



# State of the Grid

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**MBE**

4<sup>TH</sup> QUARTER 2022



## WELCOME TO OUR Q4 2022 NEWSLETTER!

MGS is all about collaboration, and we're proud to continue our tradition of sharing feature articles from our industry colleagues – old and new – in our newsletter.

In this edition, we are pleased to include articles from our old friend, Dr. Anil Jampala, who offers words of wisdom about the recent FERC 881 Order; an article about DER integration from a new industry player Thomas Lee from Derapi; an insightful article about System Planning from our own JD Hammerly; and of course I have added my recent thoughts about SMRs.

Thank you for reading!  
Dr. Mani Vadari, President

**AT MODERN GRID SOLUTIONS, SMART GRIDS ARE BUSINESS AS USUAL**  
*Differentiated services to utilities and their vendors focusing on Smart Grid and System Operations.  
Our team brings deep expertise in all aspects covering technology and management consulting.*



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## INDUSTRY EVENTS

### CONFERENCE & EXHIBITION: Distributech 2023

Mr. John (JD) Hammerly and Dr. Vadari attended the 2023 Distributech held February 7-9 in San Diego. Mark your calendar for next year in Orlando, FL.

### CONFERENCE & EXHIBITION: [Inida Smart Utility Week 2023](#)

February 28-March 4 2023 in New Delhi

Dr. Vadari is part of the U.S. delegation attending. He will be delivering the keynote speech, teaching an IEEE Master Class, and moderating a panel, "Evolving Architecture of the Net Zero Power System," using excerpts from his PNNL report on Smart Grid Architectures.



## CHECK IT OUT!

**PNNL Report:** ["Introducing the 9500 Node Distribution Test System to Support Advanced Power Applications: An Operations Focused Approach"](#), Alexander Anderson, Mani Vadari, et. al., Sep 2022, PNNL-33471

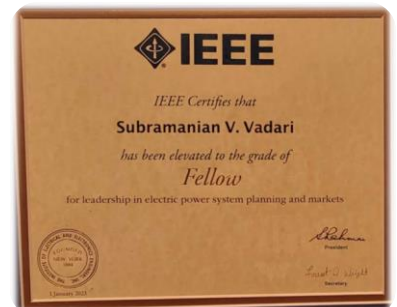
### REPORT: Energy Technology Perspectives 2023

The energy world is at the dawn the age of clean energy technology manufacturing that is creating major new markets and millions of jobs but also raising new risks, prompting countries across the globe to devise industrial strategies to secure their place in the new global energy economy, according to a major new IEA report. Read the report [here](#).

### Dr. Mani Vadari was elevated to IEEE Fellow in January 2023

The IEEE Fellow is a distinction reserved for IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation.

IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.





## MERGERS AND ACQUISITIONS

### Hydro Quebec agrees to acquire Great River Hydro

Hydro-Québec has entered into an agreement to acquire Great River Hydro, LLC, which owns 13 hydropower generating stations with a total installed capacity of 589 megawatts along New England's Connecticut and Deerfield rivers in the states of Vermont, New Hampshire and Massachusetts. Great River Hydro is being sold for a value of approximately US\$2 billion. Read more [here](#).

### ERMCO acquired Spire Power Solutions

Spire Power Solutions L.P. ("Spire"), one of North America's leading manufacturers of power transformers, has been sold to Electric Research and Manufacturing Cooperative, Inc. ("ERMCO"), a leader in the manufacturing of liquid-filled distribution transformers for the utility, commercial and industrial markets. ERMCO is a wholly owned subsidiary of Arkansas Electric Cooperatives, Inc. ("AECI"). Read more [here](#).

### United Utility has acquired BHI Energy's Power Delivery segment

United Utility Services ("United Utility"), a specialty utility services company, has entered into a definitive agreement to acquire BHI Power Delivery, a leading specialty utility transmission and distribution services provider, from Westinghouse Electric Company. Read more [here](#).

### bp completes acquisition of Archaea Energy

bp has completed its acquisition of Archaea, according to an [announcement](#) from the company. "We see enormous opportunity to grow our bioenergy business by bringing Archaea fully into BP," said Dave Lawler, chairman and president of BP America, in a statement. "The talent, expertise and passion of their team has let them achieve incredible growth so far, and we're excited to support the next chapter in line with our strategy." The transaction was first announced in October. It has since received all necessary regulatory approvals, as well as approval from Archaea's shareholders on Dec. 13. The deal was valued at \$4.1 billion, based on a price of \$26 per share and \$800 million of net debt.. Read more [here](#).

### Bowan Consulting purchases SEI Engineering

Bowman Consulting Group Ltd. announced the purchase of SEI Engineering, LLC. Headquartered in Paonia, Colorado and operating as SEI Professional Services, the company provides a full array of technical services to developers and owners of utility and commercial-scale solar energy facilities. The SEIE team comprises many of the solar industry's top photovoltaic (PV) and battery storage system designers, engineers, and technicians. Read more [here](#).

### TRC and Greenbird Partner to accelerate grid modernization for utilities

TRC announced a go-to-market partnership with Greenbird Integration Technology, an integration technology provider based in Norway. The partnership between the two companies will reduce timelines for system integration and data-driven services

for global utilities and energy providers. Greenbird's cloud-native big data integration platform, Utilihive, simplifies the integration of systems, applications, devices (smart meters, sensors IoT devices), data and clouds. The technology is purpose-built for multi-utilities of all sizes, using accelerators and out-of-the-box solutions to streamline integration projects with both new and legacy systems commonly used by the sector. Read more [here](#).

### Infosys and GE Digital collaborate

Infosys a provider of next-generation digital services and consulting, announced a strategic collaboration with GE Digital, GE's software division, to accelerate grid transformation for the utility sector. Together, GE Digital and Infosys will follow a joint go-to-market approach to deliver value-added solutions for grid-related products and services for their new and existing clients. Infosys will build a GE Digital Center of Excellence (CoE) to expand the talent pool for the GE GridOS® portfolio and bring in best practices in service delivery. Infosys will also invest in accelerators to integrate the GE platform and application suite into enterprise ecosystems and address client-specific requirements. In addition, Infosys will bring in digital capabilities in areas like AI, Cloud, Cybersecurity and Industrial IoT to support utility transformation. Read more [here](#).



### PPL sells Safari Energy to Aspen Power Partners

Safari Energy, a subsidiary of PPL, reached an agreement to be acquired by Aspen Power Partners for an undisclosed amount. Safari Energy is a provider of solar energy solutions intended to serve commercial customers in the United States, offering solar project development, engineering, maintenance, and design services to commercial and industrial customers, real estate owners, public sector organizations, and solar developers, thereby enabling commercial customers and users to optimize returns through solar power deployment. Read more [here](#).

### SMR developer X-energy goes public

X Energy Reactor Company, LLC, a developer of small modular nuclear reactors and fuel technology for clean energy generation, and Ares Acquisition Corporation, a publicly-traded special purpose acquisition company, announced they have entered into a definitive business combination agreement. The combination will establish X-energy as a publicly-traded developer of a more advanced small modular reactor ("SMR") and proprietary fuel that supports the transition to clean, affordable energy through enhanced safety, lower cost, scalability and broader industrial applications. Demand for nuclear power is strong, X-energy said, citing its selection by the U.S. Department of Energy for \$1.2 billion in federal funding as part of the Advanced Reactor Demonstration Program. [Read more here](#).

### ATCO closes major Canadian renewables acquisition

ATCO, through its investment in Canadian Utilities Limited, has successfully closed the previously announced acquisition of a portfolio of wind and solar assets and projects located in Alberta and Ontario from Suncor Energy Inc. Concurrent with the close of this acquisition, ATCO entered into a new 15-year renewable energy purchase agreement (REPA) with Microsoft Corporation. Under the terms of the agreement, Microsoft will purchase 150 megawatts (MW) of renewable energy generated by ATCO's newly acquired Forty Mile Wind Phase 1 Project in Alberta.



## KEY HIGHLIGHTS

### **NRC certifies first small U.S. small modular reactor design**

The U.S. Nuclear Regulatory Commission (NRC) issued its final rule in the Federal Register to certify NuScale Power's small modular reactor. The company's power module becomes the first SMR design certified by the NRC and just the seventh reactor design cleared for use in the United States. The rule takes effects February 21, 2023 and equips the nation with a new clean power source to help drive down emissions across the country. Read more [here](#).

### **DEWA to use ChatGPT in its services**

Dubai Electricity and Water Authority (DEWA) announced that it's working to enrich its services with ChatGPT technology supported by Microsoft. This will make DEWA the first utility globally and the first UAE government entity to use this new technology. This is part of DEWA's continuous efforts to promote its leadership locally and globally. The aim is to provide services supported by this technology and employ it in serving customers and employees. Read more [here](#).

### **GE Hitachi contract for first North American SMR**

GE Hitachi Nuclear Energy (GEH), Ontario Power Generation (OPG), SNC-Lavalin and Aecon have signed a contract for the deployment of a BWRX-300 small modular reactor (SMR) at OPG's Darlington New Nuclear Project site. This is the first commercial contract for a grid-scale SMR in North America. Read more [here](#).

### **Minsait uploads SCADA system into AWS cloud**

Minsait, an Indra company, has announced the launch of the new version of its SCADA system deployed in the cloud infrastructure of Amazon Web Services (AWS). Minsait ACS, Minsait's unit in the United States tasked with introducing its Phygital product range into the country's market, has worked with AWS on the dimensioning and specification of the cloud infrastructure to enable the company's customers to rapidly implement the technological infrastructure they require, permitting the automatic allocation of resources and transforming fixed costs into variable ones by means of a pay-as-you-go system. Read more [here](#).

### **Sun Cable enters voluntary administration**

Renewable energy firm Sun Cable announced it will enter voluntary administration after the company's backers failed to reach an agreement on funding structure and what direction it should take. Sun Cable – considered to be the world's biggest renewable energy export project – is expected to cost over US\$21 billion. It proposes to build an enormous, 30,000-acre solar farm in the Northern Territory, add an enormous (40-gigawatt hour) battery for electricity storage, then connect Australia to Singapore via Darwin through an undersea cable over 4,000km long. This would be by far the world's longest electricity cable if it existed today. Read more [here](#).

### **Iberdrola to install its first floating solar plant in Brazil**

The Iberdrola group plans to install in Brazil, the company's first floating photovoltaic plant in the world. The project will be built on the water surface of the Xaréu dam on the island of Fernando de Noronha, is recognized by UNESCO as a World Natural Heritage Site. With an output of 630 kilowatts (kW), the floating plant will generate around 1,240-megawatt hours (MWh) of green energy per year, enough to cover, with zero-kilometer electricity supply, more than 50% of Compesa's energy consumption on the island. The installation will have around 940 panels that will prevent the emission into the atmosphere of more than 1,660 tonnes of CO2 per year. The construction of this project, which is expected to begin before the end of the year, will involve an investment of 2 million euros. Read more [here](#).

### **Idaho Power joins Western Resource Adequacy Program**

Idaho Power is joining forces with energy companies across the West to continue ensuring clean energy resources can meet growing demand while maintaining reliable, affordable service. Idaho Power is the latest utility to move into the next implementation phase of the [Western Resource Adequacy Program](#) (WRAP). Companies from Oregon, Washington and British Columbia announced their commitment to join, and more are expected. Read more [here](#).

### **Minsait, Red Hat and Intel to digitalize electrical substations**

Minsait, an Indra company, has teamed up with Red Hat and Intel to launch an open scalable solution with advanced security capabilities geared towards the virtualization of electrical substations, ones which can be used at both the primary facility segment and at secondary substations (or transformer substations). The main purpose of this collaboration has been to create a comprehensive Edge Computing architecture that encompasses all the operational processes required following the digitization of these assets that is compatible with the demanding real-time security requirements in these operating environments. Read more [here](#).

### **RMI launches "Virtual Power Plant Partnership" with support from General Motors & Google Nest**

RMI, a nonprofit dedicated to accelerating the global energy transformation, recently announced the formation of the [Virtual Power Plant Partnership](#) (VP3). In recognition of the critical work needed to tackle scaling the market for virtual power plants, initial funding of the VP3 effort was made possible by General Motors and Google Nest. Virtual power plants are portfolios comprised of hundreds or thousands of households and businesses that offer the latent potential of their electric vehicles (EVs), smart thermostats, appliances, batteries, solar arrays, and additional energy assets to support the grid. Read more [here](#).

### **New European company to ensure all wind turbine blades are recyclable**

A Denmark-based company Continuum plans to make all wind turbine blades fully recyclable and stop landfilling and their emissions-intensive processing into cement with six industrial-scale recycling factories across Europe. The first factory will be in Esbjerg and is expected to be operational by the end of 2024, followed by a second factory in the UK. The company says it will be able to start taking end-of-life blades by the end of 2023. Read more [here](#).

### **California ISO adopts policies supporting grid reliability**

The ISO Board and Western Energy Imbalance Market (WEIM) Governing Body approved the Energy Storage Enhancements and Resource Sufficiency Energy Enhancements initiatives in a December joint meeting. Both [proposals](#) (PDF) are scheduled to be implemented by this summer, when extreme heat can create high demand for energy resources during critical hours. With nearly 5,000 megawatts (MW) of storage resources now connected to the grid, the storage enhancements proposal reflects the ISO's continuing work with industry stakeholders to refine its policies ensuring batteries are accurately priced in the real-time market and fully charged for providing energy when needed. Read more [here](#) (PDF).

### **NYC will replace its largest fossil-fuel plant with wind power**

US energy asset manager and developer Rise Light & Power, has submitted a proposal in response to New York State's offshore wind solicitation, which the company says will be the nation's first renewable repowering of a major fossil-fuel plant with offshore wind power. By securing an ownership stake in an offshore wind project, Rise said it was an integral part of an offshore wind proposal submitted to the New York State Energy Research and Development Authority (NYSERDA). Read more [here](#).

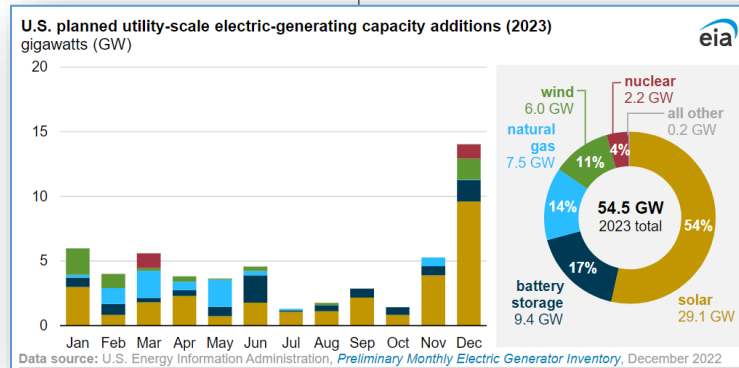


## DOE And NREL Announce First Cohort Of The Clean Energy Cybersecurity Accelerator Program

The U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL) announced a call for applications for the second cohort of the Clean Energy Cybersecurity Accelerator (CECA) program. The program brings together federal experts, energy industry representatives, and innovators in a unified effort to rapidly develop cybersecurity solutions for renewable energy resources and other grid operations and to bring them to market faster. CECA is a key component of DOE's strategy to ensure America's critical energy infrastructure remains reliable, resilient, and secure as more renewable energy is incorporated into the generation mix to achieve President Biden's ambitious vision of a 100% clean electricity sector by 2035 and net-zero economy by 2050. Read more [here](#).

## EIA says solar to make up more than half of new U.S. capacity additions in 2023

Developers plan to add 54.5 gigawatts (GW) of new utility-scale electric-generating capacity to the U.S. power grid in 2023, according to our Preliminary Monthly Electric Generator Inventory. More than half of this capacity will be solar power (54%), followed by battery storage (17%). Solar U.S. utility-scale solar capacity has been rising rapidly since 2010. Despite its upward trend over the past decade, additions of utility-scale solar capacity declined by 23% in 2022 compared with 2021. This drop in solar capacity additions was the result of supply chain disruptions and other pandemic-related challenges. EIA expects that some of those delayed 2022 projects will begin operating in 2023, when developers plan to install 29.1 GW of solar power in the United States. If all of this capacity comes online as planned, 2023 will have the most new utility-scale solar capacity added in a single year, more than doubling the current record (13.4 GW in 2021). Read more [here](#). See chart on this page.



## GE launches GridOS

GE Digital, an energy software vendor, announced the world's first end-to-end software portfolio, GridOS®, built specifically for grid orchestration. Designed to modernize and transform the electric grid into the clean energy grid of the future, GridOS is a platform and application suite enabling secure and reliable grid management while delivering the resiliency and flexibility needed by utilities worldwide. Read more [here](#). Watch GE's video [here](#).

## Sunrun and PG&E collaborate on residential battery-powered VPP

Following a year of record-high summer temperatures in California, Sunrun and Pacific Gas and Electric Company (PG&E) launched an innovative energy reliability program to provide meaningful and flexible support from residential solar and battery systems during the state's hottest months, when demand for energy is highest and energy supplies are tighter. Through the Energy Efficiency Summer Reliability Program, Sunrun will enroll up to 7,500 new and existing residential home solar and battery systems in PG&E's service area into the program, creating a virtual power plant capable of discharging 30 megawatts of clean energy back to the grid. PG&E and Sunrun partnered to create an optimal battery dispatch schedule that lowers

the overall cost of power during the times of highest need as well as reduces critical strain on the entire energy system and reliance on fossil fuel-burning power plants. Read more [here](#).

## Progress report on modernizing Puerto Rico's grid with 100% clean energy

The U.S. Department of Energy (DOE) and the Federal Emergency Management Agency (FEMA) released a one-year progress report for the Puerto Rico Grid Resilience and Transition to 100% Renewable (PR100) Study. PR100, which launched in February 2022 with funding from FEMA, is a two-year study designed to help inform infrastructure investments that will provide Puerto Rico with clean, reliable, and affordable power. The study aims to generate community-driven pathways to meet Puerto Rico's target of 100% renewable electricity by 2050 and improve the resilience of the power system against future extreme weather events. Preliminary findings of the first year of study research and stakeholder input include:

- Renewable energy potential in Puerto Rico significantly exceeds total energy demand now and through 2050.
- Distributed energy resources and alternative system configurations (e.g., community solar, agrivoltaics) could ensure Puerto Rico meets its renewable energy targets while preserving agricultural land and protected areas.
- Significant additional generation capacity is needed immediately to improve reliability.
- Smaller renewable resources spread across the power system could recover faster from disruptive events than the current system, which consists of fewer and larger power plants.
- Prioritizing stakeholder input and interagency coordination is key to overcoming past challenges.

Read more [here](#).



## FEATURED ARTICLE



### Coordinating distributed energy resources unlocks electrification and decarbonization

By Thomas Lee, Chief Strategy Officer at [Derapi](#)

The low-carbon transition is one of the most pressing challenges we face in the 21st century. With climate change threatening to erode critical environmental resources and economic growth, we need to produce and consume our energy in ways that are sustainable and resilient. In addition to supporting renewable sources of energy, the industry can accelerate this transition by making it easier for consumers to adopt smart, connected distributed energy resources (DERs) that can be coordinated to optimize electricity consumption based on cost, carbon emissions, and grid capacity.

Recent Federal legislation along with changes in state and local policies is expected to drive substantial new growth in rooftop solar, battery storage, electric vehicles, heat pumps, and other major electrical devices. Growing interest in these technologies, driven by the imperative to reduce carbon emissions to meet climate targets, raises concerns that demand for electricity will outpace the ability of our power system to generate and deliver sufficient energy to serve future loads. However, with the use of software and digital technologies, these devices can be integrated into our existing electricity network efficiently and affordably.

#### Software combined with smart, connected devices can accelerate electrification and reduce costs.

Today's grid is designed to handle peak demand from uncontrolled devices, similar to the way our highways are designed to accommodate rush hour traffic. However, modern DER devices are increasingly software-driven, internet-accessible and designed to be controlled remotely. This capability means that the grid no longer needs to accommodate the possibility that all devices could draw their maximum power simultaneously. By using software to coordinate the timing and level of energy consumption among devices, it is possible to ensure the devices can be used as needed while staying within the limits of available infrastructure. In addition to enabling faster adoption of these devices, software coordination of DER devices also has the benefit of shifting loads and flattening peaks, increasing utilization of existing infrastructure, and delaying or avoiding costs for upgrading infrastructure.



This coordination requires robust and reliable interoperability between devices. These interactions are complex because they often rely on communication that occurs over multiple protocols and device types. In most cases, communication occurs via proprietary protocols or application programming interfaces (APIs) that differ from one manufacturer to the next, and from one device type to another. This requires DER software developers to spend considerable time and effort integrating with the myriad of device types and manufacturers. Although there are ongoing efforts to develop standards to address this, progress and adoption have been slow, and those standards that do exist are typically confined to a particular device type, either due to feature limitations or industry adoption. Furthermore, standards often have variations in implementation between manufacturers, rendering them incapable of full interoperability.

#### The industry can accelerate the uptake of DERs by making interaction amongst DERs easier, faster, and more secure.

The industry can accelerate electrification and decarbonization by making interaction amongst DERs easier, faster, and more secure. Derapi was founded to address precisely this issue. We are building a vendor-agnostic API platform for DER device data and control. Derapi takes care of the initial integration with each vendor, as well as ongoing maintenance. The software developer is provided a secure, harmonized interface through which they can access devices from any supported vendor. Derapi also addresses data privacy concerns by providing a simple, standardized process for device owners to authenticate their identity and give permission for Derapi and the DER service provider to access their devices and data.

By offering these device integrations as a service, Derapi enables DER software developers to deliver value-added services, such as smart electric vehicle charging, energy and carbon optimization, load shifting, and demand response more quickly. DER device manufacturers can also more quickly develop innovative products and features, knowing that their customers will easily be able to adopt them.

Removing the barriers to integration and coordination of all types of distributed energy resources (DERs), frees the industry to focus on developing comprehensive, compelling solutions that excite their customers and accelerate our transition towards a decarbonized future. At Derapi, we're excited to be part of this journey!



## FEATURED ARTICLE



### System Planning, the Next Decade

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

*Over the next decade, electric utilities will face unprecedented change in how they plan, forecast, model, operate, and financially settle their own and third-party assets. Decarbonization increases reliance on distributed and centralized weather-variable-supply-resources (WVSR).*

#### Why it matters

This situation makes the traditional system planning challenges of capacity, reliability, resiliency, and power quality significantly more complex and dependent on others. In addition, new storage, monitoring, and control technologies all increase Planning's options to address traditional planning challenges. Societal and regulatory pressures for energy equity further complicate Planning's tasks, forcing analysis of investment beneficiaries, contract/warranty constraints, and consideration of facility siting.

#### Expanding the IRP

In the United States, investor-owned utilities (IOU) historically planned similarly, usually aligning their ongoing planning with the biennial integrated resource plan (IRP). As we advance, the IRP's grid assets focus must expand, increasing non-utility-owned capacity. Fulfilling IRP commitments through Planning-driven grid projects requires a multifaceted evaluation significantly different from the analysis of the past. In the future, utilities must address the traditional planning challenges, consider wired and non-wired designs, utility/private-sector partnerships, benefiting customers, facility siting, and overall energy equity.

#### State and Federal regulation hurdles

States such as California and Texas foster third-party investment in WVSR and storage under the wholesale markets. Others, such as North Carolina, take a different approach with their recent approval of Duke Energy's prescriptive Carbon Plan, allowing Duke Energy to own/operate or contract/operate 55% of all front-of-the-meter (FTM) WVSR and all storage. New York requires utilities to open grid investments greater than two million dollars to competitive bids.

Finally, FERC Order 2222 forces wholesale market operators to offer membership to aggregators of distribution and behind-the-meter (BTM) assets. Aggregators represent assets, such as WSVR and storage, in the wholesale market. FERC 2222 isn't specific to carbon-free assets, which allows aggregator assets to include fossil-fired resources. Under FERC 2222, grid investments won't be limited to the utilities or their customers. Private sector investors and not-for-profit entities may invest in putting distribution-connected and BTM supply and storage into swaths of a utility's service territory. The utility may face massive changes, creating unforeseen planning challenges.

#### Evolution of Planning

The impact of these changes will force utility planning to embrace new approaches and, therefore, new solutions. Leading engineering solution vendors, such as Cyme and DNV, are expanding their offerings to embrace non-engineering and non-commercial evaluation on qualitative or softer metrics such as energy equity. The hosting of existing grid capacity becomes central to Planning regardless of the regulatory regime. A logical extension to hosting capacity will be automatically optimizing an asset's placement on the grid. This ability will be particularly critical for storage as a supply and delivery resource.



Another area of significant focus will be near-term and real-time forecasting because as more storage becomes interconnected, forecasting its behavior becomes critical. The state-of-charge (SOC), historical behavior, and current value of energy and ancillary services are the only quantitative parameters enabling forecasting, but in the end, the decision to charge or discharge isn't predictive as it is for WVSR.

Lastly, more advanced solutions can calculate the future wholesale market value for non-wires grid improvements and optimize for complex objective functions, enabling utilities to more easily justify their investments. Solutions in this space are just beginning to emerge and will evolve rapidly because of their intrinsic value.

#### Co-existence will be key to growth

In the near term, no vendor can dominate the Planning and Engineering solutions space because the outlined factors rapidly diversify the requirements. The characteristic most enabling market share expansion will be the ability to coexist with solutions provided by other vendors and customers. Ease of integration, standards compliance, open data exchange, and flexible deployment models (e.g., solution, service, or outcomes via tools and labor) will enable market share expansion.



## FEATURED ARTICLE



### It's time to plan and implement FERC Order 881

By Anil Jampala, Senior Director North America Operational Technologies at [PSC Consulting](#)

[FERC Order 881](#), intended to improve transmission line ratings, will require Independent System Operators (ISOs), Regional Transmission Organizations (RTOs), and Transmission Owners (TOs) to implement Ambient-Adjusted Ratings (AARs) on the transmission lines over which they provide transmission service. All requirements of FERC 881 must be implemented by no later than July 12, 2025.

The final FERC 881 rule does not mandate the adoption of Dynamic Line Ratings (DLRs). It does, however, require that TOs establish and maintain systems and procedures necessary to enable those wanting to use dynamic line ratings to do so.

#### What are Ambient-Adjusted Ratings?

Ambient-Adjusted Ratings are transmission line ratings that are more dynamic than static or seasonal ratings that are more common today. Because AARs are generally calculated hourly, their values frequently change, reflecting a near real-time forecast of ambient air temperature across a given time period.

They include adjustments for solar heating by day segments, where local sunrise and sunset times are used to determine daylight hours. Night-time periods are updated less frequently but at least monthly.

#### FERC 881 and the industry

Under FERC 881, TOs are responsible for calculating transmission line ratings in accordance with methodologies per good utility practice. They are also expected to share transmission line ratings and methodologies with their RTOs, ISOs and market monitors.

There can be no change without challenges, of course. In the May 2022 California ISO (CAISO) [Order No. 881 Compliance discussion webinar](#), Andrew Ulmer, Assistant General Counsel at CAISO, spoke a bit about what they are doing internally to get ready for FERC 881:

*"We've formed a team internally, and the team involves a number of different business units. It includes our operational and readiness group, our market policy team, grid assets, market network application services, operation engineering services, and our reliability coordinator services, among others.*

*We've got our EMS team working on this, as well as our enterprise project management office. We've gone through the order. . . [and] come to the recognition that it's one that really touches a number of different functions that the ISO performs, many of our business processes. It touches many of our stakeholders – perhaps in different ways – but there really is an end-to-end aspect of this that we're trying to think through and that's why we try to get off with as robust a team as possible."*

For TOs, FERC 881 may require some heavy lifting to make improvements in infrastructure and processes, and also address related operational issues, including:

- Time-to-implementation
- System architecture improvements
- Compliance issues
- Software upgrades
- Geographic challenges
- Transparency issues
- Increased workforce requirements
- Security concerns
- Training updates
- Training scenario updates

#### FERC Order 881 and climate change: Boosting reliability in the face of extreme weather

In June of 2022, FERC proposed two new rules aimed at making the grid more resilient against the increasingly extreme weather patterns associated with climate change. The first rule would require NERC to develop reliability standard modifications to require TOs to develop benchmarks, studies, and action plans related to climate change.

The second requires TOs to submit a one-time report outlining their policies and procedures for assessing extreme weather vulnerability and developing approaches for mitigation. In addition, the implementation of AARs will also provide much-needed support for TOs in the face of increasing extreme weather conditions.

#### What does FERC 881 mean for NERC compliance?

The North American Electric Reliability Corporation (NERC), a not-for-profit regulatory group, recommends that utilities review their current compliance documents and cross-reference them with the new FERC order. This will enable them to be prepared should they have to modify existing facilities' rating methods and other affected NERC compliance documents to maintain compliance.

*Interested in learning more? Dr. Anil Jampala has also authored a white paper, ["FERC 881 roadmap considerations for transmission owners"](#) which lays out some of the key areas of impact, considers the right questions to ask and offers suggestions for dealing with the changes necessary for compliance.*







## WHAT'S ON MANI'S MIND?

### Small Modular Reactors (SMRs): Is this the future of our dispatchable generation?

#### Newsflash #1

On 19<sup>th</sup> January 2023, the U.S. Nuclear Regulatory Commission (NRC) [certified the NuScale standard design for a small modular reactor](#). The applicant for certification of the NuScale standard design is NuScale Power, LLC. The design is an advanced light-water SMR with each power module capable of generating 50 megawatts of emissions-free electricity.

#### Newsflash #2

On 23<sup>rd</sup> January 2023, [the first contract for North American Small Modular Reactor was signed](#). GE Hitachi Nuclear Energy (GEH), Ontario Power Generation (OPG), SNC-Lavalin and Aecon have signed a contract for the deployment of a BWRX-300 small modular reactor (SMR) at OPG's Darlington New Nuclear Project site. This is the first commercial contract for a grid-scale SMR in North America.

#### This is significant news.

But before we go there, let's first define an SMR. According to [Wikipedia](#), "small modular reactors (SMRs) are a proposed class of nuclear fission reactors, smaller than conventional nuclear reactors, which can be built in one location (such as a factory), then shipped, commissioned, and operated at a separate site. The term SMR refers to the size, capacity, and modular construction only, not to the reactor type and the nuclear process which is applied. SMRs are typically anticipated to have an electrical power output of less than 300 MWe (electric) or less than 1000 MWth (thermal). Many SMR proposals rely on a manufacturing-centric model, requiring many deployments to secure economies of unit production large enough to achieve economic viability.

Ideally, modular reactors will reduce on-site construction, increase containment efficiency, and are claimed to enhance safety. The greater safety is expected to come via passive safety features that operate without human intervention. SMRs are also expected to reduce staffing versus conventional nuclear reactors and are claimed to have the ability to bypass financial and safety barriers that inhibit the construction of conventional reactors.

There are more than eighty modular reactor designs and yet unfinished demonstration projects, and the first SMR units are in operation in Russia and China. The floating nuclear power plant Akademik Lomonosov (operating in Pevek in Russia's Far East) is, as of October 2022, the first operating prototype in the world. The first unit of China's pebble-bed modular high-temperature gas-cooled reactor HTR-PM was connected to the grid in 2021."

#### Are we there yet?

No, not even close. The certification is just the first step in getting the first credible alternative to a carbon-free dispatchable generation capability to replace the demise of traditional sources such as coal and natural gas. Some of the challenges with SMRs are:

- It is still powered by nuclear. How many of us remember the experience of 3-mile island?
- At least in North America, we have no experience with either manufacturing, implementing or operating one of these generators.
- What happens to the spent fuel that is coming from these generators? We still do not have a way to process or store spent nuclear fuel.
- These are small in size and modular, which means that they may be installed closer to the load (consumption), but how will the public react to having nuclear reactors in their backyard?
- The cost profile is still yet unknown. Will these designs be ultimately cost-effective?

#### Closing thoughts

SMRs represent the first opportunity to implement dispatchable generation. We don't know if the NuScale design - or which of the eighty designs around the world - will succeed in the long run. But the promise is there. Let's see where it takes us.



## MEET THE EXPERTS

Booga Gilbertson is an experienced senior executive, MBA, advisor, board member, and transformational leader with a successful record of leading and partnering with stakeholders and teams to achieve great results while navigating uncertainty and disruption.



**Booga Gilbertson**

She is a strategic systems thinker who translates the big-picture vision and builds consensus across diverse perspectives to achieve successful outcomes. She is known as a creative problem

solver who cuts through the clutter to generate options and secure broad buy-in and resources for solutions to complex business challenges.

Booga most recently served as COO at Puget Sound Energy, Washington state's largest energy company, which serves 1.5 million customers and is a leader in renewable energy. She led the electric, natural gas, and corporate safety business units delivering strategies to realize service and financial objectives, improve risk management, asset and infrastructure integrity, public and employee safety, enable clean energy solutions and integrate technology and data.





# 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.

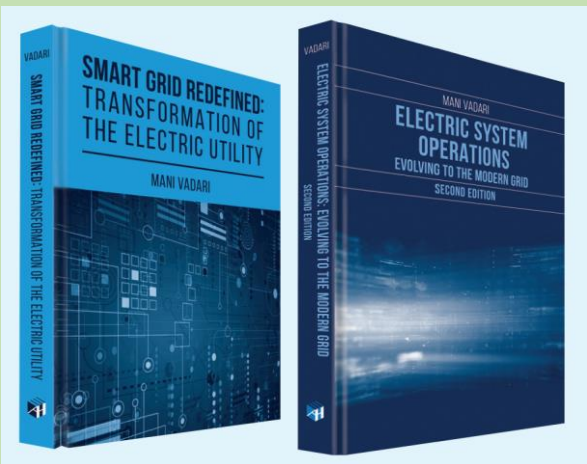
MGS has assembled a team of leading experts all having between 25 – 45 years of experience delivering complex, innovative technology, business, regulatory and finance solutions to electric utilities, corporate clients and policymakers. Our experts bring expansive breadth and tremendous depth in engineering,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

- 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)
- Assisting the Pacific Northwest National Laboratory on a DOE project - development of a distribution application development platform (GridAPPS-D).
- Assisting with a major multi-OpCo distribution operations transformation – Control center consolidation, ADMS implementation and operations standardization.
- Business Architect role at a major East Coast multi-jurisdictional, multi-state utility 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 and Blockchain.
- 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.

## 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.

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](mailto:info@moderngridsolutions.com).