



State of the Grid

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4TH QUARTER 2020



WELCOME TO OUR Q4 2020 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.*



None of us would be surprised to know that [Google's 2020 trending searches](#) were dominated globally by two topics: the **coronavirus** and the **presidential election**.

Alas, "Happy New Year" sentiments ring hollow as the world is approaching 2 million dead from COVID-19 and people are still fighting against the US election results.

As we head into 2021, let's hope the topics that consume the zeitgeist turn to more uplifting and hopeful issues.

Thank you for reading!
Dr. Mani Vadari, President



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INDUSTRY EVENTS

CONFERENCE: AESP 31st Annual Conference

January 25-28, 2021

AESP (Association of Energy Services Professionals) leads a community of professionals dedicated to improving energy efficiency through learning, networking and knowledge sharing. [Click through for more info and to register.](#)

CONFERENCE: ISGT North America

February 16-18, 2021

The theme for the 12th Conference on [Innovative Smart Grid Technologies](#) (ISGT 2021) is "Technology Solutions for an Evolving Grid", sponsored by the IEEE Power & Energy Society (PES). All presentations will be pre-recorded with live Q&A.

CONFERENCE: Energy Storage Conference 2021

January 20-21, 2021 in Berlin, Germany

This two-day event will bring together the senior representatives of the different stakeholders involved in the energy storage sector from utility providers, power generators, technology developers, energy storage service providers and policy regulators. [Click through for more info and to register.](#)

CONFERENCE: 2021 NARUC Winter Policy Summit

February 7-10, 2021 in Washington, DC

This summit will convene an array of speakers from federal agencies, industry, advocacy organizations, and more to provide the latest policy updates related to utility regulation. [Click through for more info and to register.](#)

WEBINAR: Innovating in a Highly Regulated Environment

January 14, 2021 2:00 PM EST

In this webinar, leaders from Tesla, Algonquin Power & Utilities, and Duquesne Light share their stories of how they innovated in a highly regulated environment. [Click through for more info and to register.](#)

WEBINAR: De-risking Utility Operations in a Contactless Environment

January 27, 2021 2:00 PM EST

This session brings together a panel of utility professionals who can describe how they turned their incident response pain points into positive action that boosted customer satisfaction and drove bottom-line results. [Click through for more information and to register.](#)

SAVE-THE-DATE: 2021 PES General Meeting

July 25-29, 2021. Registration will open soon. Find more information [here.](#)



MERGERS AND ACQUISITIONS

AVANGRID and PNM Resources announce merger

In a [press release](#), PNM Resources announced with AVANGRID that they have entered into a definitive agreement under which AVANGRID will acquire all the outstanding shares of PNM Resources. The agreement, which has been unanimously approved by both companies' Boards of Directors, creates a leading U.S. regulated utility and renewable energy platform. Once combined, the integrated operation would contain ten regulated electricity providers in New York, Connecticut, Maine, Massachusetts, New Mexico and Texas.

AVANGRID, Inc. – a subsidiary of Spanish energy company Iberdrola - is a leading, sustainable energy company employing approximately 6,600 people with approximately \$35 billion in assets and operations in 24 U.S. states. PNM Resources is an energy holding company based in Albuquerque, NM, with 2019 consolidated operating revenues of \$1.5 billion. Through its regulated utilities, PNM and TNMP, PNM Resources has approximately 2,811 megawatts of generation capacity and provides electricity to approximately 790,000 homes and businesses in New Mexico and Texas.

ENGIE and EDPR launch North American offshore wind company

EDP Renewables and ENGIE [announced](#) that they have combined their existing and planned offshore wind efforts to form a new company, Ocean Winds (OW). After launching OW in Europe, the two companies are now unveiling the U.S. arm of the new company: OW North America.

Regulators around the world, including U.S. authorities, have approved the merger of EDPR and ENGIE's offshore wind businesses allowing OW to begin life with 5.5 GW of committed offshore assets starting with a total of 1.5 GW under construction and 4.0 GW under development, with the target of reaching 5 to 7 GW of projects in operation or under construction and 5 to 10 GW under advanced development by the middle of this decade.

Power System Operators Launch Global Consortium

During the BloombergNEF Summit in October, Audrey Zibelman, CEO of the Australia Energy Market Operator (AEMO) announced the launch of the Global Power System Transformation Consortium (G-PST). CEOs of six of the world's leading system operators, Australia Energy Market Operator (AEMO), National Grid Electricity System Operator UK, California Independent System Operator (CAISO), Electric Reliability Council of Texas (ERCOT), Ireland's System Operator (EirGrid), and Denmark's System Operator (Energinet) are leading this consortium. The goal of the consortium is to dramatically accelerate the transition to low emission and low cost, secure, and reliable power systems, contributing to >50% emission reductions of all pollutants globally over the next 10 years by enabling the efficient integration of substantial clean energy investments into power systems. Read more [here](#).

Stem, Inc., first public pure play smart energy storage company

Stem, a global leader in artificial intelligence (AI)-driven clean energy storage systems, and Star Peak Energy Transition Corp., a publicly-traded special purpose acquisition company, [announced](#) a definitive agreement for a business combination that will result in Stem becoming a public company. Upon closing of the transaction, the combined company will be named Stem and remain listed on the New York Stock Exchange under the new ticker symbol "STEM." The combined company will be led by John Carrington, Chief Executive Officer of Stem.

Founded in 2009, Stem is a provider of AI-driven energy storage systems. The Company generates revenue by providing customers with integrated energy storage systems, long-term recurring software services and energy market participation through its proprietary software platform, called Athena™, which enables AI-automated system operations. The Company empowers its customers and partners to optimize energy usage by automatically switching between battery power, onsite generation and grid power.

Pioneer Natural Resources buys Parsley

The Solar Foundation and the Interstate Renewable Energy Council (IREC) [announced](#) they have signed an agreement to merge into a single, expanded nonprofit dedicated to the rapid adoption of clean energy. The merger will combine the strengths of two renowned national clean energy organizations, effectively doubling the staff and quadrupling the impact. The Solar Foundation is the leading national nonprofit dedicated to accelerating adoption of solar energy and related technologies and, since its relaunch in 2010, has had a remarkable ten-year track record of leading cutting-edge research, education, and capacity building programs. IREC has been trusted for its independent clean energy expertise for nearly 40 years, playing a critical role in building the foundation for rapid adoption of clean energy by tackling regulatory, workforce, and economic barriers.

Schneider Electric buys ETAP

ETAP was acquired by Schneider Electric for an undisclosed amount. Schneider Electric also has an agreement to acquire the remaining 20% in 2025. Schneider Electric is a leader in the digital transformation of energy management and automation. Trusted by 10,000+ design and engineering firms globally, ETAP models, simulates, controls, and optimizes customer electricity power systems based on their digital twin equivalents. Read more [here](#).

Eos Energy Enterprises created via acquisition

Tesla has a new publicly traded competitor for its battery-based electricity-storage business. [Eos Energy Enterprises](#) completed its merger with a special-purpose acquisition company, or SPAC, and began trading under the ticker EOSE. Both companies offer the ability to store power produced by renewable but unpredictable assets such as solar power so that it can be used when demand is the highest.





KEY HIGHLIGHTS

Hawaiian Electric acquires contract for 12 US Army facilities

Hawaiian Electric Co. Inc. [announced](#) it will take over the electric distribution systems of 12 U.S. Army installations on the Island of Oahu, Hawaii, in late 2021. The Hawaii Public Utilities Commission approved a 50-year contract for Hawaiian Electric to own, operate, maintain and upgrade the electric distribution systems serving Army bases, installations and facilities, the Hawaiian Electric Industries Inc. subsidiary said in a press release announcing the PUC's Oct. 30 decision. The installations at issue include the Schofield Barracks, Wheeler Army Airfield, Tripler Army Medical Center, Fort Shafter and Army housing areas. The U.S. Defense Logistics Agency valued the deal at \$638.5 million over 50 years.

Japan's largest power generator to close inefficient coal plants by 2030

Japan's biggest power generator [JERA has committed](#) to shutting down all inefficient coal-fired power plants in the country by 2030. And it has also set a goal to achieve net zero emissions of carbon dioxide by 2050 to tackle climate change. JERA, a thermal power and fuel joint venture between Tokyo Electric Power Company Holdings and Chubu Electric Power, set the hefty 2050 target at a time when companies worldwide are pushing to create a decarbonised society. Closing inefficient coal power stations is not only in line with global trends, but is also aligned with government policy. JERA plans to shutdown all inefficient coal power plants (supercritical or less) by 2030, and will gradually increase the ratio of mixed combustion of fossil fuels, ammonia, and hydrogen at thermal power plants.

Siemens Energy teams up with Duke Energy, Clemson University to study hydrogen use

Siemens Energy, Duke Energy and Clemson University have teamed up to study the use of hydrogen for energy storage and as a low- or no-carbon fuel source to produce energy at Duke Energy's combined heat and power plant at Clemson University in South Carolina. The U.S. Department of Energy announced that it awarded Siemens Energy a \$200,000 grant for the research initiative. The pilot project, called H2-Orange – a nod to hydrogen gas and the collaboration with Clemson University – will ramp up in March 2021 and include studies on hydrogen production, storage and co-firing with natural gas. Per a Siemens [press release](#). The studies will evaluate multiple forms of hydrogen production, including green hydrogen, which is created from water and has no byproducts. Hydrogen also has the potential to store larger quantities of energy more efficiently and for longer durations than current lithium-ion battery technology.

Con Ed to build NY State's biggest battery storage system in Queens

Con Edison and business partner 174 Power Global have an agreement that will place the largest battery storage project in New York State on an industrial site in Astoria, Queens. The batteries will be able to discharge 100 MW – that's 100 million watts – of electricity. 174 Power Global, which specializes in renewable energy projects, will build and own the battery system off 20th Avenue near the East River on land owned by the New York Power Authority (NYP&A) where the former Poletti power plant used

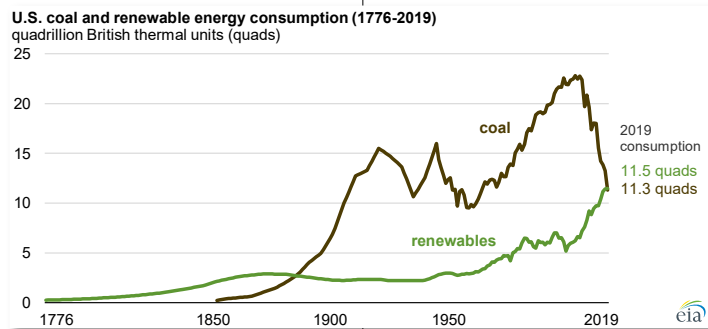
to be. The 100-megawatt/400-megawatt hour East River Energy Storage System will hold enough electricity to run more than 16,000 homes for several hours during a summer heat wave. It's enough to power the World Trade Center for about a day.

COVID-19 Relief Bill Contains Clean Energy Policy Act

The \$900 billion COVID-19 relief bill passed in December by Congress and currently awaiting President Donald Trump's signature into law allocates money and changes to the energy policy. According to the [Senate Committee on Energy and Natural Resources](#), key energy-related measures in the bill include energy efficiency; renewable energy; energy storage; carbon capture, use and storage; advanced nuclear; industrial and vehicle technologies; the Department of Energy; mineral security, cyber and grid security and modernization; and workforce development. This act, called the American Energy Innovation Act, is contained within the omnibus relief bill, and runs about 500 pages of the bill's 5,500-page length.

US renewables consumption surpasses coal for the first time in 130 years

U.S. renewable energy consumption in 2019 surpassed coal for the first time in 135 years, [according to the federal Energy Information Administration \(EIA\)](#). Total renewable energy consumption in the United States grew for the fourth year in a row to a record-high 11.5 quadrillion British thermal units (Btu) in 2019. Coal consumption, meanwhile, dropped for the sixth straight year and totaled 11.3 quadrillion Btus, according to the EIA analysis. The overall coal consumption was at its lowest level nationally since 1964. Coal-fired electricity generation also fell to a 42-year low. This outcome mainly reflects the continued decline in the amount of coal used for electricity generation over the past decade as well as growth in renewable energy, mostly from wind and solar. Compared with 2018, coal consumption in the United States decreased nearly 15%, and total renewable energy consumption grew by 1%.



Amazon now largest corporate purchaser of renewable energy in the world

Amazon announced plans to add 26 utility-scale wind and solar energy projects, totaling 3.4 GW of electricity production capacity, bringing its total investment in renewable energy in 2020 to 35 projects and more than 4 GW of capacity – the largest corporate investment in renewable energy in a single year. These new projects will make the company the largest-ever corporate purchaser of renewable energy.

Amazon invested in 6.5 GW of wind and solar projects that will enable the company to supply its operations with more than 18 million megawatt hours (MWh) of renewable energy annually. This is enough to power 1.7 million U.S. homes for one year. These projects will supply renewable energy for Amazon's corporate offices, fulfillment centers, and Amazon Web Services (AWS) data centers that support millions of customers globally. They will also help advance Amazon's goal to be net-zero carbon emissions across its business by 2040. Part of that commitment is powering Amazon's infrastructure with 100% renewable energy, and the company is now on a path to achieve this milestone by 2025, five years ahead of the initial 2030 target. Read more from Amazon [here](#).

GE Renewable Energy and Veolia sign blade recycling contract

GE Renewable Energy [announced](#) that it has signed a multi-year agreement with Veolia North America (VNA) to recycle blades removed from its US-based onshore turbines during upgrades and repowering efforts. Through this agreement, GE plans

to recycle the majority of blades that are replaced during repowering efforts. Veolia will process the blades for use as a raw material for cement, utilizing a cement kiln co-processing technology. VNA has a successful history of supplying repurposed engineered materials to the cement industry. Similar recycling processes in Europe have been proven to be effective at a commercial scale. On average, nearly 90% of the blade material, by weight, will be reused as a repurposed engineered material for cement production. More than 65% of the blade weight replaces raw materials that would otherwise be added to the kiln to create the cement, and about 28% of the blade weight provides energy for the chemical reaction that takes place in the kiln.

Food manufacturers join alliance committed to reducing waste and creating renewable energy

Vanguard Renewables announced that London-based Unilever, Seattle-based Starbucks, and the Dairy Farmers of America have joined the company in launching the Farm Powered Strategic Alliance (FPSA). According to the organization, the FPSA is aimed at accelerating long-term commitments to avoid or eliminate food waste first and repurpose what can't be eliminated into renewable energy. The FPSA commits to reducing food waste from manufacturing and the supply chain and repurposing any unavoidable waste that cannot be eliminated into renewable energy via Vanguard Renewables' farm-based anaerobic digesters. The FPSA members also commit to begin exploring the process of decarbonizing their thermal energy usage by converting to farm-derived renewable natural gas. Read more [here](#).

Hydro Quebec to build green hydrogen electrolyzer facility

Hydro-Québec [announced](#) plans to build an electrolyzer facility with a capacity of about 90 MW, to supply green hydrogen and oxygen to the Recyclage Carbone Varennes (RCV) plant project. The RCV project will transform non-recyclable waste into biofuels, providing an alternative to landfill. The water electrolysis plant, to be built in Varennes, near Montréal, will require an investment of about \$200 million from Hydro-Québec, the sole shareholder. The plant will generate about 11,100 metric tonnes of hydrogen and 88,000 metric tonnes of oxygen annually. The hydrogen produced will be used as the gasification agent at the RCV biofuel plant, which will be built in a neighboring lot at an estimated cost of over \$680 million.

UK announces 10 point green industrial revolution plan

On November 18, Boris Johnson, the UK's Prime Minister [announced](#) a 10-point plan billed as the 'Green Industrial Revolution Plan' which is the government's blueprint for delivering on the UK's domestic legal commitment to be a net zero economy by 2050. There will be a new legislation over the coming months which will implement the Plan. The government announced that 250,000 new jobs would be created because of the Plan's implementation. The 10 points in brief, hereunder:

- 1) **Offshore wind:** The UK will quadruple its offshore wind capacity to 40GW by 2030.
- 2) **Hydrogen:** The UK will aim to generate 5GW of "low-carbon" hydrogen production capacity by 2030, with the creation of a Hydrogen Neighborhood in 2023 and a Hydrogen Village by 2025.
- 3) **Nuclear:** The UK will scale up large nuclear generation at Hinkley Point and Sizewell C, while also developing small and advanced reactors.
- 4) **Electric Vehicles:** The UK will end the sale of new petrol and diesel cars and vans by 2030 and the sale of new Hybrid cars will end in 2035. The UK will accelerate the rollout of charge points and make grants

available to incentivize EV purchasing, with a large-scale factory to produce EV batteries planned to be built in the Midlands.

- 5) **Public transport:** The UK will incentivize cycling, walking and investment in zero-emission public transport.
- 6) **Aviation and shipping:** Research projects for zero-emission planes and ships will be conducted to support airlines, airports and shipping firms.
- 7) **Domestic and public buildings:** A £1 billion spending commitment starting next year will aim to make homes, schools and hospitals become more energy efficient. The UK will install 600,000 domestic heat pumps annually by 2028 and the Green Homes Grant voucher scheme will be extended to install insulation in homes. By 2023 no new homes may be heated by gas boilers.
- 8) **Clean hydrogen, carbon capture and storage (CCS):** The UK will target the removal of 10MT of carbon dioxide by 2030 through CCS and create two carbon capture clusters by the mid-2020s, with another two set to be created by 2030.
- 9) **Nature:** The UK will plant 30,000 hectares of trees every year to restore the natural environment and invest to improve new flood and coastal defenses in England by 2027.
- 10) **Innovation and finance:** The UK will make the City of London the global center of green finance.



IEA Chief says renewables immune to COVID-19

Fatih Birol, executive director of IEA, said during a press conference for the launch of IEA's latest report into renewables that the global energy sector was "experiencing its worst year since the Second World War". The impact of Covid-19 on the industry is 7-times worse than the global financial crash earlier this century. However, he highlighted that renewable power was the one

area beating this trend. He stated, "90% of global energy growth is coming from renewables." Birol pointed out a success story in India, which during the first half of 2020 it already had 15 GW of wind and solar installed, which is as much as what was installed during the entire 2019. Birol said, "Renewable power is defying the difficulties caused by the pandemic, showing robust growth while other fuels struggle." The IEA report also stated that China and the US will include new additions of renewables this year to their portfolios, reaching a record level of approximately 200 GW. Read more [here](#).

Scottish government gives consent for new pumped hydro plant

Coire Glas, the UK's largest newly planned hydro pumped storage scheme, has been granted consent by the Scottish Government marking another step towards helping Scotland and the UK deliver their net-zero ambitions. If commercially approved, SSE Renewables' Coire Glas scheme would have the potential to double the UK's pumped storage volume capacity and provide the national grid with the low carbon balancing flexibility needed to reduce energy costs to consumers while helping decarbonize the power system. The project's future commercial development is now subject to identifying the right market investment framework. The Coire Glas project, located near Loch Lochy in Lochaber in the Scottish Highlands, would be the UK's first new pumped storage scheme in over 30 years. Initially approved for a 600MW scheme in December 2013, revised plans were subsequently submitted in April 2018 to the Scottish Government for an up-to-1500MW scheme. The changes were designed to maximize the potential of the site and help the UK in its transition to a net zero energy system by 2050. The newly approved scheme would be capable of a power output of up to 1500MW for 24 hours non-stop and a pumped storage capacity of up to 30GWh. Read more [here](#) and [here](#).

Budweiser announces brewery to be powered by one of UK's largest wind turbines

Budweiser Brewing Group UK&I, a proud part of AB InBev, and renewable energy company, CleanEarth, today announce reaching a new milestone in the brewer's sustainability efforts. A new wind turbine has been installed at Budweiser Brewing Group's brewery in Magor, South Wales to help power the site with renewable electricity. With blades of an incredible 68 metres in length, the turbine is believed to be the longest to enter commercial operation on UK soil. The blades' tips reach a height of 150 metres and sweep an area the equivalent of two Wembley football pitches. The turbine is the latest step in Budweiser Brewing Group's commitment to brew its beers with 100% renewable electricity by next year, and its continued investment in renewables.

Japan aims to eliminate gasoline vehicles by mid-2030s

Japan aims to eliminate gasoline-powered vehicles in the next 15 years in a plan to reach net zero carbon emissions and generate nearly \$2 trillion a year in green growth by 2050. The plan seeks to replace the sale of new gasoline-powered vehicles with electric vehicles, including hybrid and fuel-cell vehicles, by the mid-2030s. To accelerate the spread of electric vehicles, the government targets slashing the cost of vehicle batteries by more than half to 10,000 yen or less per kilowatt hour by 2030. The "green growth strategy," targeting the hydrogen and auto industries, is meant as an action plan to achieve Prime Minister Yoshihide Suga's October pledge to eliminate carbon emissions on a net basis by mid-century. Read more [here](#).

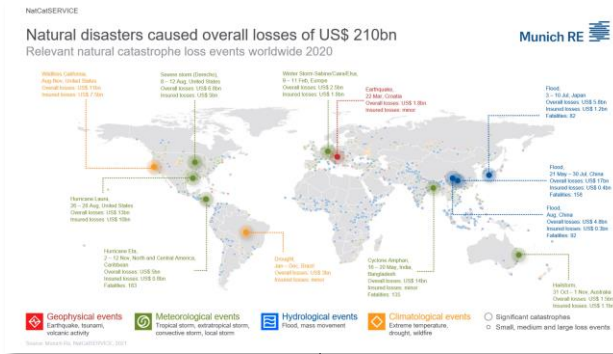
Renewables meet 46.3% of Germany's 2020 power consumption

Renewable sources met 46.3% of Germany's power consumption in 2020, 3.8 percentage points more than in 2019, utility industry association [BDEW reported](#), adding that parts of the increase came from a drop in usage in the coronavirus crisis. Germany wants to raise the share of renewable in its power mix to 65% by 2030 and is just finalising a green law reform bill this week to step up its efforts. BDEW also offered power production totals for 2020 - some 564.5 TWh were produced, 6.5% less than 2019.

Disasters caused \$210 billion in damage in 2020

A record number of hurricanes, wildfires and floods exacerbated by climate change cost the world \$210 billion in damage last year, [according to a report](#) by reinsurance company Munich Re. Damages totaled \$95 billion in the U.S., nearly double the losses in 2019. The country experienced a record number of Atlantic

hurricanes and the largest wildfires on record in California in 2020, the second-hottest year on record. The six costliest disasters of 2020 occurred in the U.S., the worst of which was Hurricane Laura. The storm caused \$13 billion in damage after it devastated parts of Louisiana in August. The Atlantic hurricane season saw a record 30 named storms and accounted for \$43 billion in losses, almost half of the total disaster loss in the U.S. last year, the report said. The single worst disaster last year was flooding across China from summer monsoons, which amounted to \$17 billion in damage, of which only 2% was insured. Cyclone Amphan hit India and Bangladesh in May, causing \$14 billion in damage, very little of which was insured, the report said.



WHAT'S ON MANI'S MIND?

2020 was definitely one of the most bizarre years of my life. It started with over 60,000 miles of travel between January and February and then suddenly stopped altogether. For the rest of the year, my colleagues nor I made even one trip. It was a complete stop.

COVID-19 is not a local issue, and it is not a national issue. It's a global issue whose impact is felt way beyond most of the previous "big" ones: AIDS (1981+), H1N1 Swine Flu (2009-2010), Ebola (2014-2016), Zika (2015+). Yet none of the previous significant viruses impacted the entire world quite like this one. Companies have moved to work remotely, untold small businesses have had to shut down, unemployment is sky-high, and travel within the US and international destinations is [still a third of what it used to be](#).

If all this was not enough, as we were grappling with the pandemic, the killing of three black people in the US - Ahmaud Arbery, Breonna Taylor and George Floyd - prompted international protests and a justified outcry for equality all around the world. Finally, at the end of the year, the US held its presidential election, a saga that continues to this day. (As of this writing, I'm watching pro-Trump protesters storming the Capital.)

Our Clients

The pandemic does not discriminate, forcing even critical electric utility employees to work remotely. The speed with which this happened required utilities' IT departments to suddenly transform themselves and create the infrastructure to allow most of their employees to work from home. Utilities also needed to keep the lights on with COVID-19 placing additional risk on employees while performing the everyday activities of planned and unplanned work.

Another major issue impacting utilities is the economic ramifications of COVID-19 leaving a significant number of customers who could not or did not pay their electricity bills. This unexpected decrease in revenue got a double whammy with the substantial increase in costs needed to handle the transition to working remotely. As a result, utilities have done considerable belt-tightening with a subsequent reduction in raises, bonuses, and a reduction in workforce in some utilities.

Our Team

Despite all the negative news, Modern Grid Solutions (MGS) - and the band of merry men and women who make us up - has accomplished a lot in 2020. We couldn't be more grateful for the opportunity to work with leading-edge clients on exciting projects to modernize the grid. Here are five of our major deliverables over the last 12 months...

1. We've continued to be involved in the ADMS installation at a very large multi-OpCo utility.
2. We've continued to be involved in the development of the next-generation ADMS platform.
3. We developed a state-of-the-art operating model for DER dispatch at another large multi-OpCo utility.
4. We refined and transformed the energy delivery digital strategy for another large multi-OpCo utility.
5. We helped transform the delivery system planning operating model at another major utility.

On behalf of MGS, I offer my sincere thanks to our team - John (JD) Hammerly, Susan Christensen-Wimer, Michael Harrison, Anne Cleary, Gary Rosenwald, Venky Sethuraman, Denee Hayes, and Gayle Wooster (who still produces this newsletter). Even in such a crazy year, we managed to deliver significant value to our clients, which at the end of the day is really what it's all about.



FEATURED ARTICLE



The EV Market is Accelerating

By Mani Vadari, John Hammerly and Mike Harrison

[Original article in T&D World.](#) Included here with permission.

The electric vehicle (EV) wave has come ashore. EV penetration is transitioning from its embryonic stage to the market growth stage across many transportation industry segments: cars, light trucks, buses, light commercial vehicles (LCVs), even Class-8 trucks (those more than 33,000 pounds). Although some segments are electrifying faster than others in terms of market penetration, overall, this change will be the single most transformative event in the transportation sector since Henry Ford invented automobile assembly-line manufacturing. This change impacts everything – how far vehicles travel before requiring refueling (recharging in this case), the time recharging takes, where and when vehicles recharge – the very nature of replenishing the vehicle's energy reserves. With this change comes opportunities for a new set of players to enter the marketplace, with the most impacted entity, the electric utility. These new market entrants will also bring new business models into a marketplace that is still evolving and will take some time to mature.

Over the past decade, following significant advances by the European Union (EU), upwards of two dozen investor-owned and municipal utilities in the United States have launched significant EV charging network infrastructure pilots. Initially, state governments drove these initiatives to achieve aggressive carbon reduction targets, but now EV charging capability is rapidly expanding into a national priority. Concurrently, a host of emerging companies have defined and advanced home charging, superchargers, and fleet charging technologies. Many of these companies participate in utility-supported EV infrastructure pilots. While some of these newer entrants questioned utilities' involvement, most have seen utilities' ability to help accelerate ubiquitous charging coverage as an important accelerator for EV adoption by alleviating EV range limitations or intercity use concerns among consumers. For example, California IOUs have installed more than 12,000 charge spots since 2016 – a significant portion of the nearly 70,000 charge spots installed in the United States by early 2020.

Major automakers shifting significant production to EVs by 2025 will further accelerate transportation electrification. Yet charging infrastructure is at risk of lagging further behind as charging deployment to date is well under 10% of the coverage required by the mass market to support EV adoption by 2025 (source: International Council on Clean Transportation analysis-ICCT).

The residential EV charging segment represents a significant electricity consumption increase. For example, households charging two Tesla Model 3 class EVs twice weekly drive an increase from 909 kWh to over 2000 kWh per month (average residential change per U.S. EIA). Utilities, after a decade of year-over-year load decline, want this growth. Will utilities largely remain as reactive connection/delivery entities or consider broader collaboration with suppliers and their customers? Like the roles of established and emerging third parties, the utilities' role will be dictated by regulations, business models, and stakeholders' views on how to best drive progress to achieve carbon reduction targets.

Except for California's recent order banning carbon-emitting vehicles by 2035, the regulatory landscape remains heavily subsidy-driven for leading EV suppliers. The business models span capturing the customer with unrelated services (that is, advertising) during charging, augmenting existing refueling infrastructure, vehicle-as-a-service, employee benefit charging (in office complexes), and rate-based electricity supply. Even with significant financing chasing these business models, many will not survive in the long term. Technological innovation, however, offers both opportunities and threats that may change this outlook. Ubiquitous Class III charger deployments not only reduce charging time but also drive business model viability as much as customers who embrace charging primarily at home and work. Regardless, utilities have an opportunity to take on proactive roles, whether as direct suppliers of solutions for fleets and private vehicles or as a commodity supplier to those serving consumers.

With battery technology anticipated to drive cost parity of EVs by 2022 to 2024, most automakers are expected to phase-out ICE-driven cars from their portfolio by 2025 to 2040. Resulting from this phase-out, demand for ubiquitous coverage of charge spots with appropriate capabilities (for example, slow versus supercharging) will increase dramatically, essentially shifting from government "push" to consumer/major manufacturer "pull." Significant capital will be required to meet ICCT projected charge point coverage required to support mass-market EV penetration. The EU has also demonstrated the value of a master network architect function that combines energy and telecommunications requirements to define utility network capabilities and charge spots' location. Partnerships with cities and statewide transportation authorities will be critical.

While today's charge spot providers recover their investment (and expensive capital charge) through charging rates that often exceed 50 cents/kWh, a broader footprint enabling a wider range of consumer adoption will require support via governmental or utility mechanisms. A key factor to keep in mind is that private investors will mostly flock to urban centers where they believe the business value exists. To support countrywide EV adoption, however, ubiquitous EV charging coverage requires identifying a Provider of Last Resort (POLR), who must be appropriately compensated for possible

electricity sales at reduced rates. European models (for example, Norway) have recognized the master network architect role's value. This window provides utilities the opportunity to establish their value-added position (for example, low cost of capital, superior ability to manage long-term charge point investment risk given evolving consumer behavior) at the state level so that charging network infrastructure addresses the rising wave of consumer demand for EVs.

Further, there will be a need to add charging stations along the country's highway and byways, making range anxiety a non-issue. Unless utilities act quickly, however, their role in creating this future is far from assured. With the appearance of distributed energy resources (DERs) and the budding emergence of hydrogen as a transportable or locally-produced commodity, this opportunity could be quickly taken away from the electric utility, allowing other business models to dominate. Now is the time for the electric utility as the commodity provider to show leadership and bring other businesses to provide services to the public.

In the words of legendary Chrysler CEO, Lee Iacocca, "Utilities can lead, follow, or get out of the way." Utilities have a unique opportunity, just as with ICE-based cars, where there was a complete dependency on oil companies. In the future, the supplier of the commodity will be the electric utility as the primary distributor of electricity. Electricity is ubiquitous in its availability, from the residence to the office and beyond.

Find more articles from MGS experts in T&D World [here](#).





FEATURED ARTICLE



Storage Primer First of a five-part series

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

This is the first in a series of five articles about storage. As a whole, the series serves to provide context and expose 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. This series will provide the reader with a primer on stationary storage and its long-term importance to supply reliable, inexpensive and environmentally attractive electricity for a viable society.

Overview

Electricity storage (storage) is a set of technologies that stores previously generated electric energy and releases that energy later. Without storage, electricity needs to be produced, delivered, and consumed nearly instantaneously for the grid to maintain balance. Until recently, storing electricity across the electric grid was limited, but recent advances in new energy storage technologies are making the wide-scale deployment of electricity storage viable.



Big "WHYs" of Storage

With many predictions, as their realization shifts from fantasy to reality, clarity emerges on why storage has taken so long. A confluence of factors was required to drive its current rapid evolution. The overarching factor is carbon-free energy, but storage has two major roles in achieving it. The first, and arguably most important role is in transportation. Electrified transportation eliminates emissions while maintaining societal mobility. Second, stationary storage provides operational flexibility for the energy sector by either producing or consuming energy upon command.

A zero-carbon electricity supply's intermittency drives stationary storage's role. The most abundant renewable resources - wind and solar - are also the least flexible, predictable and controllable. **Stationary electricity storage represents a "spring" to be compressed when renewable electricity is abundant and released when not.** Further, it brings flexibility. For transportation, energy density (range) and charge time (refueling) are critical. Stationary storage charge pace can be engineered to meet the required flexibility.

Challenges

Longevity and duration represent stationary storages' major challenges. The former, because stationary storage costs are recovered over its life, and the critical factor is the number of times it is charged and discharged. Although there are other factors, such as speed and depth of charge, the number of charge/discharge cycles impact storage longevity the most.

Storage duration is the second major challenge. Second and minute horizon stationary storage provides regulation and spinning reserves more flexibly than fossil alternatives. Two-, four-, eight-hour storage provides the flexibility to capture abundant solar during the

day, serving daily peaks in the evenings. Weekly, monthly and seasonal storage preserves surplus solar, wind and hydro produced electricity for release during supply shortages and peaks, which for some in North America occur on cold, dark and still winter mornings.

What about cost?

Cost is critical, but, again, differs between the transportation and energy sectors. For the former, manufacturing cost is paramount because it significantly contributes to the overall vehicle cost. Manufacturing cost is also important for stationary storage, but other costs, such as land, deployment and interconnection weigh heavily on the final cost. Also, longevity, duration, and cost are coupled. Return-on-equity favorability increases for assets with longer lives (cycles) and offering greater flexibility (duration).

Further, stationary storage valuation complexity increases because longer duration storage implies fewer cycles during a given assets' life. Thus, the transition from a future solution's promise to its realization is not easy, pretty or simple.

Next in the series

This article is the first of a five-part series on storage. The second will address Li-NMC technology and why it will remain dominant soon. The third identifies emerging, possibly competitor technologies for stationary storage. The fourth article examines the necessary scale and practical applications of stationary storage in a transformed electrical landscape. The final will provide insight into the future, identifying possible opportunities and threats.



MEET THE EXPERTS

Mr. Moisan is a senior industry executive with over fifty years of experience focused on the Energy and Utilities Industry. Covering generation, transmission, distribution, and customer dimensions, he continues to address the strategic and operational issues facing this industry.



Robert Moisan

Bob combines an innovative vision for the business with practical strategic and operational fundamentals as the basis for providing solutions which realize bottom line impacts. More typically, his role encompasses the execution and delivery of these strategies to the stakeholders' advantage. Bob has served and addressed the business needs of major utility, energy, product, technology, and services companies during a period of economic, business, technology, and regulatory change and uncertainty.

He has engaged as a change agent challenged to bring a transformation to his client and their customer's technology and business operations. His experiences range from engaging in proposing and negotiating major initiatives to business strategy to delivery. He brings focus and leadership to teams to assure successful strategies, broad consensus, and results-based execution.



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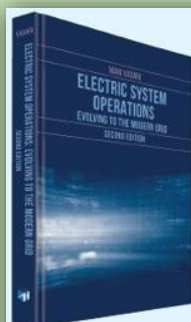
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 - Assisting the Pacific Northwest National Laboratory on a DOE project - development of an OpenADMS application development platform (GridAPPS-D).
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- Assisting a major multi-Opco utility with identifying improvements to their Outage Customer Experience – People, Process and Technology.
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For Utilities and Policy Makers <ul style="list-style-type: none"> Strategy, tactics, and process redesign Business, technical and enterprise architecture Transmission and distribution roadmaps Grid modernization plans Project and program management Strategic change management RPS Support For Suppliers and Corporate Clients <ul style="list-style-type: none"> Business model design and analysis Electricity market entry and go-to-market Market analysis, volumes, and trends Competitive landscape analysis Alliances, divestitures, and acquisitions M&A, Project finance, structured products 	For Utilities and Policy Makers <ul style="list-style-type: none"> T&D system operations – EMS, DMS, OMS Generation operations Energy markets – design and deployment Energy and REC tracking system T&D Automation and smart grid solutions GIS and asset management solutions Generation planning and renewables integration Big data management and analytics Solution and vendor selection For Suppliers and Corporate Clients <ul style="list-style-type: none"> Solutions design and implementation Portfolio review and analysis Adjacency analysis and technology management Energy, REC and emissions trading



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