



# State of the Grid

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Q3 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.*



Even as worldwide deaths related to COVID-19 have surpassed 5 million and 700,000 deaths in America with over a third of our country yet to be vaccinated against the virus, we're starting to see more relaxations in guidelines.

More energy industry events that were cancelled or postponed have become virtual or hybrid affairs. Still some are going back to in-person events.

Whether you are traveling again or still sticking close to home, we at MGS remain at your service and are doing our best in these trying times.

Dr. Mani Vadari, President



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## INDUSTRY EVENTS

### REPORT: Global Offshore Wind Report 2021

The Global Wind Energy Council (GWEC) released the third edition of its annual Global Offshore Wind Report, which finds that Offshore Wind capacity grew steadily in 2020, with 6.1 GW installed globally led by China. Find out more in the report available [here](#).

### STUDY: The State of Vehicle Fleet Electrification

NRG Energy and research firm Smart Energy Decisions partnered to survey 228 fleet managers receiving invaluable knowledge regarding "The State of Vehicle Fleet Electrification." The study found an overwhelming 86% of respondents expressed some level of interest in fleet electrification. Get the 22-page gated study [here](#).

### LIVE EVENT: DistribuTECH International Conference & Exhibition

January 26-28, 2022, in Dallas, TX

The conference and exhibition offer information, products and services related to electricity delivery automation and control systems, energy efficiency, demand response, renewable energy integration, advanced metering, T&D system operation and reliability, communications technologies, cyber security, water utility technology and more. [Get more info here](#).

### VIRTUAL EVENT: Black Sky Hazards and Grid Resilience

November 16-17, 2021, Online and OnDemand

This T&D World event is focused on timely topics in hardening, protecting and controlling the grid. Topic areas include, "Assessment, Planning & Prevention", "Response & Recover" and "Technology Innovations." [Find out more here](#).

### TRAINING: From Modern Grid Solutions

Modern Grid Solutions delivers senior management and executive training to utility customers and employees. Most recently, a three-day course on Grid Modernization was delivered to several Caribbean utilities in late July. In addition, a five-day course on Power System Fundamentals is scheduled for delivery early in the new year.

Modern Grid Solutions delivers courses throughout the year on several topics. Key courses delivered include (1) Grid Modernization (Smart Grid), (2) Power System Fundamentals, (3) Electric Utility Fundamentals, (4) Advanced Distribution Management System, (5) Smart Cities, and (6) Wholesale and Retail Markets.

Our customized training courses are designed modularly and can be delivered as separate units or multi-day courses. Courses are instructor-led by experts with over 35 years of energy industry experience. If you're interested, please let us know and we can schedule something on our calendar.



## MERGERS AND ACQUISITIONS

### Hitachi completes acquisition of GlobalLogic for \$9.6 billion

Hitachi has completed its acquisition of GlobalLogic in a deal estimated at \$9.6 billion, the biggest such deal in the engineering services space. GlobalLogic will continue to operate as an independent brand under the Hitachi umbrella. Hitachi expects collaboration between GlobalLogic and its five sectors – I.T., energy, industry, mobility, smart life, and its automotive systems business (Hitachi Astemo) – to add value to its wide range of products, adding advanced digital technologies, and creating new Lumada solutions. With companies across sectors focusing on digital transformation of their businesses, there is a lot of potential to tap into the combined strengths of both. Read more [here](#).

### Mitsubishi Electric has acquired Smarter Grid Solutions

Mitsubishi Electric Power Products, Inc. and Mitsubishi Electric Corporation announced that the deal to acquire U.K.-based Smarter Grid Solutions (SGS) has closed. SGS is a leading developer of software management solutions for the distributed energy resources (DER) market. Financial terms of the transaction were not disclosed. SGS will report into Mitsubishi Electric Corporation's North American power systems subsidiary, Mitsubishi Electric Power Products, Inc., and will maintain operations in Glasgow, Scotland. Read more [here](#).

### Bp acquires energy management provider Open Energi

bp has acquired UK-based digital energy business Open Energi. The company's digital platform uses real-time data to optimise the performance of energy assets. It can generate savings and maximize revenues for customers by connecting to power markets and providing flexibility at times of low renewable generation and during price peaks. It also accumulates data and learns how best to further optimise the energy use of different assets over time. Read more [here](#).

### Enel agrees to buy hydro assets from ERG in €1 billion deal

Europe's biggest utility said it had agreed to acquire a 527-megawatt portfolio of assets from Italy's ERG generating an average of around 1.5 terawatt hours of power per year. The deal is expected to close at the start of next year. Enel, one of the world's biggest green energy groups, has pledged to spend 160 billion euros over the next 10 years to make the company carbon-free by 2050. Read more [here](#).

### EDF Energy sells its only gas-fired power plant in the U.K. to EIG

Institutional investor EIG completes acquisition of 1400MW of EDF assets creating a new electricity supplier, West Burton Energy. The newly created company will support the energy transition in the U.K. through the use of the highly flexible assets, EIG said. EDF's 49MW West Burton B battery storage asset has been sold as part of the deal. Read more [here](#).

### U.K. regulator clears National Grid's \$11 billion acquisition of WPD

Britain's competition regulator cleared National Grid's proposed acquisition of the United Kingdom's largest electricity distribution business without referring the \$11 billion deal to a lengthy investigation. National Grid agreed in March to buy Western Power Distribution (WPD), which runs grids in the English midlands and southwest regions and Wales, from U.S.-based PPL Corp. In a shift away from gas and toward electricity, National Grid is also selling their Rhode Island gas and electricity business for an equity value of \$3.8 billion (see news below) and have initiated the sale process for a majority stake in National Grid Gas, which owns the national gas transmission system. Read more [here](#).

### Energy Vault valued at \$1.1 billion after merger

The company announced that Energy Vault's merger with Novus Capital Corporation II values the grid-scale energy storage provider at \$1.1 billion. Energy Vault's energy storage systems use gravity to store and release renewable energy on demand, giving grid-scale reliability to clean energy sources in place of fossil fuels. The company has eight executed agreements and letters of intent for 1.2 GWh of energy storage capacity, with deployments planned for later this year in the U.S., before rolling out in Europe, the Middle East, and Australia in 2022. Read more [here](#).



### APA offers to buy AusNet Services for \$7.2 billion

Australian energy infrastructure firm APA Group made a non-binding proposal to buy AusNet Services Ltd. for A\$9.96 billion (\$7.22 billion), entering a bidding war with Canadian investor Brookfield Asset Management who offered \$7 billion. Its potential acquisition sees AusNet join the growing number of Australian energy infrastructure companies subject to takeover bids, with the bulk of Australia's privately owned network companies potentially about to change hands. Spark Infrastructure, which holds major stakes in S.A. Power Networks, PowerCor, and TransGrid, is currently the subject of a \$5 billion takeover offer led by KKR and the Ontario Teachers' Pension Plan. And TransGrid recently spun off its grid services and renewable energy arm, forming the new venture Lumea. Read more [here](#).

### PPL receives FERC approval to acquire R.I. utility

In March, PPL said it was selling its U.K. business, Western Power Distribution, to National Grid for \$11 billion (see related news above). It also announced it would separately acquire National Grid's Rhode Island utility, Narragansett Electric for \$3.8 billion. FERC has recently approved PPL's bid and the deal now only requires approval from the Rhode Island Division of Public Utilities and Carriers to move forward. These deals are part of PPL's shift to focus on U.S. utility investments and a simplified corporate structure. Read more [here](#).

### Sustainable infrastructure developer Generate Capital raises \$2B

Generate, a sustainable infrastructure company announced it had raised \$2 billion in corporate equity from institutional investors to accelerate sustainable infrastructure deployment. Existing investors AustralianSuper and QIC led the fundraising round with new investment from Harbert Management Corporation, Aware Super, and CBRE Caledon. Read more [here](#).



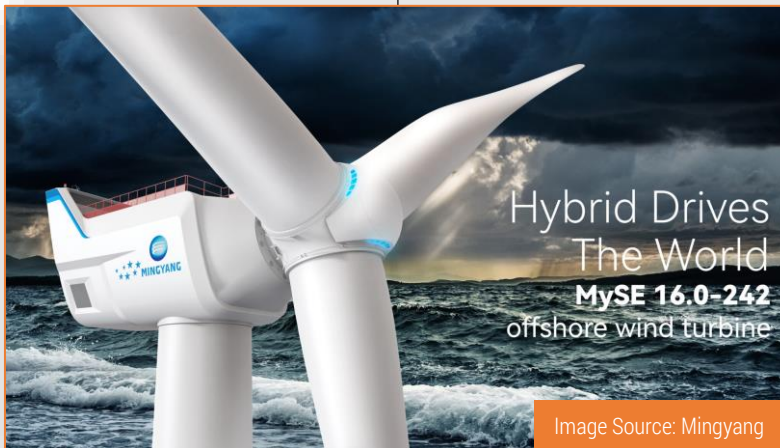
## KEY HIGHLIGHTS

### Exelon and PPL join Electric Highway Coalition

In July, Exelon – and its six utility companies - announced its commitment to join the Electric Highway Coalition, a partnership among 17 U.S. utilities to create a seamless network of rapid electric vehicle charging stations connecting major highway systems, stretching from the Atlantic Coast through the Midwest, South and into the Gulf and Central Plains. In September, PPL announced its three utility companies will also collaborate with other coalition utilities to provide drivers access to efficient, fast electric vehicle charging stations that broaden the network charging infrastructure and create convenient options for long distance E.V. travel. Read more [here](#) and [here](#).

### 264-meter tall offshore wind turbine is now the largest of its kind

Chinese manufacturer MingYang Smart Energy has unveiled a 264-meter tall, 16-megawatt capacity offshore wind turbine. The MySE 16.0-242 becomes the world's largest hybrid drive wind turbine with a 242-meter diameter rotor, 118-meter-long blades, and 4,600 m2 swept area. The model is capable of generating 80,000 MWh of electricity every year, enough to power more than 20,000 households. More info from Mingyang Smart Energy [here](#).



### Iron-air battery technology on path to commercialization

Iron-air battery technology holds the promise of becoming the lowest cost energy storage – less than one-tenth of that of lithium-ion. The technology being advanced by the Massachusetts-based startup [Form Energy](#) in essence involves the rusting and de-rusting of iron to deliver energy storage in the multi-day range up to about 100 hours. In the discharge process, iron is rusted when exposed to oxygen from the air. Then with the application of an electrical current in the charging process, the rust is converted back to iron as the oxygen is removed. The technology has long been known but is yet to be commercialised and its promise is in the abundance and availability of iron, which the Form Energy founders believe can enable it to be cost-competitive with conventional power plants. Read the rest of this article from Smart Energy International [here](#).

### U.K. smart meter network doubled in the last year

According to the Data Communications Company's (DCC's) Annual Report, 6.7 million next-generation gas and electricity meters were connected to the U.K.'s DCC network over the last 12 months, with installations undeterred by the pandemic. Remaining first generation meters will have full smart functionality returned in next year. It is estimated that smart meters are now saving the country more than 300,000 tons of CO2 per year. Network coverage expanded further over the year, and now reaches 99.3% of premises in Britain. Read more [here](#).

### PG&E hardening system by burying 10k miles of lines

Pacific Gas & Electric plans to bury 10,000 miles of its power lines in an effort to prevent its grid from sparking wildfires when electrical equipment collides with millions of trees and other vegetation across drought-stricken California. The new infrastructure safety initiative is a multi-year effort to underground approximately 10,000 miles of power lines. It represents the largest effort in the United States to underground power lines as a wildfire risk reduction measure. Read more [here](#).

### IPCC report, "code red for humanity"

This past August's release of the United Nation's Intergovernmental Panel on Climate Change (IPCC) was a stark reminder of the need for transformative and rapid change to avoid the worst effects of climate change. U.N. Secretary-General Antonio Guterres' description of the report's findings as a "code red for humanity" could not have been more explicit about the need for fast action. Read more [here](#) and [here](#).

### Duke Energy reaches 10k-megawatt renewable energy milestone

With the 144-megawatt Pflugerville Solar facility coming online in July, Duke Energy reached a significant milestone – it now owns, operates, or purchases more than 10,000 MW of solar and wind energy throughout the United States from both its regulated and nonregulated businesses. As one of the nation's top renewable energy providers, Duke Energy's renewables portfolio includes nearly 200 sites in 22 states, with over 1,000 megawatts of new projects under construction throughout the country, including Florida, Texas, and the Carolinas. At peak output, the company's current renewables portfolio capacity generates

enough energy to serve the equivalent of approximately 2.4 million homes and businesses. Read more [here](#).

### Europe's largest energy storage project comes into commercial operation

Europe's largest energy storage project, the 100MW/100MWh Minety plant with Sungrow's 1500V energy storage system solutions, has been successfully grid-connected, designed to facilitate grid stability and maximize renewable energy utilization. The U.K. experienced the most debilitating blackout in nearly a decade in August 2019. The incident exposed the serious lack of frequency regulation of the national grid and demonstrated that the construction of energy storage projects that can regulate the grid's frequency in a timely fashion should be prioritized. The Minety project, which began at the end of 2019, considerably mitigates the problem. Sungrow supplied both NCM and LFP battery energy storage system solutions featuring high integration, which minimize the footprint, slash the commissioning duration and significantly reduce the system cost by 5%. The solution well meets the latest U.K. frequency regulation requirement called dynamic containment - requesting the plant to respond to the power instruction of the grid within 1 second, making the project one of the rare 30% of the U.K.'s storage plants equipped with this function. Read more from Sungrow [here](#).



## Global E.V. sales set to hit 14 million vehicles by 2025

In its [2021 Electric Vehicle Outlook](#), Bloomberg projects that annual passenger electric vehicle sales will rise from 3.1 million in 2020 to 14 million in 2025. The 12 million passenger E.V.s currently on the road represent 1 percent of the global fleet. The total number will rise to an estimated 54 million vehicles by 2025. While E.V.s will take a 16 percent share of the worldwide market in 2025, some national markets will have much higher penetration, such as Germany with 40 percent of all sales and China – the world's largest auto market – with 25 percent.

## America's first offshore wind port breaks ground

New Jersey officials broke ground last week on the nation's first purpose-built port for the offshore wind industry. The New Jersey Wind Port is designed to serve as a hub for the offshore wind industry along the East Coast, with access to more than 50% of available U.S. offshore wind lease areas. The project is expected to create up to 1,500 manufacturing, assembly and operations jobs, as well as hundreds of union construction jobs in New Jersey. It's expected to be completed by the end of 2023. Read more [here](#).

## World's largest floating wind farm starts operating

The installation of the wind turbines at Kincardine, the world's largest floating wind farm, has marked the start of the long-term Power Purchase Agreement (PPA) between Statkraft and Kincardine Offshore Windfarm Ltd (KOWL). The 50 M.W. Kincardine floating wind farm will provide over 200,000 MWh per year to the Scottish grid, enough to power over 50,000 homes, Statkraft said. Read more [here](#).

## World's largest direct air capture and CO2 storage plant

Orca is the name of Climeworks' new direct air capture and storage plant in Iceland. It will take carbon dioxide removal to the next level by combining Climeworks' direct air capture technology with the underground storage of carbon dioxide provided by Carbfix. Orca will capture 4000 tons of CO2 per year – making it the world's biggest climate-positive facility to date. The construction of Orca started in May 2020 and is based on advanced modular technology in the form of stackable container-size collector units. These units are powerful and compact with a minimal physical footprint, making it possible for Orca to be operational in under 15 months. Orca runs fully on renewable energy and has been strategically located adjacent to ON Power's Hellisheiði Geothermal Power Plant. Read more [here](#).



## China pledges to stop funding overseas coal projects

Chinese leader Xi Jinping said that China would not build new coal-fired power projects abroad, using his address at the United Nations General Assembly to add to pledges to deal with climate change. Xi provided no details, but depending on how the policy is implemented, the move could significantly limit the financing of coal plants in the developing world. Xi's announcement followed similar moves by South Korea and Japan earlier this year, and U.N. Secretary-General António Guterres and U.S. climate envoy John Kerry have urged China to follow the lead of its Asian counterparts. Read more [here](#).

## EPRI, NREL, and the University of Washington to Advance Electric Grid Decarbonization

The Electric Power Research Institute (EPRI), the U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL), and the University of Washington announced the creation of the industry-wide Universal Interoperability for Grid-Forming Inverters (UNIFI) Consortium to advance research on grid-forming inverters supporting variable renewable energy growth across the power system. Funded through a \$25 million DOE award, the public-private consortium aims to enable power-sector decarbonization through 2035. Expected outcomes include the creation of system-stabilizing inverter controllers, simulation techniques, and hardware testbeds that facilitate grid resilience and reliability. The consortium will work to create future educational curricula and support workforce development initiatives while broadly disseminating research results throughout the industry. Read more [here](#).

## DoE releases Solar Futures Study providing the blueprint for a zero-carbon grid

The U.S. Department of Energy released the Solar Futures Study detailing the significant role solar will play in decarbonizing the nation's power grid. The study shows that by 2035, solar energy has the potential to power 40% of the nation's electricity, drive deep decarbonization of the grid, and employ as much as 1.5 million people—without raising electricity prices. The study's findings call for massive and equitable deployment of clean energy sources, underscoring the Biden Administration's efforts to tackle the climate crisis and rapidly increase access to renewable power throughout the country. Read more [here](#)—full report [here](#) (PDF).

## Sandia designs better batteries for grid-scale energy storage

Researchers at Sandia National Laboratories have designed a new class of molten sodium batteries for grid-scale energy storage. The new battery design was shared in a [paper](#) published in the scientific journal *Cell Reports Physical Science*. For many years, molten sodium batteries have been used to store energy from renewable sources, such as solar panels and wind turbines. However, commercially available molten sodium-sulfur batteries, called sodium-sulfur batteries, typically operate at 520-660 degrees Fahrenheit. Sandia's new molten sodium-iodide battery operates at a much cooler 230 degrees Fahrenheit instead. Read

more [here](#).

## The U.S. consumed a record amount of renewable energy in 2020

In 2020, renewable energy consumption in the United States grew for the fifth year in a row, reaching a record high of 11.6 quadrillion British thermal units (Btu), or 12% of total U.S. energy consumption. Renewable energy was the only source of U.S. energy consumption that increased in 2020 from 2019; fossil fuel and nuclear consumption declined. Our U.S. renewable energy consumption by source and sector chart (left) shows how much renewable energy by source each sector consumes. Read more [here](#).



## FEATURED ARTICLE



### Economics of electricity storage

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

*In this, the penultimate article in the five-part electricity storage series, the author addresses the economics of electricity storage. 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.*

The three previous energy storage articles focused on the technologies that drive the battery energy storage system (BESS) marketplace. As with real estate, our carbon-free energy future is about location. Location will dictate both utilities' and developers' investments in renewables, transmission, and BESS. Although BESS technology is evolving rapidly, the energy storage business models supporting investments are progressing in parallel. Most domestic BESS installations are installed in one of the seven RTO/ISO footprints because wholesale markets' energy and ancillary services provide more attractive revenue realization.

Implicit in the BESS revenue models is the temporal mismatch between when variable renewable energy (VRE) is abundant and higher electricity demand. The mismatch increases energy prices, making the energy stored in a BESS more valuable. Normally, electricity demand is highest within three hours after sundown during warm seasons and in the early morning in cold seasons. A BESS stores VRE for later release to better align with the daily electricity demand.

Multiple factors impact energy revenue from storage. One factor is round-trip efficiency, expressed as losses between electricity stored and what can be later discharged. This efficiency applies to energy stored for a specific time and at a specific battery temperature. Deviations, longer storage time, or non-optimal temperature reduce efficiency.

Ancillary services, including multiple reserve types, regulation, and load-following, exist in some form in all domestic RTO/ISOs. Unfortunately, every market has its commodities, and each commodity in each market has unique attributes making revenue predictability challenging. Ancillary services produce BESS revenue, likely more revenue than energy revenue at certain times in specific markets. Ancillary services add significant complexity to bidding a BESS into wholesale markets because a BESS can provide both energy (kWh) and power (kW).

Classical reserve or capacity commodities pay the supplier for the commitment to supply kWh if needed, while regulation pays for kW to balance supply and demand in real-time. A BESS can participate in multiple market commodities simultaneously so long as the BESS can deliver the required commodity when requested. A BESS could provide energy, reserve, and regulation for the same period but managing the BESS state-of-charge becomes more complex. A BESS-providing regulation is usually guaranteed the same state-of-charge at the beginning and end of the market delivery period. The BESS collects the obligation payment for reserves but must deliver the energy if called upon or face penalties. A load-following ancillary service pays for the delivery of energy at a variable rate for a fixed period. Although a BESS can provide flexibility to participate in multiple ancillary services, optimizing revenue requires keen attention to battery limitations, power system conditions, and demand/supply forecasts.

Today's BESS revenue is derived from short-term storage, but longer-term BESS solutions will soon begin to appear that stretch the storage window from less than six hours to days or even weeks. This long-term storage capability historically was supplied by traditional pump-storage hydro. To supply longer-term storage, the BESS cost per kWh stored must become lower as the length of time stored kWh increases to make the economics viable.

Emerging technologies such as thermal, iron-air, compressed gas, and even suspended weights anticipate delivering very low-cost, long-term storage solutions at scale. Each technology also faces a round-trip efficiency challenge. Some technologies can only discharge half the energy they consumed to charge, making their round-trip efficiency below 50%.

BESS revenue realization is not straightforward and varies based on where the BESS is located and how it is interconnected to the grid. BESS revenue realization is even less predictable for the significant portion of the United States not under a wholesale market compared to areas under wholesale markets. As the BESS market matures, so will the business model. That model will continue to vary by the BESS installation locations, the existence or lack of a wholesale market, VRE resources availability, and transmission access to high-demand areas.

The final article in this five-part storage primer series will provide insight into the future, identifying possible storage opportunities and threats.





## FEATURED ARTICLE



### Dominant DER Considerations Following FERC Order 2222

Authors: Przemek Tomczak, Dr. Mani Vadari, Simon Boyer, and Mattijs van den Hoed

The current state of the U.S. energy market is changing, most notably with the introduction of the Federal Energy Regulatory Commission's (FERC) Order 2222, a landmark step in the history of the North American energy industry. As part of the Order, FERC asserted its jurisdiction on those who aggregate Distributed Energy Resources (DERs) and participate in the wholesale market as a public utility, no different than a typical generation company; **in other words, the aggregator will be subject to the same regulations as a utility and is here to stay.**

How do you guarantee security of supply under this new emerging construct, one where the dispatch becomes increasingly granular and under the management of aggregators? These changes will need to address metering, market participation requirements, and so on; consider then the level of information sharing which will now be required of all market participants. Will distribution companies, for example, be mandated to facilitate the data interoperability between the Regional Transmission Organization (RTO) and the new market entrant -- the Aggregator or DER Provider? This begs the question:

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*Who keeps the data, who owns data, and who ensures that the data is accurate and up to date?*

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Typically, distribution companies have been focused on delivering power to their customers using assets that were under their control. SCADA, ADMS, AMI, GIS, Asset Management, etc. were implemented to support real-time control and management of their systems and assets and for measuring consumption and production for billing. Each utility manages the data captured from those systems differently -- different tolerances for deviations (or quality), different algorithms for correcting the data, and different measurement frequencies. Choices were made for their system, assets, and customer base.

The data and supporting systems were never designed for sharing with third parties or especially an RTO in real-time; now, this is all changing as resources - connected at the distribution level -- are deployed, with the goal of participating in a much broader grid and markets. These changes require a better view across the entire value chain -- for all participants -- meaning the secured sharing of data will become increasingly important, as will its quality.

There are two parts to this information sharing -- sharing models (as-built model and as-operated model) and sharing data (e.g., flows or who delivered what energy to whom, when and in response to which market signal). But that's a lot more data to be captured, validated, maintained, and shared than before.

As the number of entrants increases and the market evolves, utility leaders -- regardless of previously assumed roles -- will need to assess their data standards and align to address several emerging challenges, notably:

- **Trust and integrity in facilitating the exchange of information and using it for managing the physical grid and markets.** It's impossible to ignore the importance of security as we integrate new technologies at the edge of the grid and increasingly share data across multiple market participants.
- **Ensuring data is only shared with authorized parties so that information cannot affect the physical grid or at the expense of others, including energy customers (e.g., double counting by participants participating in both wholesale and retail programs).** In order to fulfill the objective of facilitating data interoperability -- the rules for who needs the data, for what purpose -- need to be clarified so that it is only provided to authorized parties for the defined purpose.

• **Who defines the rules, and who can get what information and when?** Information sharing is critical in a world with FERC 2222 to

manage reliability with more participants and facilitate the offer of services that benefit the bulk power and distribution systems.

The energy industry is undergoing a transformation; increased innovation and industry action such as the recent FERC 2222 ruling is spurring the creation of the next generation digital ecosystem for the energy markets -- and more complexity. In order to meet this moment -- transparently and efficiently -- the utility industry must work together.

#### Authors:

- [Przemek Tomczak](#)
- [Dr. Mani Vadari](#)
- [Simon Boyer](#)
- [Mattijs van den Hoed](#)







## FEATURED ARTICLE



### Seven Things Leaders Can Do to Support Women in the Workplace Right Now

By [Andrea Heuston](#), #1 Best-selling Author, Creative Magician, Script Whisperer, Set Director, Champion of Female Leaders

Andrea Heuston, founder and CEO of [Artitudes Design](#), has been in the tech industry for over 30 years. Her company, Artitudes Design, is a full-service creative services and experiential design firm that specializes in connecting messages to audiences in a visually impactful way. Andrea is a respected business leader and entrepreneur who is sought after as a board member and a Keynote speaker. She recently published the #1 bestselling book, [Stronger on the Other Side: The Power to Choose](#). In 2020, she started her own podcast, "[The Lead Like a Woman Show](#)" focusing on empowering women leaders to empower others through topical discussions and interviews with female leaders. She is passionate about helping to close the gender gap for women in business.



This past year has been tough on women in the workforce. Yes, it has been hard on all of us. However, women have been particularly hard hit by the COVID economy. Women, especially women of color, are more likely to have been laid off or furloughed during the COVID crisis. What's more, according to an article in U.S. News & World Report, one in ten women have left their jobs due to pressures at home that overtook daily life during the past 15 months.

A growing and prosperous economy depends on a large and committed workforce, with women playing a vital role. According to the Economist, the share of women in the workforce is down to levels not seen since 1987.

So, what can we do about it? How can we help? Here are seven things leaders can do right now to support gender diversity at work:

1. **Support Working Parents.** The disproportionate burden of household and childcare related chores has left women feeling anxious and exhausted. This gives companies an opportunity to adopt gender-inclusive and family-friendly workplace policies that support flexible work arrangements to encourage a more balanced share of childcare and family responsibilities.
2. **Recognize and Monitor for Unconscious Bias.** Creating a safe and rewarding workplace for women means taking action against unconscious bias. Educating all employees on how to recognize their own biases creates a more equal atmosphere for professional growth.
3. **Stop Treating Women Differently.** Yes, women and men are different. However, both sexes add value through their ideas, skills, thoughts, and strengths. Supporting a growth mindset in your work culture means valuing everyone's input. Everyone deserves to be

treated with respect, dignity, and authenticity.

4. **Let Women Speak.** I've been in many rooms where men are called on first to share their ideas. Decades of repression have caused many women to not speak up at the risk of being interrupted, undermined, or having their ideas co-opted as someone else's. You cannot be a champion of women without recognizing and calling poor behavior. Let women speak – and listen to what they say – and use that information to strengthen the conversation.
5. **Give Women Equal Pay.** I feel like a broken record, but in the U.S., women still only earn \$.82 per every \$1.00 a man earns. The gender pay gap is even more brutal for women of color. Neither race nor gender should affect what someone earns.
6. **Provide Access to Coaching and Training.** It's important to prioritize a culture of learning. Empowering women to reach the highest ranks of company leadership can lead to a more profitable and inclusive culture. Helping them through access to coaching and training helps them steer their way through limiting beliefs and uncertainty that strengthens the entire organization.
7. **Involve Men in the Conversation.** It only benefits everyone to have men be more aware of the challenges their female colleagues face. Male allies play an important role in sustaining and building on equality efforts. It's vital to include them in the conversation and secure their support.

This list is certainly not everything that is needed to create a more balanced gender-diverse work environment. There is always more work to be done. However, it's up to all of us as leaders to help even the playing field so that women feel heard, included, empowered, and valued. Now is the time to protect and foster the roles of women in the workplace to build a better future.

# The rising tide lifts all boats.

- John F. Kennedy





## FEATURED ARTICLE



### Evolving Architectures and Considerations to address Distributed Energy Resources and Non-Wired Alternatives

By Dr. Mani Vadari

What follows is the Executive Summary from a paper written under the auspices of the GridAPPS-D™ project, a Department of Energy-sponsored open-source software platform being developed for data integration and application development. As a part of this project, the analysis of architectural considerations was needed to ensure that today's architectures could transition to handle tomorrow's planning/operational problems and situations. Read the full paper on the U.S. Department of Energy Office of Scientific and Technical Information [here](#) (PDF).

The electric grid is in the beginning stage of a transformation, arguably the most significant in its history. This transformation is driven by a combination of shutdowns of coal-fired plants, commissioning of new natural-gas plants, and tremendous growth in energy supply from renewables, wind, and solar, based on location. Regardless of this transformation, customer expectations for reliability, power quality, and resiliency have only increased – customers want improved reliability and better power quality, supplied by sustainable (green) energy sources through a resilient grid at the lowest possible cost. Even as these expectations increase, grid reliability is threatened by increasingly erratic and severe weather events and changing customer behavior of adding renewables and non-wires alternatives both on the grid and behind-the-meter. As utilities navigate this transformation, their progress is supported by advances in Operational Technologies (O.T.), and Informational Technologies (I.T.), such as automation, smart inverters, cloud computing, mobile computing, machine learning, big data analytics, and others, which have the potential to enable advanced capabilities more efficiently and at a lower cost. Finally, the industry is experiencing new business entities like aggregators, community choice aggregation (CCA), microgrids, and others that will interact with the grid in novel ways. There is another dimension to be considered here. In addition to advanced solutions, the industry is at another tipping point where new technological architectures are essential to managing grid complexity.

These changes will significantly affect transmission and distribution operations. Expected changes will include (1) different system operators controlling segments of the system; (2) different sources of active/reactive power supply ranging from transmission-located to rooftop solar-based, some of which will be from renewable sources and could vary depending on solar/wind availability; (3) the ability to dispatch sources of power supply versus 'must take' when available; (4) new cost models for this power whether tariff-based or market-

based; (5) adjusting how ancillary services are procured to ensure the grid will still work reliably providing quality power to all. Continuing support for legacy technology investments is required to enable this new future scenario. Along with cybersecurity and equity issues, the future will require new architectural approaches for electric grid operations to tackle the rapidly evolving requirements of the future electric grid.

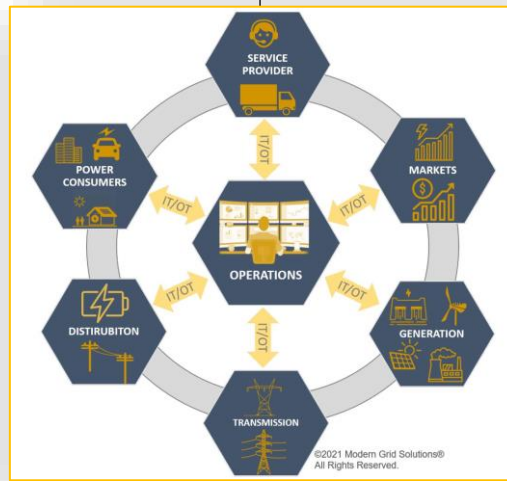
This white paper focuses on the architectural considerations that will allow the industry to handle this transition in a planned manner. It introduces and formalizes two architectural constructs –the data bus and the control bus. The data bus is responsible for carrying all non-operational models and information necessary to drive utility decisions. In contrast, the control bus is responsible for carrying all operational data and control actions taken at the local level, centralized level, or other levels in-between, should they exist. This separation was necessary to isolate data and actions that control the electric grid from getting interspersed with other types of information exchange. These may already exist in today's architectures at a conceptual level, but not as formal components. Both constructs are necessary to ensure that the most efficient processing of information and control occurs at the proper location. The two buses also need to work through a broad range of communications mechanisms and protocols and support all the systems (e.g., centralized, decentralized, distributed, and non-utility).

The two buses are isolated by one or more security mechanisms, ensuring information transported by either of them or their actions are not compromised. These buses are also supported by a combination of (1) standards-based data structures, (2) standardized interfaces (i.e., Application Program Interfaces (APIs)), (3) a standardized set of available services in the architecture, (4) standardized as-built and as-operated models, all leading to (5) self-registration and provisioning of devices, applications, and systems on the network. These support components apply to the buses, applications and devices on the power grid.

The future of reliable electricity supply relies on an information-rich environment where an increasing amount of data will come from sensors on the electrical system and beyond (grid-edge and Behind-The-Meter [BTM]). The data is often accompanied by its implicit patterns and behaviors, providing insights into electric grid behavior. The

overall architectures and systems implemented must evolve with these changes. This white paper reviews those architectural considerations and provides a detailed perspective on their requirements and how they will evolve.

This paper intends to provide a context for vendors, utilities, and their service providers to review and understand the changes that are coming in the future and get ready for them. Each vendor and utility may approach the journey in their own ways to stay competitive and ahead of the others. Still, we hope they approach these changes using the constructs presented in this paper allowing for more seamless interactions between the various stakeholders in the evolving marketplace and also to avoid their assets from being stranded.



A conceptual view of the power delivery mechanism





## WHAT'S on MANI'S MIND?

### The promise of hydrogen as a car propellant... Myth or reality?

Over the last couple of months, two main headlines seized my attention. The first one from June was, "[Honda Clarity Fuel-Cell and PHEV Models to End Production Soon.](#)" The second from a week ago, "[Toyota Mirai drives 845 miles on a tank of hydrogen, sets world record.](#)"

*Well, which one is it? Is the hydrogen-fueled vehicle dead or alive and ready to get-kicking?*

While I think we can all agree that hydrogen has good potential in our future, exactly what role it will play is still somewhat unclear. In addition, we also have the following competing headlines where California has been dreaming of a "[Hydrogen Highway](#)" since 2004 and several states in the eastern U.S. are in the process of setting up a vast EV charging network.

*Again, which one is it? EV or hydrogen fuel-cell?*

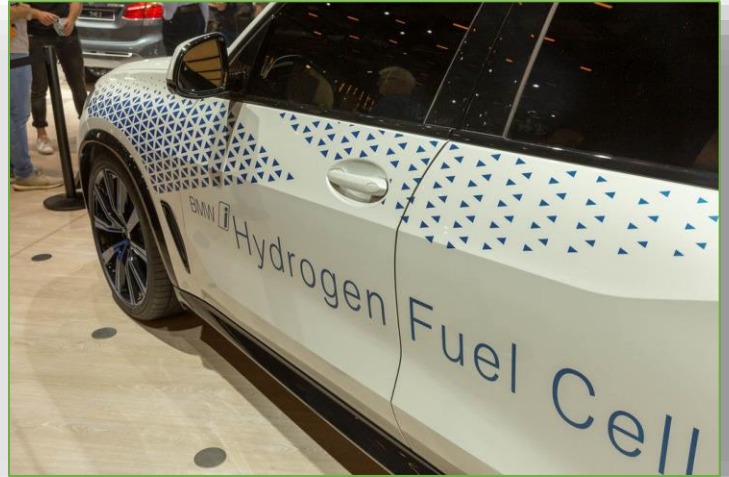
This discussion is, of course, in the face of EV rapid advancement, with almost every car manufacturer worldwide setting full electrification targets. The [U.S. government is setting an ambitious new target to make half of all new vehicles sold in 2030 zero-emissions vehicles](#), including battery-electric, plug-in hybrid electric, or fuel cell electric vehicles. While the future of [Nikola](#) semi-trucks is in doubt, [Hyundai and big-rig producer Cummins](#) are looking into the possibility to jointly develop and commercialize fuel cell powertrains by combining Hyundai's fuel cell systems with Cummins' electric powertrain, battery, and control technologies. [Toyota and Kenworth](#) are building 10 fuel cell semi-tractors for use in and around the Port of Los Angeles and Port Hueneme, California.

From a transportation perspective, hydrogen will be used in a fuel cell that will convert hydrogen to electricity, which will then propel the vehicle. So, does it also qualify to be called an electric or electrified vehicle?

Where is this all leading? We believe that it is taking us toward a future that will evolve through a combination of conventional (on its way down), electrified, and alternative fuel vehicles being developed by a broad range of auto and truck manufacturers, some legacy and some new. Each, however, has its own vision of what our driving future will look like.

And only time will tell what the reality shall be.

Signing off,  
Mani Vadari



## MEET THE TEAM



Michael Harrison has over three decades of utility industry experience, starting from field operational and engineering roles at two major US utilities followed by strategic consulting assignments ranging from U.K. privatization to unregulated business formation to large scale transformation and smart grid led partnership with Cities in the digital era.

Michael is a visionary who inspires utility personnel to follow their performance "north star" by creating bold technology-enabled operating models, pursuing impactful business extensions, and demonstrating leadership commitment required to motivate all who translate visionary aspiration into an operating reality.

Michael is the founder and managing director of Realize Visions and a principal at Modern Grid Solutions. He provides advisory services to senior utility executives in transformation, performance realization, change leadership, renewables/distributed generation platforms, and smart city enabling capabilities and services. In his work with Modern Grid Solutions, Michael imparts his industry knowledge and operational experience to engender ownership of smart grid, customer experience and distributed resource operating models and capability roadmaps.

Michael holds a Master of Business Administration, Master of Science in Structural Engineering, and a Bachelor of Science degree in Civil Engineering as well as a patent in business transformation methodology.



# MORE ABOUT MODERN GRID SOLUTIONS

## Modern Grid Solutions

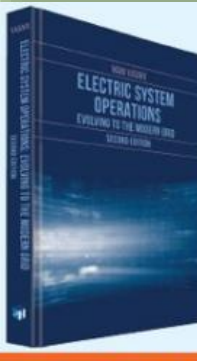
Modern Grid Solutions (MGS) is a cost-effective, global, supplier of deep expertise and board-experienced domestic resources. Our team members have been industry colleagues for over 25 years. Our approach focuses on delivering actionable guidance, direction, and value based on the depth of our team's 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-jurisdictional 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 a major multi-jurisdictional utility with assessing their ADMS implementation and helping define their long-range planning efforts.
- Assisting multiple startup companies in the areas of IoT, Blockchain, and Voltage regulator.

BUSINESS EXPERTISE AREAS	TECHNICAL EXPERTISE AREAS
<b>For Utilities and Policy Makers</b> <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> <b>For Suppliers and Corporate Clients</b> <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>	<b>For Utilities and Policy Makers</b> <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> <b>For Suppliers and Corporate Clients</b> <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;
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- Explains how a utility's network operation is a key contributor to the viable sustainability of its business.

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## 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 Vadari, 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)

## Recorded Webinar: "To DER or not to DER – is that a valid question?"

Hosted by K.X. and CGI, this [roundtable of industry experts](#), including Dr. Vadari, explored the recent FERC 2222 ruling and the next steps affecting the North American Energy Markets.



## 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](mailto:info@moderngridsolutions.com).