), either executed or unexecuted.

To avoid fulfilling the commercial readiness requirements, the customer can deposit an additional fee equal to twice the study deposit fee.

Demonstrating readiness

Once in the cluster study process, the customer must periodically demonstrate financial and commercial readiness by posting deposits equal to nine times its interconnection study fee. This is triggered when the system impact study results are released, when the facilities study agreement has been executed, and when the customer signs its interconnection agreement.

These additional deposits are refunded when the generating facility achieves commercial operation, but if the customer fails to build its generating facility and ultimately withdraws, the amount is subject to withdrawal penalties.

The exception to the penalties is if the withdrawing customer:

- Is the only one in a cluster seeing delays
- Is the only one incurring upgrade costs
- Sees > 25% increase from the previous study
- Shows a greater than 100% increase in the upgrade costs

The proposed withdrawal penalties vary from one to nine times the study costs, depending upon whether the customer withdraws during the study process or after signing an interconnection agreement and whether a commercial readiness demonstration has been provided. Customers that provide a commercial readiness deposit in place of a demonstration will be subject to higher withdrawal penalties, and in some cases, withdrawal penalties are not capped.

Technological advancements

The NOPR also proposes the incorporation of technological advancements into the interconnection process, including:

- Co-located resources can share a single interconnection point and request. Interconnection customers can expand a generating facility in the queue (within limitations) without automatically losing their position in the queue.
- Interconnection customers can request surplus interconnection service earlier in the process, as soon original interconnection customer has an executed LGIA or requests the filing of an unexecuted LGIA.
- Transmission providers, if requested, must use the operating assumptions for interconnection studies reflecting the proposed operation of storage or hybrid resources (e.g., will a storage resource charge during peak load conditions?). Transmission providers can memorialize any operating restrictions in the LGIA or require control technologies where appropriate.
- Transmission providers must evaluate, if requested, alternative transmission solutions, such as advanced power flow control, transmission switching, advanced conductor, dynamic line ratings, static synchronous compensators, and static VAR compensators.
- Non-synchronous generation interconnections need to accurately model the facility's performance during system disturbances following the control system's settings used during the commissioning and operation of the generating facility to maintain ride through capability.

Most importantly

This NOPR will standardize and clarify the interconnection process allowing third parties to anticipate and industrialize their processes regardless of the transmission provider. For transmission providers, it established consistency, which will lead to study efficiencies over time. For the US, the NOPR will speed up new generation deployment.



WHAT'S on MANI's MIND?

Mani's takeaways from Distributech 2022

Distributech went through a couple of machinations this year. Originally scheduled for the end of January, it got moved to the end of May 2022, but still in Dallas at the same location. That was an amazing piece of luck. January was possibly not the best time with the COVID situation still somewhat "iffy." But in May, we were all vaccinated and boosted (some of us twice). It was also the first time since the pandemic's start that this large conference was held in person.

Some facts:

- Distributech was held on May 22-25, 2022, at the Kay Bailey Hutchison Convention Center in Dallas, Texas.
- It was held in parallel with the PowerGen conference, also organized by Clarion Events
- It was held as an in-person event, and while the event was well-attended, the numbers were down significantly from the highs of the event in 2020, the last time it was held in person.
- And maybe it was me, but the convention room floor space appeared smaller.

My biggest takeaway was catching up with old and new friends. Going to different booths and saying hi to people we had not met for more than two years was nice – a lot of catch-ups. Several people had changed jobs, some had just retired, and others had just started their own companies/consulting companies. Also, many just decided not to come to the conference.

The next big takeaway for me was DERMS – the ability to manage Distributed Energy Resources (DERs). We could not go to a single booth without discussing DER Management. Everyone needed to tell us how their offering was different, better, and/or solved some specific nuance of the problem that others just did not. The real issue was that they were all partly correct.

For the first time, the term DER meant different things to different people – while it mainly covered renewable sources like solar/wind (either separately or with behind-the-meter storage) and stand-alone storage, the configurations covered a broad plethora of possibilities. The configurations covered Behind-The-Meter (BTM) installations, rooftop solar (or + storage), stand-alone storage, electric vehicles (personal and/or fleet) with or without V2G (Vehicle-to-Grid), microgrids, Virtual Power Plant (VPPs), and grid-scale installations (transmission and/or distribution), and everything in-between.

And, for everyone reading John (JD) Hammerly's multi-part articles on storage, just considering the different types of storage and their potential play on the grid will recognize the size of the problem and/or marketplace. While I am sure, I have missed a few configurations, this list alone is enough to make anyone's head explode. Consider different DERMS software that manages or optimizes one or some of these configurations, but very few vendors handle all or even most configurations.

The next fun area for us to explore was some of the newer vendors/solution providers we met with looking to learn something from them and even understand how their solutions/approaches could be useful to our clients in the utility industry. We met several of them, including – [Piclo](#), [WhyGreene](#), [Smarter Grid Solutions](#) now a Mitsubishi Electric Company, [Palantir](#), [dcbel](#), [Integral Analytics](#), [PowerRunner](#), and many others.

Overall, this was an excellent conference. We came back significantly smarter, better educated on some of the newer technologies and services, and, most importantly, much more capable of providing better services to our clients.

Our industry is in the throes of a change in dimensions, scale, and speed with a future whose end-state is still somewhat unknown. We can all agree that the future will be better, more nimble, greener, and much more exciting than it has been in the last 100+ years. We saw a level of excitement that we had not seen before.

I am pumped up!



Dr. Mani Vadari participating in Distributech's technical conference (top) and exhibition (bottom).



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.

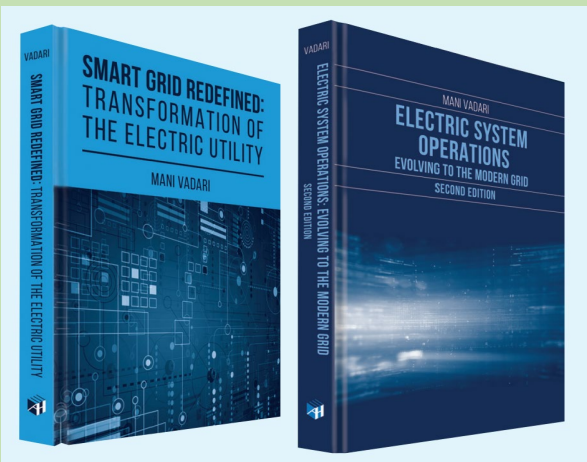
At MGS, our focus is on our clients and helping them connect the dots to make the modern grid possible. This is our obsessive passion and we've mastered the details so that our clients can keep their main focus on their businesses. And, in return, our clients value our boutique consultancy because of our unique value proposition. At MGS, all our consultants are seasoned experts offering their undivided attention and treating our clients' businesses as if they were our own.

Ongoing Modern Grid Solution Projects

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 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"> • 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 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

- 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 needs of the 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 implementation and operations standardization.

- Assisting a major multi-jurisdictional utility in a Business Architect role with implementing a DER dispatch (People, Process and Technology) solution across Transmission and Distribution
- Assisting a major multi-jurisdictional utility with defining and updating their Digital Field and Grid Operating Strategy.
- Assisting a major northwest utility with overhauling their innovation process to make it business-as-usual – across delivery system planning, operations, and beyond through the inclusion of wired and non-wired alternative solutions on the grid.
- Assisting multiple startup companies in the areas of IoT, Blockchain, and Voltage regulator.
- Assisting a major east coast gas utility with their decarbonization strategy.
- Assisting several system operations vendors with the development of their product implementation strategies.



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. This book has been used in a semester-long course at Shri Vishnu Engineering College for Women in Bhimavaram and at BV Raju Institute of Technology in Narsapur, taught by Dr. Anil Jampala, Dr. NDR Sarma and Dr. Mani Vadar, author.

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 out now and available in China. 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)

Both of Dr. Vadari's books are regularly used as text books in several universities in the U.S. and abroad.



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.