

Communication Technologies for Remote Generator Monitoring



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Overview

Remote Generator Monitoring (RGM) has become increasingly popular over the past decade, which is not surprising, since it provides substantial benefits to generator maintenance companies and generator owners. A wide array of RGM solutions are available, both “OEM” (generator manufacturer specific) and “universal” (works with most generator makes and models) types, with a wide range of both complexity and cost.

One of the most important factors to consider when choosing an RGM solution is the communication technology used to send data from the generator being monitored to the monitoring vendor. This white paper will explore the various communication technologies utilized by the RGM solutions currently available, and the communication technologies will be compared on four critical attributes:

- Reliability
- Installation
- Longevity
- Cost

Understanding the differences between the various communication technologies will help generator maintenance companies make informed decisions about which generator monitoring solutions they install for various applications. By choosing the right solution for each application, you can improve maintenance scheduling and increase revenues, while also boosting customer satisfaction.

Communication Technologies Report Card

Technology	Grade	Reasons
Cellular (LTE)	A	Good coverage, reliability, value and longevity
Cellular (non-LTE)	B	Good coverage, reliability and value, but limited longevity
Satellite	B-	Great coverage, but expensive, has limited vendor choices and can be challenging to install
Telephone Line	D	Very poor longevity and can be challenging to install
Wired Internet	D	Poor reliability after events which cause power outages, challenging to install
WiFi	F	Very poor reliability after events which cause power outages, challenging to install, subject to dropped connections

Read on to find out why these communication technologies earned these grades, the advantages and disadvantages of each technology, and the best communication technology to select for various RGM applications and scenarios.

Communication Technologies for Remote Generator Monitoring

Definitions

Cellular: Public cellular wireless networks offering 'nationwide' or regional coverage for telephone and data services, which are operated by major cellular carriers (e.g. AT&T, Sprint, Verizon, etc.)

Communication Technology: Method used to communicate data from the generator monitoring device (located at or near the generator) to the RGM service vendor.¹

'Last Mile': The connection from the major network 'back-bone' to the premise. May be wired or wireless and may be longer or shorter than a mile.

LTE: Long Term Evolution cellular communication technology. Presently, this indicates the newest and fastest cellular technology available, and is typically also described as 4G (fourth generation) by the cellular carriers. LTE indicates that the carrier is committed to continuing to support this technology well into the future, even as newer, next generation technologies (5G, etc.) will become available.

Non-LTE: Cellular technology which was deployed prior to the newest / fastest cellular technology available, and for which the cellular carriers do not have a commitment to longevity. This is typically 2G and/or 3G technology, and carriers have already started to discontinue (or 'sunset') this service to make room on their networks for LTE technology. Most Non-LTE cellular will be discontinued within 1 – 5 years, so devices which solely rely on this technology will have to be replaced.

WiFi: Technology which allows wireless local networking of devices such as tablets or smartphones and is based on the 802.11(x) standard of the Institute of Electrical and Electronics Engineers (IEEE). WiFi provides a local wireless connection or 'gateway' (generally under 100 feet of range) between these devices and the broadband internet service at a home or business and cannot supply internet service to the devices unless it can access the premise broadband service.

Wired: Communication technology which uses a 'hard-wired' connection to communicate data from the generator monitoring device (located at or near the generator) to the remote monitoring service vendor. The local area network (LAN) connection is typically an ethernet cable connected to a modem or router which receives broadband internet (wide area network, or WAN) via coaxial cable, fiber optics, etc.

Wireless: Communication technology which uses a wireless connection to communicate data from the generator monitoring device (located at or near the generator) to the remote monitoring service vendor. Examples include cellular, satellite, UHF and WiFi. Although WiFi uses a wireless path to connect the RGM equipment to the WiFi router within the premise, it relies upon a wired connection from the WAN modem or router to the RGM service vendor.

¹ This white paper does not cover local communication protocols which might be utilized by the generator monitoring device to gather data from the generator controller (i.e. CAN Bus, Modbus, etc.), or communication methods used to communicate data from the remote monitoring service vendor to the persons or entities responsible for monitoring the generator.

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Wired Communication Technologies

There are two primary types of wired communication networks in use in North America for data, video and voice communications:

Cable Television Networks / Fiber-Optic Networks

The 'Cable' and 'Fiber' networks are the most widely used wired systems in North America for delivering television, internet, and voice services to residential and commercial premises. These systems typically consist of a network 'backbone' that utilizes fiber-optic cabling and equipment to carry vast amounts of video, audio and data at high speeds over long distances, and sub-networks which utilize copper coaxial cable or fiber-optic cable to distribute the video, audio and data to neighborhoods and individual premises. These sub-networks are also known as the 'last mile' of the network and consist of overhead and/or underground cabling. Connection to the internet at the premise may be wired (i.e. ethernet) and/or wireless (i.e. WiFi).

Copper 'Twisted Pair' Telephone Lines

This extremely antiquated infrastructure is being phased out, or "de-commissioned" by landline telephone companies throughout the country, and as such, should NOT be considered a viable communication technology for any use, including remote generator monitoring.

Wireless Communication Technologies

There are two primary types of wireless communication networks which provide nationwide coverage in North America for voice and data communications, 'Cellular' and 'Satellite'. There are many other wireless networks that use various proprietary technologies (including UHF radio networks offered by CRN Wireless), however, this white paper is focused on the Cellular and Satellite wireless networks, which offer extensive coverage across North America.

Cellular Networks

The cellular networks are terrestrial wireless networks which typically utilize many 'cell sites' (located on buildings, towers, etc.) to wirelessly communicate voice and data to mobile and fixed cellular devices. The network (and therefore coverage) is built around population centers and/or roadways, so coverage may be poor or non-existent in very remote and/or unpopulated areas.

Satellite Networks

Several satellite services allow for wireless communication of voice and data from mobile or fixed devices (satellite 'terminals') to geostationary or low-earth orbit satellites in space. Coverage is global (or nearly global), but requires an unobstructed, upward-facing antenna located outdoors.

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Advantages and Disadvantages of RGM Communication Technologies

Technology	Advantages	Disadvantages
Cellular (LTE) Grade: A	<ul style="list-style-type: none"> • Extensive coverage utilizing hardened nationwide cellular networks; not dependent upon local premise internet • Low equipment costs and network fees • Real-time reporting (negligible latency) • Fast and simple installation, with Plug & Play connection to cellular network • Highly secure connection, with extremely low vulnerability to cyber-attacks/hacking • Great longevity (current LTE technologies to be supported through at least 2030 +) 	<ul style="list-style-type: none"> • Coverage may be poor or non-existent in very rural, unpopulated or remote areas
Cellular (non-LTE) Grade: B	<ul style="list-style-type: none"> • Includes all advantages of non-LTE Cellular, except great longevity 	<ul style="list-style-type: none"> • All non-LTE coverage expected to 'sunset' (be eliminated) in 1 to 5 years • Coverage may be poor or non-existent in very rural, unpopulated or remote areas
Satellite Grade: B-	<ul style="list-style-type: none"> • Coverage in very rural, unpopulated or remote areas which may lack cellular coverage 	<ul style="list-style-type: none"> • Higher equipment costs and network fees • Requires outdoor, upward-facing antenna and is subject to interference from atmospheric conditions and snow cover • Latency of up to 5 minutes may occur (not real-time) • Very few vendor choices
Wired Internet Grade: D	<ul style="list-style-type: none"> • Potentially FREE (no recurring fees to utilize existing wired internet at premise) • Real-time reporting (negligible latency) 	<ul style="list-style-type: none"> • The 'last mile' may not exist, especially at rural or remote locations • High monthly costs if wired internet must be installed as RGM communication path • Installation requires connection to local premise internet service, which customer may not allow • 'Last mile' overhead and/or underground cables to premise are subject to interruption during same events which cause power outages • Relies upon consumer-grade local network equipment (i.e. modems, routers, etc.), which may not have backup power • Premise owner may change or alter network equipment at any time, rendering RGM equipment inoperable
WiFi Grade: F	<ul style="list-style-type: none"> • Includes all advantages of Wired Internet 	<ul style="list-style-type: none"> • Includes all disadvantages of Wired Internet • Requires reliable WiFi coverage / path • Subject to failure when customer switches WiFi router or changes WiFi password

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Conclusion

Which communication technology is right for each application?

- LTE cellular communication is the best option for RGM communication at any locations which have reliable LTE cellular coverage.
- At locations which don't have LTE coverage yet, a Non-LTE solution can be deployed, but should be replaced with an LTE solution once LTE coverage becomes available.
- Satellite communication is a good alternative to cellular at remote locations which don't have any cellular coverage, provided the budget for RGM is adequate.
- Wired Internet and WiFi are not good communication technologies for RGM, for the many reasons covered in this white paper.

CRN Cellular Generator Monitor

The CRN Cellular Generator Monitor is a simple and extremely cost-effective monitoring solution suitable for the smallest residential generator, to large industrial generators, and everything in between. CRN dealers appreciate the universal compatibility and simple, fast installation (typically under 30 minutes). Most dealers find that it is so cost-effective they can standardize on the CRN Cellular Generator Monitor for every generator they install or service.

Every CRN Generator Monitor is shipped with all parts necessary for installation, and mounts directly to the generator enclosure. The dealer controls the flow of information, and decides which recipients will receive alerts, preventing irrelevant alerts and unnecessary service calls. In addition to real-time alerts, dealers can receive weekly exception reports, so they know the status of each generator to maximize service call efficiency.

A Win-Win: Improve Your Bottom Line While Providing a Valuable Service

- **Generate Incremental Revenue** for this valuable service by incorporating it into your maintenance contracts. Your customers will pay for the added assurance that generator monitoring provides.
- **Improve Customer Satisfaction** by proactively addressing generator problems and reducing incidents of generator failure during power loss. Know if there is a problem before your customer does.
- **Increase Efficiency and Profit** by accurately planning maintenance needs and scheduling maintenance visits more efficiently.

CRN Wireless is an international provider of wireless products and services that facilitate the communication and monitoring of data and alarm signals. For over 30 years, our products and services have been used in a variety of applications across a broad range of industries including security, generator monitoring, life safety and industrial monitoring. CRN products have been installed in over 20 countries across 5 continents. From monitoring devices to turnkey wireless networks and fully customized products, we offer a broad range of wireless monitoring solutions.