

WHITE PAPER

THE FUTURE OF BACKUP POWER AND THE 5G NETWORK

ABSTRACT

The fifth generation of wireless technology, or 5G, is one of the fastest, most robust technologies in the world. When compared to previous generations, users will see faster downloads, latency and a significant impact on how we stay connected in our everyday lives. The benefits of 5G are expected to make businesses more efficient and give consumers access to more information. According to Qualcomm, a wireless technology company, connected cars, smart communities, immersive education and linked industrial systems will all rely on 5G networks.¹ As more innovation relies on 5G, it is imperative for the technology to have backup power in place to ensure the critical reliability of the network. This paper will cover what solutions are necessary to ensure reliable, constant power for the 5G network, including the latest trends and innovations powering the telecom industry.

INTRODUCTION

The United States started rolling out 5G networks in 2018 and we are still in the early days of implementation. Cell companies are vying to have the fastest and largest 5G networks because the benefits of the new technology are expected to transform entertainment, communication and transportation as well as manufacturing. Qualcomm reported next-generation 5G networks can be 100 times faster than 4G, making communication between devices and servers much faster.¹

Much of the hype surrounding 5G is centered on speed. However, 5G will also have greater bandwidth and reduce latency. Edge computing, the base for zero latency, can allow self-driving cars to process information they need to make decisions in a blink of an eye and the health care industry believes 5G could help power the next generation of telemedicine and robotic surgeries. Communication and cloud platforms will also be faster and easier to use.

Much of the 5G network will travel over super-high-frequency airwaves, bringing faster speeds and more bandwidth with them. However, they can't travel through walls, windows or rooftops and they get considerably weaker over long distances. This means a wireless company would need to install thousands, or more, miniature cell towers on top of lampposts, on the sides of buildings or walls, often in close proximity to one another to achieve a superfast 5G network. Typically, these small cells must be placed about 800 to 1,000 feet apart, according to AT&T.² A wireless carrier could opt to install a low-band network (wide coverage area but only 20% faster than 4G), high-band network (fast speeds but signals don't travel well) and mid-band network. Most US carriers will have a mix of different network types that will enable both broad coverage and fast speeds.

POWER OUTAGES AND TELECOMMUNICATIONS

Your cell phone will continue to work during a power outage, but whether a call goes through or not is a different answer. Cell service depends on antennas and base stations to connect calls from a tower and other cellular providers. While your phone may be completely charged, a call may not go through because of a problem at the cell tower, cell company switching equipment, or other cell service and landline provider issues. The Federal Communications Commission (FCC) imposes specific mandates on wireless carriers including backup power at most cell sites. Therefore, cell towers typically have backup solutions that support operations. In critical service areas, battery backup is enhanced by generators that start when the batteries cannot provide enough power. Telecommunications relies on an elaborate network of cell phone towers and facilities to transmit phone calls and provide services. To operate effectively, each tower and facility requires constant and reliable electrical power. Today, the industry

1. <https://www.qualcomm.com/5g/what-is-5g>

2. <https://www.wsj.com/articles/the-downside-of-5g-overwhelmed-cities-torn-up-streets-a-decade-until-completion-11561780801>

continues to expand, there is an increased use of cell phones, and there are more computers that use high-speed Internet. When a tower loses power, services are not available and the consequences can be severe.

In the next decade, as more technology depends on 5G, the need for reliable backup power will only increase. With 5G interconnecting and controlling machines, objects and devices, the loss of power could cost lives. In the event of a 5G network failure, the entire ecosystem of interconnected devices could collapse. Autonomous vehicles and drones would come to a standstill and critical infrastructure stops working. Large segments of society would come to a halt.

BACKUP SOLUTIONS FOR 5G

We rarely think about power until it is unavailable. Power outages are becoming more prevalent in the last decade and happen for several reasons. According to the Edison Electric Institute, 70 percent of power outages in the U.S. are weather related, but other causes include vehicle accidents, equipment failure, animals and an overworked power grid.

2020 POWER OUTAGES	
Total Outage Hours Lost	1,024,296,527
Affected Customers	50,005,692
Weighted Avg Duration	20.5
Number of Tracked Outages	4,623

OUTAGE TYPE VOLUME	
Hurricane	499,969,977
Strong Storms	277,030,376
Snow/Ice Storms	90,963,431
Equipment Failure	79,135,521
High Winds	45,593,970
Tropical Storm	2,625,934
Fire	1,166,624
Earthquake	424,746
Vehicle	281,852
Theft/Vandalism	124,571

Providing backup power to the 5G network does pose some challenges. Since 5G works through smaller and increased radio cells, getting traditional backup power to all the locations could be difficult and expensive. To ensure reliable power at all times, a myriad of solutions will be required to provide the ultimate backup power solution including the following:

Site Installations

Every element of the network will need to have backup power. This includes the cell tower site, the carrier switching station as well as the national operating center (NOC). Every site requires a different type of solution. At the cell tower, a high power, compact diesel or gas generator is an ideal solution. For instance, Generac’s new compact diesel generator offers 30 kW of power with a run time of 79 hours. The easily configurable unit with high fuel efficiency means the remote unit requires less servicing. It provides more power to keep up with the increase in demand and the compact footprint keeps rental costs lower. With new 5G sites being constructed on rooftops, generators are also capable of being installed on top of buildings to provide necessary support. Generac’s natural gas and propane powered generators offer a unique and significant advantage for rooftop installations avoiding diesel fuel storage and refueling while reducing carbon emission, especially in more dense urban areas. Carrier switching stations and NOCs on the other hand require substantial backup or even prime power gensets to ensure the flow of information never stops. Units like Generac’s line of 750 kW – 3.25 MW industrial generators can be customized to meet the highest reliability and performance standards.

Edge Computing Backup

New 5G services promise significant advances in innovation, but these services will make unprecedented demands on data centers and the need for backup power. At a basic level, edge computing brings computation and data storage closer to the devices where it is being gathered, instead of relying on a central location that can be thousands of miles away. According to Gartner, an IT service management company, edge computing, or processing outside a traditional centralized data center or cloud, will account for 75% of enterprise-generated data by 2025, up from just 10% in 2018.³ As edge computing data centers assume a lead role in 5G-driven applications, they will require an evolution in robust uninterruptible power supply systems to safeguard uptime and ensure mission critical connectivity and response time.

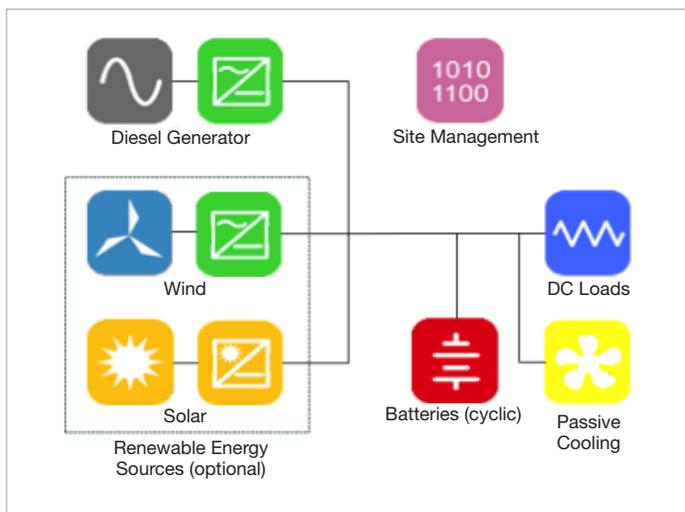
Source: Generac Power Systems, Inc.

3. <https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders/>

Edge data centers need backup power systems in case their primary source of electricity is interrupted. Switches for edge data centers are at locations like cell towers, healthcare facilities, etc. to keep up with the ever-increasing demand on carriers. A current trend is carriers leasing land and building switching stations to keep up with demand. These solutions are utilizing generators ranging from 100 kW -1 MW.

Hybrid Solutions

Another way to provide backup power to the 5G network is a hybrid solution. A hybrid telecom solution design should be a combination of renewable energy resources like solar, wind, hydro or geothermal energy generating assets along with a means to store the energy generated with batteries, pumped hydro, flywheels and thermal energy storage. This combination allows the carrier to capture as much of the renewable energy as possible to meet the power needs of the site. The addition of a diesel or gaseous generator improves the overall system resiliency when the renewable resources are not able to fully meet the load requirements.



Source: www.vertiv.com/en-emea/public-campaigns/hybrid-solar-telecom

This solution is great in urban or remote areas and is already being used to support new 5G sites. For very remote carriers that were relying solely on diesel or propane generation to provide all power needs, by incorporating renewables, the operating costs of the system will be greatly reduced. Planned maintenance and refueling schedules can be extended, as the generator will be running less hours per year due to the system using the renewable generation when available to cover the loads.

Mobile Backup Power

When it comes to providing backup power for 5G, mobile generators can be a critical need for carriers. Mobile generators offer many advantages as a backup power solution including:

- **Fast Deployment:** If you need power fast, mobile generators can be deployed and setup quickly, within days or even hours. And, a mobile generator is an ideal interim power solution while waiting for a stationary standby generator to be permanently installed.
- **Versatile:** Because mobile generators are easy to tow and transport, they are an ideal option for carriers that have multiple locations to protect. The generator can be transported to locations when and where power is needed.
- **Economical:** If you do have multiple locations to protect, a mobile generator can be the most economical option for backup power, transporting generators where the power is needed.
- **Easy to Operate:** Mobile generators are safe and easy to use once you know the basics. Pre-installing transfer switches and having a few essential power cords on hand make the process even easier.

THE IMPORTANCE OF GENERATOR REMOTE MONITORING

Customers count on carriers for reliable coverage. One off-line cell tower can make the difference between happy customers and losing them to a competitor. Carriers can monitor the network from the NOC and are notified of an outage at the tower, but they can't always determine the issue. In order to trouble shoot and make the repair, they must send a costly service team to correct the issue. With remote monitoring, carriers are provided more detailed information without having to go to the site.

Generac Industrial Power's new remote generator monitoring service, Mobile Link Industrial, adds an extra layer of protection through remote monitoring. It relays pertinent generator information directly to your service distributor 24/7. This enables improved generator operations, increases generator uptime and service response time. Remote monitoring enables virtual troubleshooting of generator status by remotely viewing generator parameters, to make decisions on whether to send a technician or not, saving time and money. Mobile Link Industrial offers reporting with details of generator performance allowing maintenance team members to manage multiple sites with the click of a button.

OTHER CONSIDERATIONS FOR BACKUP POWER

When selecting a backup power generator for urban and remote cell towers, carriers need key elements to optimize performance and return on investment. Top other considerations to keep in mind include:

Small footprint: Space can mean dollars when providing backup power to cell towers. When every square inch costs dollars, compact units, like Generac's new compact diesel 10-30 kW generator, are ideal solutions for space-constrained locations.

Emissions: Diesel-fueled generators are the workhorses of the industry. Generac's diesel engines are EPA Final Tier 4 compliant straight from the factory. Our units have an optional 125% spill containment. Generac also offers alternative fuel solutions. Natural gas generators offer reduced emissions compared to diesel generators and the permitting requirements are easier. Bi-Fuel is another great option with an initial start from a diesel engine transitioning to primarily natural gas under load.

Robust enclosure: Cell tower locations vary: they are either in the middle of cities or in remote locations. Generac manufactures sound-attenuated enclosures that reduce the noise level for city or urban cell tower locations. Generac also produces extreme weather-resistant enclosures, should the tower be located on a mountain, near the ocean or in the Midwest and subject to a variety of weather events.

CONCLUSION

As a leading supplier of backup power, Generac Industrial Power is in the forefront of developing power technologies of the future. The future of technology is centered around 5G and connectivity. Without reliable power, the cost could be severe, as large segments of society would come to a halt. In an ever increasingly connected world, the importance of backup power will only be more prominent. It is important to understand the nuances surrounding 5G to provide carriers optimal solutions to keep networks up and running at all times.