Guidehouse INSIGHTS

White Paper

Enhancing Resiliency For the Energy Transition

The Critical Role of Dual Purpose Resiliency Microgrids

Published 2Q 2021

Commissioned by Enchanted Rock

Peter Asmus
Research Director

Pritil Gunjan
Principal Research Analyst

Introduction

Most conversations about the energy transition to a low carbon energy future include renewable technologies such as solar photovoltaics (PV) and wind energy, energy storage, and electric vehicles (EVs). But this major change to the power grid represents more than just a migration to cleaner energy technologies. It reveals fundamental forces changing how energy is produced, delivered, and consumed by billions of consumers and businesses in a modern global economy.

As regulations and policies clamp down on greenhouse gas emissions, massive deployment of renewable energy is required, as is wholesale electrification of buildings and transportation, which changes the grid composition to be more dependent on highly variable resources such as solar and wind. This offers major challenges to managing grid stability and reliability—vital infrastructure in today's increasingly digital economy ever more dependent upon electricity. But increasingly severe weather events and the resulting power outages (some lasting weeks) exacerbate challenges to grid reliability.

To help solve these problems at scale, distributed generation technologies in the form of resilient microgrids will grow in importance, offering resiliency value to site hosts and grid services value to the larger grid, the underlying rationale for new platforms such as dual purpose microgrids. Dual purpose microgrids offer long duration resiliency at the customer site and can balance wholesale wind and other renewables on the larger grid. This duality is also possible at an affordable price point.

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Although energy storage technologies and voluntary demand response will play a role in grid stabilization, their operational limitations leave a gap in the necessary grid management toolkit. A more diversified solution incorporating cleaner fuel-based distributed generation, sometimes hybridized with battery energy storage and onsite renewables, can mitigate system supply variability and also provide the long duration local resiliency readily typically available today from diesel generators. This cleaner solution to resiliency and renewables integration will only grow in importance.

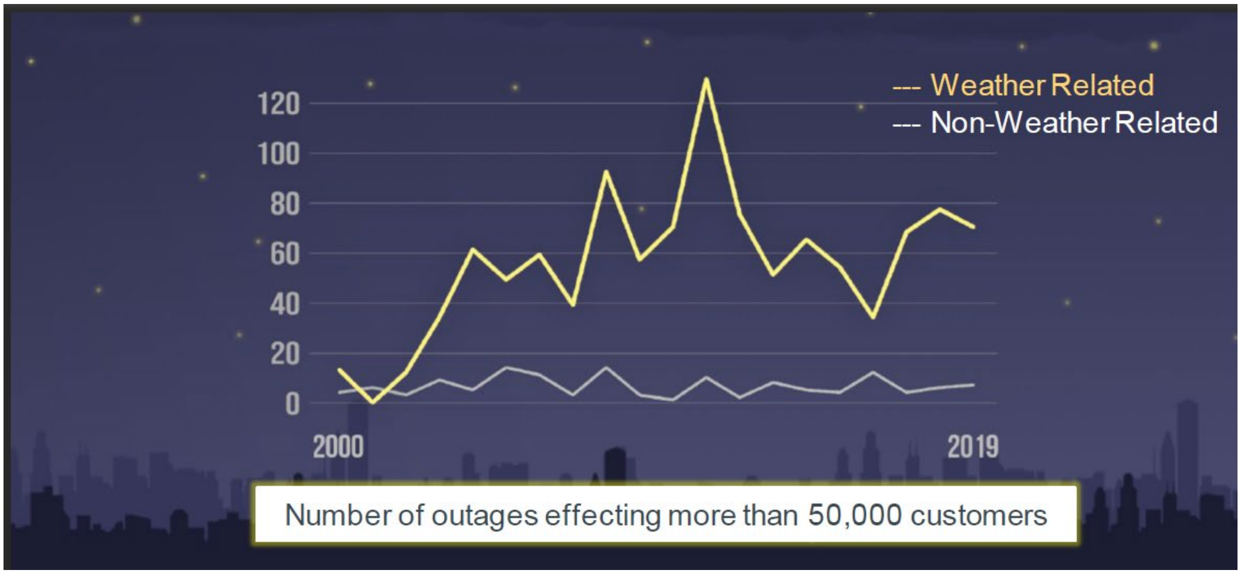
Growing populations of EVs add to the challenge of keeping the grid in balance. This trend ties electricity and transportation markets in new ways. When the grid goes down, the lights go out and vehicles may no longer be able to charge. This amplifies the challenges facing the incumbent power grid as volatility from variable renewables on supply side is matched with volatility on demand side from EV fast charging and other forms of electrification.

Power Outages and the Declining Reliability of the US Electricity Grid

The US electricity grid is reasonably reliable compared to regions of the world where the availability of electricity fluctuates daily. Compared to other industrialized regions, such as Europe, the US power grid's performance is lacking. And rather than improving with investments in smart grid technology and software platforms such as advanced distribution management systems, the rate of outages continues to climb.

Figure 1 shows data on the number of power outages in the US that impacted 50,000 or more customers between 2000 and 2019. Although a zigzag path, the overall trend of high impact weather-related outages is on the upswing, whereas non-weather-related high impact outages have been stable despite significant investments in smart grid technologies. According to Guidehouse Insights, investments in smart grid upgrades are expected to reach over $25 billion between 2019 and 2021 for North America. Meanwhile, the reliability of the US power grid declines steeply if major event days are included in the measurements. For example, the system average interruption duration index score (SAIDI) for 2017 was over 4 times higher that year when major event days were included compared to when they were not.[1] The data for the most recent year available is 2019, when the interruptions with major event days was 283.3 minutes compared to just over 118 minutes without.

Figure 1 Power Outage Impacts Keep Increasing Over Time in the US



(Source: US Energy Information Administration)

[1] SAIDI is a common measurement of utility power outage duration in minutes per customer.

Texas' Extended Outage Proves the Point

Whether hurricanes, tornadoes, wildfires, or snowstorms, the impacts of extreme weather outages can be substantial, resulting in deaths and loss of economic activity and property. The COVID-19 pandemic magnified the impacts of power outages due to remote workers residing in homes without sophisticated backup power solutions and the typical safety protocols required for people to gather safely at community centers and other disaster recovery sites. Clean, resilient, and affordable dual purpose microgrids can help address these challenges. The extended power outage in Texas in February 2021 underscores the challenges the US faces from extreme weather events and gives a glimpse of how dual purpose microgrids can address them.

The extended power outages in Texas in February underscore the challenges the US faces from extreme weather events.

The damage to the Texas economy was on par with a Category 5 hurricane. The unprecedented cold weather combined with high levels of humidity froze wind turbines and vital components at natural gas-fired power plants, resulting in power supply chain issues. Some gas wells and compressors froze so natural gas fuel was unavailable to much of the central power generating equipment. The freezing weather also imposed record loads on the regional power grid due to the need for heating. The shift to electric heat over the past few decades compounded the electricity supply problem. Since 2010, 62% of new heating systems installed in Texas are electric heat pumps, which dramatically increase electricity consumption when it is cold.[2] These supply and demand factors combined to form a non-virtuous cycle of cascading power outages throughout much of the state, lasting for multiple days.

Since Texas is the only state in the US to limit interconnections with the transcontinental power grid to avoid Federal Energy Regulatory Commission (FERC) regulation, many have stated that this policy precluded neighboring states from filling the resource gap. However, in this situation, many of these states faced the same power challenges as Texas so may have offered limited assistance. Furthermore, the extreme weather wreaked havoc with the forecasts that guide resource planning for the Electric Reliability Council of Texas (ERCOT). The normal load forecast for winter peaks in ERCOT during this time was approximately 57,700 MW. The actual peak was in excess of 70,000 MW,[3] which exceeded ERCOT's extreme weather contingency forecast of 67,208 MW.

Solving the Reliability Challenge

Although the solution to this type of reliability challenge is multifaceted, for critical infrastructure customers the no regrets solution is to build resiliency through microgrids. Microgrids provide local resiliency to homes and businesses that provide critical infrastructure, health services, and food and water while protecting against a wide range of threats to the utility grid. But not all microgrids are created equal, which is a benefit of such customized solutions. A more streamlined and modular approach is needed to deploy microgrids at scale to meet the needs of diverse climates, regulatory regimes, and application types. This will reduce cost and enable easier financing of similar systems in size and technology scope. In addition, these modular systems could keep the power flowing during outages and serve as good grid citizens and

[2] Lucas Davis, "The Texas Power Crisis, New Home Construction and Electric Heating," Energy Institute at Haas, February 22, 2021.

[3] ERCOT, "Seasonal Assessments Show Sufficient Generation for Winter and Spring," Press Release, November 5, 2020, http:www.ercot.com/news/releases/show/216844.

provide ancillary services when the grid is up and running. As such, they can help balance out increasing amounts of variable renewable energy generation. In short, the market needs dual purpose microgrids, which Enchanted Rock defines in the following way:

> *Dual purpose microgrids are local power systems that offer sustained resiliency services to customer sites to survive long duration power outages, but which also provide support services to the larger grid and wholesale markets, which reduces the overall cost of each of these services.*

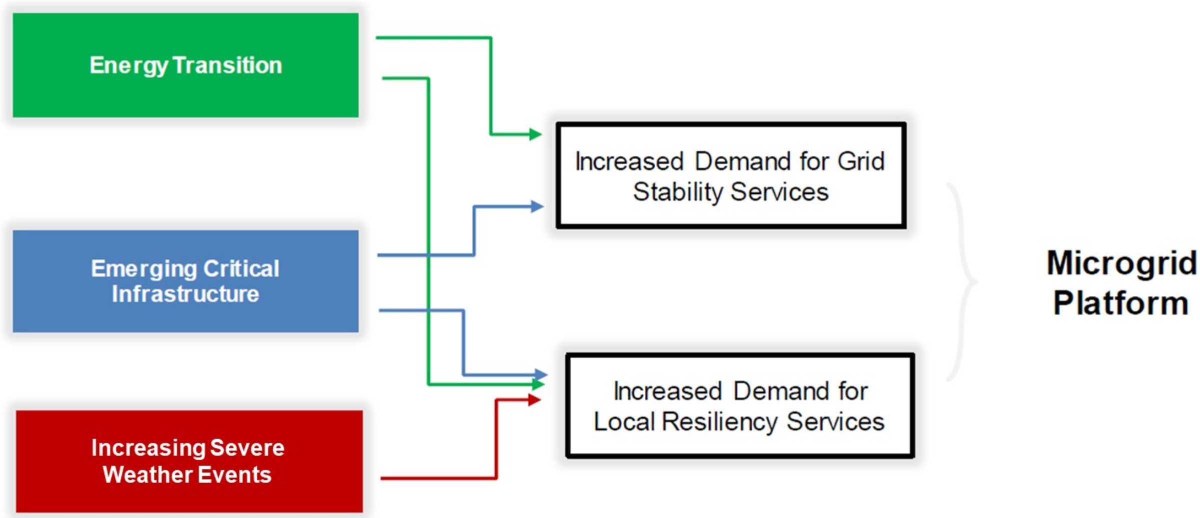
Traditional microgrids such as solar plus storage, fuel cells, or combined heat and power (CHP) focus on providing 24/7 electricity, going into island mode as long as possible during a grid outage. Their purpose could be described as meeting the demand for local resiliency services at a specific site. Ideally, these microgrids could sustain electricity supply during long duration outages. In contrast, dual purpose microgrids do not compete with grid supplied power, but instead displace our historical reliance on backup diesel generators, which represent one of the most polluting of all power generation options. Dual purpose microgrids also generate a cost offsetting revenue stream by supplying services to the wider grid during emergencies. These dual purpose microgrids are critical to making the energy transition to a low carbon energy future a commercial reality. Why do we need these types of microgrids today? The provision and use of electricity are rapidly changing in profound ways:

- The energy transition is driving growth in variable renewable energy and retirement of baseload production and at the same time electrification of previously fossil fueled energy uses is growing. According to Princeton University, the US will need to quadruple wind and solar power to reach 600 GW, which would serve about half of the nation's electricity demand to reach the net zero carbon goal by 2030 at a cost of $2.5 trillion.[4]
- Critical infrastructure is now recognized to be expanding significantly beyond hospitals and emergency services to include a much longer list of essential facilities to maintain safety, health, food, water, and communication. More businesses and organizations require continuous electricity to deliver these services to society.
- Climate change is increasing the number and impact of severe weather events causing large scale power outages, including fires, ice storms, extreme cold and heat, hurricanes and flooding, and high winds. According to the US Environmental Protection Agency (EPA), eight of the 10 warmest years on record for the US have occurred since 1998. Furthermore, nine of the 10 most extreme 1-day precipitation events also have occurred since 1990.[5] The EPA also reports that single day extreme precipitation events have increased by half of a percentage point each decade since 1910. While long-term trends show great variability in terms of frequency of hurricanes, 2017 was the worst year in US history, with 17 named storms causing $200 billion in damages.

[4] Will Wade and Eric Roston, "Getting the U.S. to Zero Carbon Will Take a $2.5 Trillion Investment by 2030," *Bloomberg*, December 15, 2020.

[5] US Environmental Protection Agency, "Climate Change Indicators: Weather and Climate," https://www.epa.gov/climate-indicators/weather-climate#.

Figure 2 Dual Purpose Microgrid Value Propositions



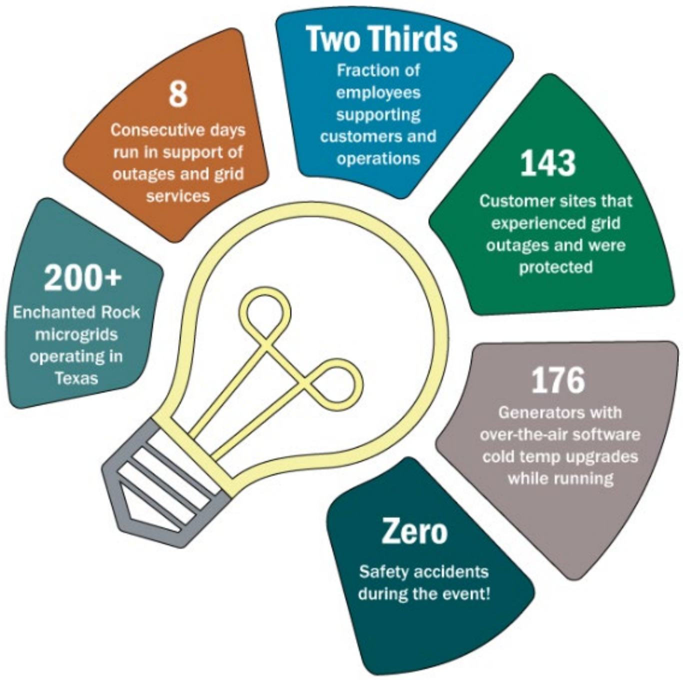
(Source: Enchanted Rock)

As Figure 2 illustrates, dual purpose microgrids provide the basic local resiliency services of a microgrid (the ability to create an island of power when the larger grid goes down) and are ready to provide grid stability services when the grid is up and running. For example, when the wind unexpectedly dies down in a state like Texas, which leads the US in installed wind power capacity at approximately one-third of all capacity, other resources must be called upon to fill the void. These supplemental resources need to respond within a very short period of time.

A term sometimes used for services provided by distributed energy resources (DER) such as demand response or battery storage is virtual power plant: the idea that aggregations of DER can provide the same services as a conventional power plant, but only be called upon when needed. For dual purpose microgrids, a better term might be aggregated power plants since, in the case of Enchanted Rock, real physical dispatchable generating assets provide local site resiliency and send value upstream to balance wholesale variable resources when required. The need for this buffering service will only increase as more and more renewables come online at the distribution and transmission level.

The value of dual purpose microgrids is illustrated by the performance of the Enchanted Rock fleet of dual purpose microgrids during Texas extended outage. Figure 3 summarizes the story. Absent these dual purpose microgrids, 143 customers, many of which are considered critical facilities, would have had outages lasting for as long as 4 consecutive days. All told, these dual purpose microgrids operated in support of onsite resilience and provision of grid services for the larger ERCOT grid network support for 8 consecutive days.

Figure 3 Dual Purpose Microgrid Performance During Texas Winter Storm of 2021



(Source: Enchanted Rock)

The Energy Transition and Shifting Energy Infrastructure Priorities

Data from the US Energy Information Administration (EIA) informs on the rapidly changing world of power supply. Traditional centralized resources are being closed and decommissioned. Nearly all utility-scale power plants retired between 2008 and 2017 were based on fossil fuels, with coal plants representing 47% of shuttered capacity followed by natural gas steam plants at 26%. The majority of near-term planned retirements will follow this pattern. According to the EIA, centralized coal plants represent the single largest fuel type showing major reductions in capacity.[6]

Nuclear plants are not far behind. Oyster Creek in Forked River, New Jersey was the first nuclear power plant to come online in December 1969 and was retired in fall 2018. Several other nuclear facilities have also shut down or are in the process of being shut down. Oyster Creek was the sixth nuclear facility to be shuttered in the past 5 years and is one of the three nuclear plants closing more than a decade before their operating licenses expire. At present, 59 nuclear plants made up of 98 nuclear reactors are still operating but 12 of these reactors representing 11.7 GW are scheduled to retire in the next 7 years.[7]

Figure 4 Nuclear Power Plants Retired or Planned for Retirements

(Source: US Energy Information Administration)

Given such large centralized thermal and nuclear power plants are no longer valued in the market due to their variable costs and large upfront capital outlays, US and global markets are shifting to smaller, smarter, and cleaner resources to reduce financial risk. Flexibility is the name of the game. As renewable energy portfolios grow, so does the need to have balancing resources that are nimble, flexible, and capable of providing bidirectional exchanges between site hosts and the larger grid network. While much

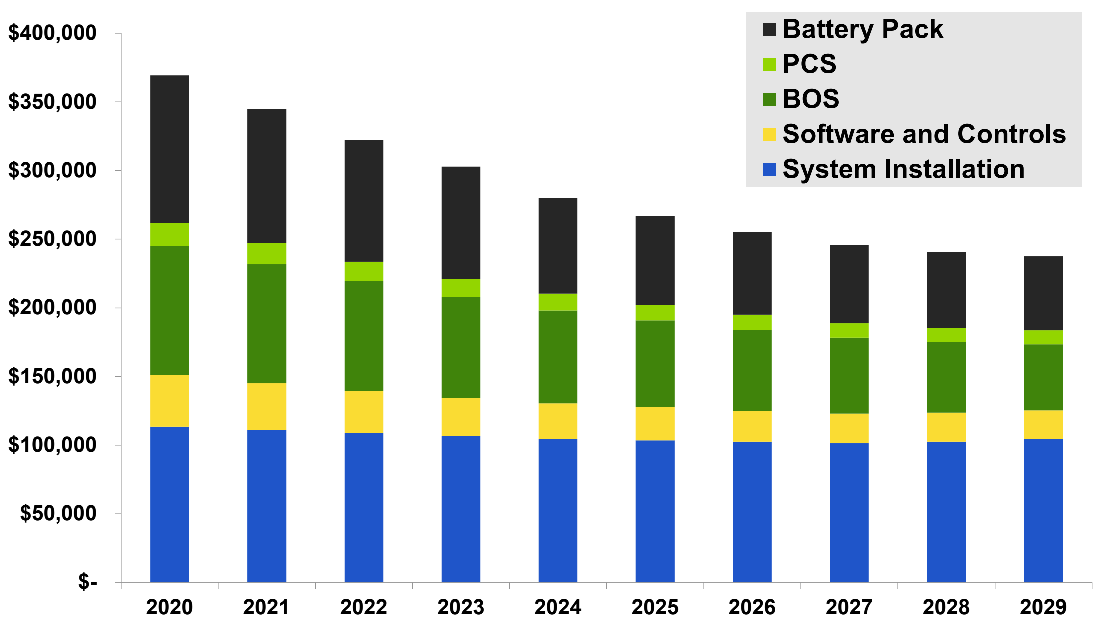
[6] US Energy Information Administration, “Almost All Power Plants that Retired in the Past Decade Were Powered by Fossil Fuels,” Today in Energy, December 19, 2018, https://www.eia.gov/todayinenergy/detail.php?id=37814.

[7] US Energy Information Administration, “America’s Oldest Operating Nuclear Power Plant to Retire on Monday,” Today in Energy, September 14, 2018,https://www.eia.gov/todayinenergy/detail.php?id=37055.

of the hype surrounds energy storage technologies, especially batteries, many regions still depend upon combustion peaking units to stabilize the system, resources that are often more polluting than some of the centralized facilities being retired. Though there is still a local backup role for distributed diesel generators, especially legacy systems already deployed, air quality limitations restrict or severely limit their ability to contribute balancing energy to the grid. Additionally, fresh investments in power sources could represent stranded assets as policymakers clamp down on emissions to meet clean air and climate change mandates and voluntary corporate goals.

Conversely, variable wind and solar represent the majority of new renewable resources being added to power grids. Although the costs for energy storage to buffer this variability are dropping, the majority of these installations remain lithium ion (Li-ion) batteries, which often are sized to only offer 2-4 hours of discharge. Guidehouse Insights anticipates continued declines in prices of Li-ion batteries, with balance of system costs shrinking while power control systems costs declining at a slightly slower rate. Despite drops in costs, Li-ion batteries are not a total solution to the days or weeks long grid balancing and resiliency challenges facing the nation and the world.

Chart 1 C&I Building Li-Ion Battery System Pricing, 250 kW/500 kWh System, US, Base Case: 2020-2029



(Source: Guidehouse Insights)

A more traditional solution for balancing utility-scale renewables are gas-fired peaker plants. However, investments in this technology have risk since these plants are only called upon irregularly and are extremely expensive to own and operate. Interest is growing in hydrogen as a long duration energy storage option. While there are some examples of microgrids using electrolyzers to create distributed hydrogen systems, the majority of these installations have been in remote island markets where the economics of competing with diesel are favorable. Yet the timeline is still many years away for fully commercialized distributed hydrogen systems in microgrids, especially for commercial and industrial (C&I) applications in the US.

All of these challenges shape the energy transition and highlight the need for incremental innovation and for an underlying infrastructure that speaks to the practical need to pursue decarbonization without counting on major breakthroughs in storage technologies. What technology can be deployed today that will still provide ongoing value in the future?

As grid outages increase in frequency and duration in the US, regulators such as the California Public Utilities Commission (CPUC) have expanded the definition of a critical facility. CPUC's recent proposed decision for the Public Safety Power Shutoff proceeding expanded the definition of critical customers. This ruling is likely a precursor of things to come throughout the US as extreme weather events continue to increase over time. This proposed decision points to growing evidence of an expanded need for resiliency by certain customer types, a list that the CPUC admits will be expanded in the future:

> *The terms critical facilities and critical infrastructure refer to facilities and infrastructure that are essential to the public safety and that require additional assistance and advance planning to ensure resiliency during de-energization events. The Commission adopts an interim list of critical facilities and critical infrastructure but notes that the electric investor-owned utilities, in their Wildfire Management Plans, often list additional or differing facilities than those adopted here. The Commission strives to move toward a standardized definition and designation of critical facilities and critical infrastructure on a going forward basis, and the definition adopted here should not be construed as restrictive.*[8]

The CPUC went on to list the following customers for its interim list of critical facilities and critical infrastructure, which aligns with the US Department of Homeland Security's Critical Infrastructure Sectors (Table 1). This list is expected to grow and includes public and private facilities. Candidates likely to be added include grocery stores, gas stations, and other customer types that play vital roles during long duration power outages. These facilities all need protection from increased outages, often lasting for days. The most cost-effective way to achieve that protection is to deploy dual purpose microgrids that provide long duration resiliency while also capturing offsetting grid service revenues to reduce the cost.

Table 1 CPUC's List of Critical Facilities and Critical Infrastructure

Sector	Critical Facilities and Infrastructure
Emergency Services	• Police stations • Fire stations • Emergency operations centers
Government Facilities	• Schools • Jails and prisons
Healthcare and Public Health	• Public health departments • Medical facilities including hospitals, skilled nursing facilities, nursing homes, blood banks, healthcare facilities, dialysis centers, and hospice facilities
Energy	• Public and private utility facilities vital to maintaining or restoring normal service, including, but not limited to, interconnected publicly-owned utilities and electric cooperatives

[8] California Public Utilities Commission, "Rulemaking 18-12-005, Decision 19-05-042," May 30, 2019, p. 79.

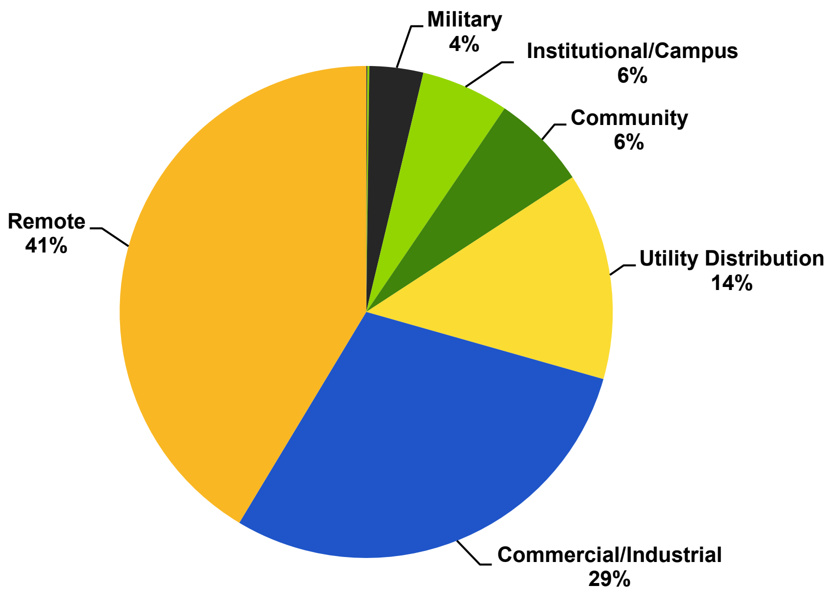
Sector	Critical Facilities and Infrastructure
Water and Wastewater Systems	• Facilities associated with the provision of drinking water or processing of wastewater including facilities used to pump, divert, transport, store, treat, and deliver water or wastewater
Communications	• Communication carrier infrastructure including selective routers, central offices, head ends, cellular switches, remote terminals, and cellular sites
Chemical	• Facilities associated with the provision of manufacturing, maintaining, or distributing hazardous materials and chemicals

(Source: California Public Utilities Commission and US Department of Homeland Security)

How Modular Dual Purpose Microgrids Serve Commercial and Industrial Customers, Communities, and the Larger Grid

C&I customers represent the fastest growing microgrid market today. In terms of a market's typical evolution, it makes sense for the C&I sector to be slower initially in uptake of microgrids than other microgrid market segments. With a razor-sharp focus on the bottom line and an aversion to risks, the private sector lags behind other market segments accustomed to explicit government support. However, when the stars align on proven technologies and viable financing business models, businesses move swiftly. And this is now the case with C&I microgrids, which represent the second largest cumulative identified capacity globally (see Chart 2).

Chart 2 Microgrid Capacity by Segment, World Markets: 1Q 2021



(Source: Guidehouse Insights)

Guidehouse Insights anticipates that, over the next decade, the C&I market emerges as the fastest growing of all microgrid markets for the following reasons:

- **Steady drops in the cost of DER assets.** While distributed solar PV and energy storage devices tend to get the most attention, other key components including scale economies from modular and standardized fuel-based generators are becoming more cost-effective. While this trend benefits all microgrid segments, it is particularly pertinent to the C&I segment. C&I customers place a premium on reliability but also do not want to pay a premium for energy services. The lower the cost of key microgrid enabling technologies, the more attractive the microgrid value proposition becomes.
- **Increased opportunity for asset monetization.** Major advances in software controls, switchgear, and relays translate into the ability of microgrids to increase the value of DER assets for seamless islanding from the grid and synchronous grid support services. These controls and

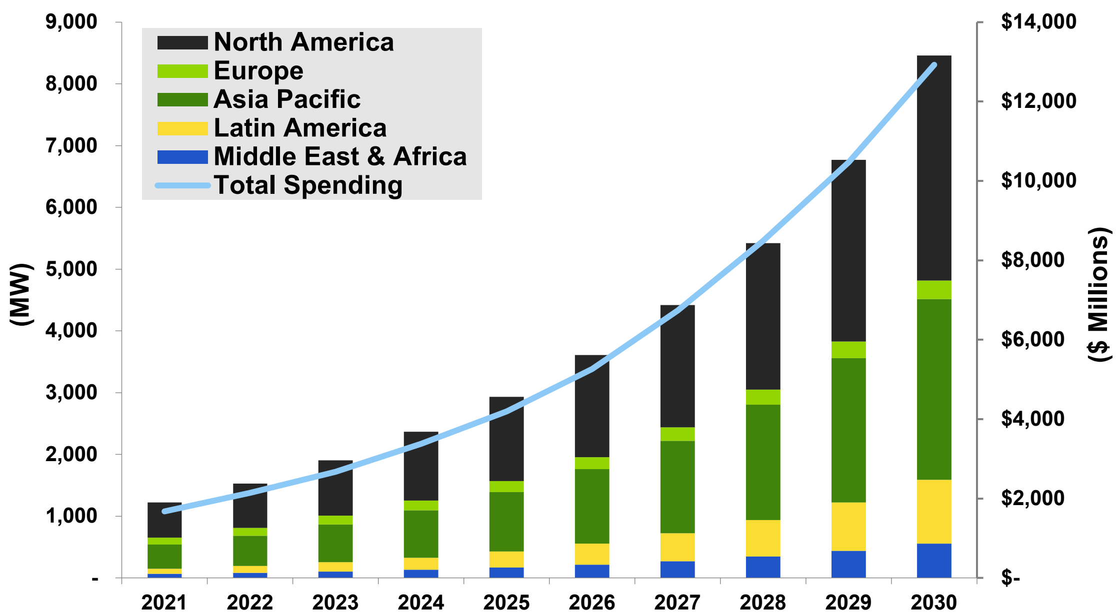
evolving market reforms such as FERC Order 2222 also enable dual purpose microgrids to reap new revenue streams through the provision of grid services.

- **Business model innovation that addresses fierce internal competition for fiscal resources within a corporate structure.** Vendors with attractive energy as a service offerings and guaranteed buydown or shared savings business models limit upfront capital expense. A microgrid looks a lot better from a corporate balance sheet perspective if it is lower in cost than diesel backup or viewed as an ongoing operations and maintenance expense.

The other shift in the microgrid market is a greater emphasis on modular solutions. The beauty of the microgrid is its ability to be tailored to meet the precise resiliency, economic, and environmental goals of any customer. Each microgrid can be a unique, customized energy system of any size, made up of a diversity of available DER assets. As the saying in the industry goes, if you have seen one microgrid—you have seen one microgrid. Though this intense customization is one of the microgrid platform's perceived strongest selling points, there are also downsides to this approach: time and money.

In response, there is a growing movement within microgrid ranks to take a contrary approach to radically expand the number of deployments. This alternative approach involves standardizing microgrid assets that can be assembled like Lego blocks, shrinking design and deployment costs. Among the market leaders embracing this approach is Enchanted Rock, which has sourced over 1,000 identical generators to date. This approach is more attractive to financiers as it creates portfolios of similar assets with proven performance attributes. In other words, make microgrids modular and plug-and-play. This is especially appealing to C&I customers who may have portfolios of similarly sized buildings and prefer a standardized approach to facilitate easier financing of infrastructure upgrades. North America, led by the US, is forecast to be the largest C&I market for microgrids over the next decade, reaching nearly $4.5 billion annually by 2030 (see Chart 3).

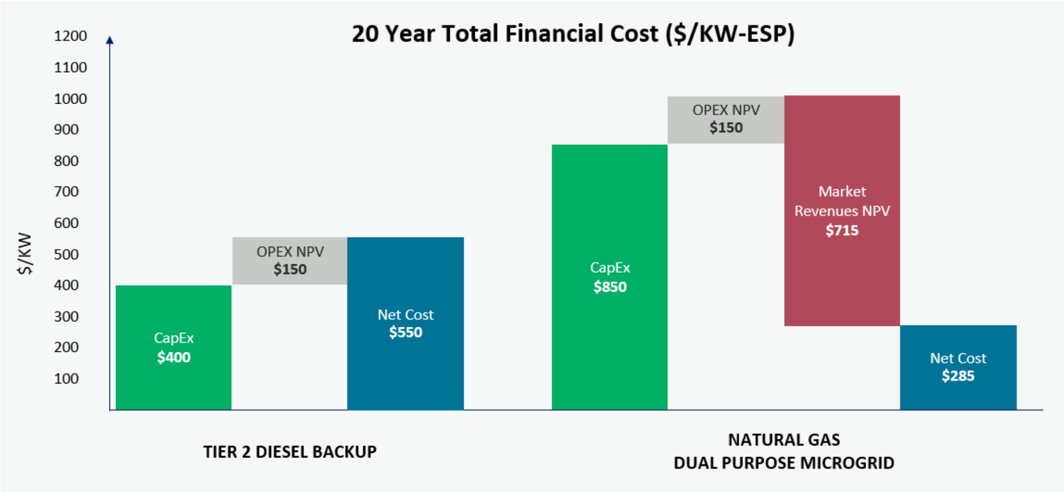
Chart 3 C&I Microgrid Capacity and Implementation Spending by Region, World Markets: 2021-2030



(Source: Guidehouse Insights)

Figure 5 showcases how a natural gas dual purpose microgrid stacks up against the cost of a typical EPA Tier 2 diesel generator. By leveraging the market revenues captured from the provision of grid services, the cost for resiliency with less environmental impact is reduced by over 50%—the most compelling distinction for much needed cost-effective resiliency.

Figure 5 Comparing Traditional Resiliency Solutions to Dual Purpose Microgrids



(Source: Enchanted Rock)

Although the primary traction of dual purpose modular microgrids to date has been with C&I customers located behind-the-meter, these microgrids can also be deployed in front-of-the-meter by or on behalf of utilities to offer resiliency services to entire communities. Take the case of the Bronzeville microgrid in Illinois located within Commonwealth Edison's service territory, which serves more than four million customers in northern Illinois. Scheduled for completion in 2022, Enchanted Rock's dual purpose microgrids will support the first cluster microgrid cluster in the nation, linking behind-the-meter rooftop solar, battery storage system, and an existing notable single owner campus microgrid at the Illinois Institute of Technology to an adjacent front-of-the-meter microgrid from Enchanted Rock, serving the surrounding community of Bronzeville.

This project shows how dual purpose microgrids can also be deployed in front-of-the-meter by a utility and support a single critical facility with resiliency services in addition to 1,000 residences, businesses, and public institutions, including a fire station and the headquarters of the Chicago Police Department. The Enchanted Rock dual purpose microgrid technologies help integrate utility-owned DER assets while also offering fast response resiliency with lower emissions than traditional solutions for this application.

Conclusions and Key Takeaways

Dual purpose microgrids offer a solution to the parallel energy transition challenges of grid transformation from renewables and electrification plus the increasing impact of severe weather and other threats to a growing array of critical infrastructure customers. The recent ice and record low temperatures in Texas and the heat storms and wildfires in California exemplify these challenges. Hurricanes also require a smarter, more cost-effective approach to resiliency that works for the overarching net zero carbon goals of society at an affordable price. Moving beyond solar PV and new batteries, dual purpose microgrids speak to the ability of such systems to deliver long duration resiliency while also helping stabilize the larger grid when called upon.

Here are three key takeaways for energy users, policymakers, regulators, and the larger energy solution ecosystem:

- The energy transition is not just about renewable energy and EVs that challenge grid operators' ability to balance supply and demand. It encompasses a long list of other technologies (including microgrids) that are flexible, affordable, and can stack use cases in ways that respond to short- and long-term customer needs.
- These supportive technologies and associated business models should be adaptive and nimble, enabling bidirectional value exchanges and allow microgrids to fully monetize their contributions to grid reliability and stability.
- Dual purpose microgrids can be deployed quickly in a modular fashion by critical customers for clean local resiliency, and regulators and utilities need to recognize their inherent value by expanding market access and fast-tracking approvals so they can facilitate the energy transition and accelerate the fight to slow global climate change.

Acronym and Abbreviation List

Commercial and Industrial .... C&I

California Public Utilities Commission…………………………………………….....CPUC

Distributed Energy Resources…………………………………………………….DER

Energy Information Administration……………………………………………….EIA

Environmental Protection Agency .... EPA

Electric Reliability Council of Texas………………………………………….ERCOT

Electric Vehicle .... EV

Federal Energy Regulatory Commission……………………………………….FERC

Gigawatt…………………………………………………………………………GW

Megawatt………………………………………………………………………..MW

Photovoltaic……………………………………………………………………...PV

System Average Interruption Duration Index Score…………………………...SAIDI

United States………………………………………………………………………US

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Scope of Study

Guidehouse Insights prepared this white paper, commissioned by Enchanted Rock, to provide a perspective on how the concept of dual purpose microgrids can enhance resiliency while also supporting the larger grid network during the energy transition. While policymakers have been focused on accelerating adoption of renewables and EVs to reduce carbon emissions, less attention has been placed on supporting DER technologies and business models that aid this shift to distributed energy from centralized energy sources through optimization and smart use of fuel-based generation assets.

Sources and Methodology

Guidehouse Insights' industry analysts use a variety of research sources in preparing research reports and white papers. The key component of Guidehouse Insights' analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Guidehouse Insights' analysts and its staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Guidehouse Insights' reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

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Published 2Q 2021